



2011-2015

SHARE

Stations at High Altitude for Research on the Environment

**Integrated project for environmental
monitoring and research in the mountain
areas of Europe, Asia, Africa and America**

SHARE

Stations at High Altitude for Research on the Environment

Vision:

To meet the requirements and priorities identified by international agencies and research institutions for understanding climate change and its impacts in high mountain regions through the employ of Stations at High Altitude for Research on the Environment.

Mission:

To study climate change impacts in mountain regions, throughout long term environmental monitoring programs. To promote adaptation strategies, supplying accurate information on different environmental disciplines: atmospheric composition and air quality, glaciers and water resources, ecosystem conservation, and human health.

Priority:

- Provide scientific analyses related to climate change and anthropic pressure impacts in high mountain areas.
 - Creation of a long-term atmospheric and environmental observation monitoring system in mountain areas
 - Implementation of a climate environmental information system on mountains
 - Supporting governments and local administrators in the adoption of proper environmental policy
 - Strengthen the collaboration with international agencies and research institutions.
- Transfer of scientific knowledge to international and local community and decision-makers, with particular attention to developing countries.

Benefits:

- Create a global coordination system for high-altitude research, providing an Italian scientific and specialized contribution
- Strengthen the role of Italy in proposing and implementing a climate and environmental information system of excellence on mountain regions as well as significantly contributing to the Rio+20 and IYM +10M+10.
- Enhancing the role of mountains, as primary indicators of climate change, at international level, providing a significant contribution to international programs such as IPCC, UNFCCC, COP
- Provide environmental quality data to national and international entities for the development of predictive models essential for the study of climate change that will guide stakeholders, policy-makers and institutions in the implementation of adaptation and mitigation schemes
- Build high-tech monitoring systems to continuously collect environmental data, which may satisfy diverse market requests
- Share with local people, especially in developing countries, the information resulting from research activities to increase sensitivity and allow them to operate in a perspective of sustainable development
- Strengthen collaboration with agencies and international institutes to avoid duplication of efforts and waste of economic resources





Stations at High Altitude for Research on the Environment

Scientific and technological research project for studying and monitoring environmental and climate in mountain areas

SHARE is promoted by Ev-K2-CNR, with the support of Italian and International research institutions and in collaboration with the United Nations Environment Program (UNEP)

SHARE, is an Italian project responding to the call of International and Intergovernmental institutions set up to improve environmental research and policies for adaptation to the effects of climate changes.

The United Nations agencies UNEP and UNFCCC, together with the World Meteorological Organization (WMO), IGBP, NASA, GEO, the inter-institutional partnership created by the G8, have included the activities carried out in SHARE program in their programs, ABC, GAW, IGAC, GEWEX/CEOP and AERONET, thus acknowledging the SHARE's value and unique contribution in the field of environmental monitoring and research in mountain regions.

Overall background and objectives

Station at High Altitude for Research on the Environment – is an integrated environmental project promoted by Ev-K2-CNR in 2005, focused on the mountain regions as primary indicators of climate change.

Originally launched as a system of measurements in environmental and earth sciences in the Himalaya – Karakorum region, **SHARE**, has later expanded its network to Europe (Apennines and Alps), Africa (Rwenzori) and more recently to South America (Andes).

From 2005 to now, **SHARE** has modified its structure, becoming a integrated and multi-disciplinary research project on environmental monitoring and climate dynamics in many mountain areas of the world.

SHARE responds to the call of international and intergovernmental institutions for improving environmental research in high mountain regions. This is to promote adaptation policies to climate change effects, and collaborate in order to define needs and priorities identified by UNEP and other International agencies for the understanding of climate change and its impacts.

SHARE specific aim is to improve **scientific knowledge on climate variability in mountain regions**, by ensuring the availability of long term, high quality data.

For this purpose, a **global mountain observation network** on atmospheric composition, meteorology and glaciology, hydrology and water resources, biodiversity and human health has been developed and maintained. **SHARE** activities also plan to include the design of mitigation and adaptation strategies to oppose the effects of climate change. This following the resolution adopted by the UN General Assembly during the 78th plenary meeting concerning the Sustainable mountain development (UN, A/Res/62/196, 2008): *"Mountains provide indications of global climate change through phenomena such as modifications of biological diversity, the retreat of mountain glaciers and changes in seasonal runoff that may impact major sources of freshwater in the world, and stresses the need to undertake actions to minimize the negative effects of these phenomena. Sustainable mountain development is a key component in achieving the Millennium Development Goals in many regions of the world."*

Technological developments aim at facilitating researches and observations in high mountain regions and represent a fundamental role in the **SHARE** project.

These activities are mainly devoted to improve the development of high altitude stations working in remote areas and to develop an autonomous climatic monitoring system, that can be transported to the interested regions and energetically self-sufficient.

Capacity building activities are another crucial objective of the **SHARE** project. In particular, local institutions are directly involved in monitoring and research activities assuring support to environmental management policies and decision-making processes in developing countries (UNEP – Bali Strategic Plan), also taking into account relations with the social system and a close collaboration with stakeholders.

SHARE PROJECT FRAMEWORK 2009 – 2015

Project Manager: Paolo Bonasoni (CNR-ISAC)
Executive Coordinator: Elisa Vuillermoz (Ev-K2-CNR)

ACTIVITY SECTOR	WORK PACKAGE	THEMATIC AREA
Scientific Research and Climate Reference Person P. Bonasoni (CNR-ISAC)	WP 1 Integrated Project for climatic, environmental and geophysical monitoring, on local, regional and global scales: Asia (Himalaya-Karakorum) Africa (Ruwendzori) Europe (Alps and Apennines) South America (Cordillera Real)	WP 1.1 Atmosphere P. Cristofanelli (CNR-ISAC) <hr/> WP 1.2 Glaciology C. Smiraglia (University of Milan) <hr/> WP 1.3 Water resource To be define R. de Bernardi (CNR-ISE) <hr/> WP 1.4 Biodiversity and natural resources S. Lovari (University of Siena) G. Rossi (University of Pavia) <hr/> WP 1.5 Medicine A. Cogo (University of Ferrara)
Technological Research and Climate Reference Person P. Laj (CNRS-LGGE)	WP 2 Scientific research and industrial design for the development of a state-of-the-art technological system for environmental monitoring in mountain areas	
Information System Reference Person M.T. Melis (Università di Cagliari)	WP 3 Multidisciplinary Information System concerning scientific and technological research activities in mountain areas, for use by scientific bodies, governments and inter-governmental agencies.	
Capacity building Reference Person to be define	WP 4 Program supporting government level decision-making processes regarding the environment; transfer of skills and technologies to promote and ensure sustainable development; technology transfer, promotion of business and institutional participation.	



WP
and
Applications

SHARE

Stations at High Altitude for Research on the Environment

WP 1 – Scientific Research and Climate

WP 2 – Technological research and Climate

WP 3 – Information System

WP 4 – Capacity Building

Applications:

SHARE – Asia

SHARE – Africa

SHARE – America

SHARE – Italia

WP1

WP 1 – Scientific Research and Climate

SHARE –promotes multidisciplinary scientific researches related to climate change studies and to typical mountain regions phenomena in five thematic areas: atmosphere, glaciology, water, biodiversity and natural resources, and medicine. Each of these thematic areas corresponds to a specific task related to a different WP.

The core of **SHARE** research activities is represented by its monitoring system that includes three climatic monitoring station (two permanent and one seasonal stations) and fourteen Automatic Weather Stations (AWS), all located at high altitude mainly in protected areas (Sagarmatha National Park in Nepal, the Central Karakorum National Park in Pakistan, the Ruwenzori National Park in Uganda, and the Stelvio National Park and Frignano Regional Park in Italy). The network's oldest stations have been running in Italy and Nepal for several years: the ISAC - CNR "Ottavio Vittori" station on Mt. Cimone (operative for the past 15 + years) and the Pyramid Laboratory-Observatory at 5000 m a.s.l. near Mt. Everest (operative for over 10 years). Thanks to the excellence and uniqueness of the data collected by these stations, **SHARE**

directly promotes environmental research and scientific studies and provides contributions to integrated monitoring programs such as UNEP-ABC, WMO-GAW, WCRP-CEOP, NASA-AERONET, ILTE, EU-EUSAAR, EU-ACCENT, EU-ACTRIS..



Benefits

Provide data collected in several areas (Atmosphere, Glaciology, Water, Biodiversity and Medicine) and in high-altitude regions to the international scientific community

Make available a unique international network of high-altitude climate and environmental monitoring in accordance with data quality international standards

Get an overall view of the effects of climate change on the entire mountain ecosystem, essential starting point for planning actions to reduce its impact

Provide data bases useful to applied research related to the evaluation of natural hazards

Responding to the needs and priorities about climate change impacts, identified by local and international entities and institutions, by providing information to support a sustainable management of natural resources



WP2

Technological Research and Climate

In the framework of the **SHARE** project, research activities devoted to technological development and innovation regarding the equipment and instruments for climate monitoring in remote areas are also included. Close collaboration with the private sector and industry is envisaged in implementing this work package.

The objective difficulties of performing continuous measurements at high altitudes, especially in developing countries, is one of the reasons why knowledge of climate and environmental processes in mountain areas is still limited. To get round these problems, it is fundamental to develop and use advanced technologies for climate change monitoring.

Recently **SHARE**, thanks to the contribution of CNR and CNRS research teams, is promoting the development of a sophisticated portable monitoring system called Nano-**SHARE** that would be set up to overcome the environmental difficulties characterizing the remote high altitude regions, such as extreme environmental conditions, transport and technical/logistical complexities, power-supply problems and the need for real-time data transmission and where the installation of a fully-equipped laboratory could be too difficult or expensive. Main applications of this system include permanent monitoring activities but also short term measurements during intensive field campaigns and /or mapping of the atmospheric composition in a specific area.

The first check and calibration tests were both carried out at the CNR Monte Cimone station, one of the thirty-four Global Station in the GAW - Global Atmospheric Watch program and at the Forni Glacier (Central Alps). On the basis of collected data and carried out analysis, the prototype will be further perfected in order to guarantee the high quality of monitoring activities.

This innovative and sophisticated environmental monitoring system is flexible, modular and powered by renewable energy sources with a low environmental impact, and will make possible to carry out measurements where the installation of a fully-equipped laboratory or standard station would be too difficult or expensive.

This WP will focus its attention also on the maintenance of the existing stations installed in mountain regions and on the quality of the acquired data. This will permit to respond to the needs and priorities identified by national and international research institutions for understanding climate changes in mountain regions. Moreover integrated data collection and information sharing would be fundamental to increase knowledge among scientific and policy-maker communities.

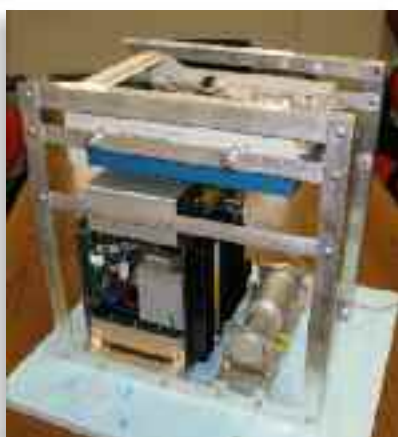
Benefits

Make available an advanced technologic system that allows to increase the coverage of environmental monitoring in remote areas

Offer the possibility to include specific sensors to the NANO SHARE depending on the required monitoring, ensuring modularity and integrity of an environmental/geophysical monitoring system adaptable to diverse applications

Reduce monitoring costs by enabling the observation in sites where the realization of an equipped laboratory or a standard station would be too difficult or expensive, thanks to the use of renewable energy sources too

Allow mapping elaboration to assess air and environmental quality and to identify priorities for action



WP3

Information System

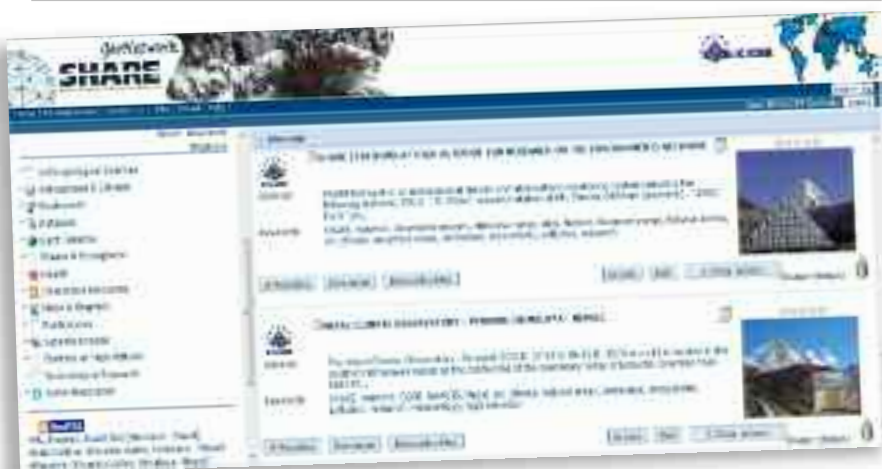
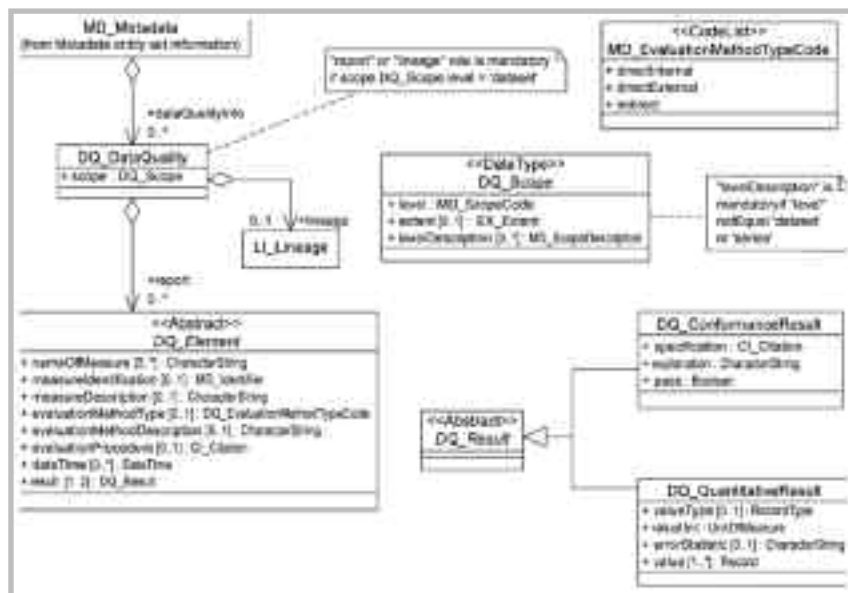
In response to the growing demand for access to information collected by high altitude stations and environmental data acquired and processed by the researchers, in the framework of the SHARE project the creation of an information system where data and metadata may be shared through specific web services, is ongoing. The **SHARE** Information System is equipped by an integrated GIS database for environmental data management in high mountain regions.

In this context, **SHARE** is developing a GeoNetwork open source architecture, to create an international standard catalogue of data and metadata to be used by the scientific community. This will permit to integrate environmental data collection and dissemination initiatives, concerning research activities in mountain regions, allowing to fill a major gap.

Two principal actions are considered:

- a shared database for the collection, management and access to spatial and non spatial data;
- a dedicated thematic portal for the access to distributed databases and to remote high altitude stations. The web portal will allow users and stakeholders to identify and access information from a wide range of sources, from local to global level.

The synergic collection of information will be encouraged in an effort to optimize investments and to make them available to stakeholders, governments, consultants, policy



makers and anyone involved in the promotion of sustainable development of the mountain environment. In fact, Information Systems and environmental monitoring databases will facilitate the dissemination of knowledge helping to improve the understanding of climate change phenomena and favoring the development of suitable mitigation and adaptation strategies.

Benefits

Collect and share high-altitude research data and information with the whole scientific community, local authorities and institutions

Store in a single and integrated information system for mountain areas the information related to Atmosphere and Climate, Biodiversity, Technology Research, Dataset, Earth Sciences, Glacier and Cryosphere, Atropological Science, Energy, Health, Interactive Resources, Maps and Graphics, SatImage, high-altitude stations, Glaciology

Provide a structured information system supporting the management of mountain resources

WP4

Capacity Building

Through its close links with UNEP, **SHARE** will strengthen partnerships with developing countries, by providing scientific knowledge and technological skills required for the study and monitoring of climate to local governments and international agencies. **SHARE** may thus be seen as a promoter of technology transfer in order to support governmental and

inter-governmental decision-making processes involving the environment.

Within this optical, capacity building activities and technological transfer mechanisms are promoted through the involvement of local decision-makers and research institutions, in developing and transitional countries. This allows to provide on-the-job training to local technicians and researchers, to create “scientific capacity” as indicated in Agenda 21.

Policy makers and local administrators will be encouraged to integrate these knowledge in the national and international development processes in order to become autonomous in the development and implementation of long-term environmental monitoring systems in mountain regions.

During each field mission carried out by European scientists in developing countries the involvement of local researchers and technicians is also foreseen and the transferring of knowledge is guaranteed during the usual research activities. Local technicians will be thoroughly trained in the management and maintenance of sophisticated environmental monitoring systems.



Benefici

Improving the scientific and technological knowledge of local staff involved in the proposed activities through the organization of training courses

Involve local people in the understanding of climate change through the organization of dissemination activities

Provide politicians and local decision-makers with information useful for the definition of national development policies

Strengthen cooperation with international agencies and organizations assuring information sharing for the promotion of actions in support of local communities

Participate in international initiatives to promote mountains as primary indicators of climate change (e.g. MICC)

THE APPLICATIONS

SHARE – Asia

The development of research activities in Central Asia around the two highest mountains on Earth, Everest and K2, starts with the creation of an environmental monitoring network implemented along the Himalaya-Karakorum range, with the aim of studying and assessing climate changes effects in this territories.

This has been possible starting observations on atmospheric composition and meteorology, limnological and paleolimnological measurements on high altitude lakes, while performing glacier monitoring and precise measurement of Earth surface coordinates.

These studies will help:

- develop an integrated system of measurements allowing to significantly contribute to the improvement of knowledge in the fields of environment and Earth Sciences in the region;
- stimulate technology transfer and capacity building processes in the fields of environmental and geophysical monitoring by directly involving target countries and local communities, in order to enable local populations to independently control and sustainably manage the local environment.

The idea of developing research activities in Asia around the two highest mountains in the world, Mt. Everest (8848 m) and Mt. K2 (8611 m), has proven to be both scientifically effective and strategic as it has already improved our understanding of environmental phenomena on a local, regional and global scale. SHARE has focused in particular on research on atmosphere, climate changes and natural hazards in the Himalaya-Karakorum region.

In fact, in the last decades, an increase in the average annual temperature trend has been recorded, which is related to the presence of significant concentrations of atmospheric pollutants and greenhouse gases emitted by India and China, two countries characterized by a continuous economic and industrial growth.

These pollutants, that in the atmosphere tend to create a thick grey-brown haze (Atmospheric Brown Clouds – ABCs), may reduce substantially the solar radiation that arrives on the earth, living rise to a possible cooling of the earth surface and at the same time a warming of the atmosphere.

This polluting cloud initially has been observed periodically overacting the Asian continent. The phenomenon has been called Asian Brown Cloud (ABC) in the framework of the homonymous monitoring and study project by UNEP. Subsequently the project has been named Atmospheric


Brown Cloud, as a consequence of the identification of many other similar phenomena all over the world and the widening of the study to a different level. The ABCs have strong influence on human health as well, threatening biodiversity too, especially in mountain regions. Many countries, particularly in Asia, have already decided to put into action monitoring activities on the air quality, in the urban areas, but the information about the pollution spatial distribution are still inadequate in particular in mountain regions, strongly sensitive to this phenomenon.

Nevertheless, the monitoring of the atmosphere composition and of the meteorological parameters in these high altitude areas, has got an essential role, not only to quantify the current pollution level, but also to carefully study its composition, the its variation in time, transport phenomena, deposition processes, for example on the glaciers. Climate variations make the this region extremely vulnerable, to the extent that in the last decades the increase in temperatures in the Himalayas area together to the deposition of pollution on glacier surface have produces a recession of glaciers and snow cover, reducing water resources in the dry season. This aspect makes an already precarious hydroelectric energy system less reliable and dramatically influences irrigation and drinking water supplies. Furthermore, glacier melting contributes to the collection of water in lakes that can subsequently burst terminal moraines, provoking disastrous land collapse and floods called Glacial Lake Outburst Floods (GLOFs). The release of large quantities of water and debris causes dangerous floods.

These events show the importance of a continuous topographic survey of glaciers' planimetric and altimetric deformations and of glacial-moraine barriers in high altitude regions such as those where Ev-K2-CNR has focused its attention.

Within the framework of the research activities, surveys have been performed on the Changri Nup glacier and on the intersection between the Lhotse Shar and Ambulapcha glaciers, located at the top of Imja, a lake feeding Dudh Koshi, tributary of the river Ganges.

SHARE – Africa



In order to obtain information on one of the most important glacial systems of the African continent, a weather station has been installed in Uganda, on the Rwenzori range, at the foot of the Elena glacier, at an altitude of 4,700 m. The glaciers of this range, representing 50% of the surface of African glaciers, show a clear reduction of the glaciated area, which for the years between 1955 and 1990 has been estimated in a loss of about 40% of their mass.

The Rwenzori is a mountain ridge spanning more than 120 km, formed by six mountain massifs, in which 43 glaciers, covering an area of 5 km², are located. The largest of these massifs is Mt. Stanley, encompassing several peaks among which the highest, Margherita, reaches 5109 m in altitude, the third highest peak in Africa after Mt Kilimanjaro and Mt Kenya.

Rwenzori is characterized by permanently snow-covered peaks (at least until now) and it runs along the border between Uganda and the Democratic Republic of Congo.

The Margherita glacier is nowadays one of the rare equatorial ice caps left.

Unfortunately, as reported by Uganda Wildlife Authority (UWA) researchers, in the spring of 2010 the ice cap at the summit broke into two parts, because of global warming, giving rise to the hypothesis that the Rwenzori Chain's glaciers are going to disappear in 20 years. In fact, the Rwenzori glacier, which 50 years ago measured about 6 km², is now reduced to less than 1

km². This ridge is one of the last areas close to the equator to host glaciers and, although it was declared a UNESCO heritage site in 1994,

Rwenzori glacier melting has resulted in a rise in the level of the river Semliki. The river marks the border between Uganda and the Democratic Republic of Congo which, as a consequence of its increased erosion force, moved by about 1 kilometer, triggering a dangerous territorial dispute.

These facts, directly or indirectly linked to the ongoing climate variations, show the importance of quality observations in these areas of the planet. Despite the adverse environmental and logistic conditions of the site, the Rwenzori AWS allowed a satisfactory analysis of the local meteorological conditions. In detail, the principal meteorological parameters are characterized by a scarce seasonal variability, characteristic of Equatorial belt. Only the precipitations show marked seasonality, with a clear influence, in the wet seasons, of the so-called "Inter Tropical Convergence Zone" (ITCZ), whose presence is identified by daily precipitations above 3 mm.

At the Rwenzori AWS similar cumulates of rain are found in less than the 34% of the days in the dry seasons (summer and winter) and in more than the 47% of the days in the wet seasons (denominated "short rains" and "long rains").

African glaciers are of invaluable scientific applicatory interest, in particular for their morphology and their climatic conditions. Research activities aim at studying the dynamics of Mt. Rwenzori's glaciers, with reference to the climatic events, their morphological variations and the impact of these modifications.

Besides the installation of the monitoring site, several measurements of the position of some glacier snouts have been performed, among them the Speke glacier. Laser scanning measurements of the Speke valley have also been carried out, in order to estimate the mass loss of the glacier since 1955 until the present day. As a support to the research program, technical and scientific collaboration activities with the Uganda Wildlife Authority and with the Uganda Meteorological Department have been started. Such activities have been followed by staff training programs, referring to the research activities, to understand the functioning of the weather station and the I.T. basics to download the collected data.

SHARE – America

At 5.230 m a.s.l., the Chacaltaya laboratory is the highest site for astrophysical and cosmic rays research in the world.

In fact, the laboratory, created by Ismael Escobar in 1942, became an important reference for cosmic radiation studies thanks to the physicians Cesare Lattes, Giuseppe

Occhialini and Cecil Powell, who in 1947 discovered “the pion” an important subatomic particle. Even nowadays, at the Chacaltaya laboratory, astrophysical and cosmic radiation researches are conducted in collaboration with the Universidad Mayor de San Andrés of La Paz.

For its location, the Chacaltaya laboratory is considered the viewpoint of Cordillera Real, on the Bolivian Andes. Built on the Bolivian Andes plateau, this laboratory is surrounded by mountains higher than 5000m a.s.l., such as Illimani (6462 m), Mururata (5775 m), Condoriri (5696 m) and the beautiful Huayna Potosi (6088 m), one of the most scenic mountains in the world.

On this mountain the homonymous glacier found place and it has now completely disappeared, as prof. Edson Ramirez, of La Paz University, announced a couple of years ago.


Therefore, studying climate evolution in this area of South America appears more important than ever. This is why, a program to support studies related to the atmospheric composition and researches in the climate change field was promoted.

At Chacaltaya, a project for the implementation of a new Global Atmosphere Watch (GAW, of the World Meteorological Organization) regional station has been launched.

During the year 2011, the new CHC GAW Station will receive instruments for aerosols and atmospheric composition measurements by a “consortium” which includes various Institutes from Italy, France, Switzerland, Germany and Sweden under the coordination of the Bolivian team at LFA-UMSA. A close collaboration has been initiated with the Ev-K2-cnr Committee, through an agreement with the University of San Andrés which will enable a fruitful exchange between researchers and scientists of both countries as well as instruments and data.



SHARE – Italia



In Italy, the perspectives for an expansion of the **SHARE** network will be focused on the creation of a high altitude national network, capable of providing a correct assessment of the background conditions of mountain environment, atmosphere and climate changes in the Mediterranean region. Although the territory geographical conformation is largely mountainous, remote areas in Italy (incorrectly considered free from the presence of pollutants) continue to be scarcely monitored. This is true, despite the fact that such measurement stations are the best platform to monitor and study the conditions of environment and atmosphere. In Italy, the situation is unique, since we are referring to the Mediterranean region, which is important both on the climatic and geographical point of view. The Italian peninsula, in fact, stretches out in the Mediterranean Sea along an axis over 12° of latitude (more than 1,200 km), from 47°05' of Vetta d'Italia (Aurine Alps, Alto Adige) to 35°29' of Punta Pesce Spada on the Lampedusa (Pelagie Islands, Sicily). The SHARE network in Italy would enable to provide essential information on the safeguard and the development of mountain environment and not only.

I temi sviluppati nell'ambito di questa applicazione sono:

- a)** Monitoring of greenhouse gases and effect;
- b)** Transport of atmospheric pollutants in mountain areas between the borders;
- c)** Transport of mineral aerosol (Saharan dust) and influence on the concentration of PM10 and PM2.5 in urban areas and on the exceeding of EU limits;
- d)** Transport of carbonaceous aerosol produced during arboreous and biomass fires;
- e)** Influence of mineral and carbonaceous aerosol deposition on albedo variations in glaciated areas and subsequent impact on ablation processes;
- f)** Assessment of glacial mass balance, seasonal water release and climatic parameters;
- g)** Assessment on a regional scale of the radiative forcing due to the aerosol transport phenomena and climate altering gases in the free troposphere;
- h)** Data-delivery-service in order to contribute to the validation of climate

models (CGM, CCM), physic-chemical transport models (CTM), and forecasting models on air quality (GEMS), and improvement of their performance through the assimilation of data;

i) Development of technologically advanced solutions enabling continuous measurements in high altitude remote sites, notwithstanding the adverse weather and logistical conditions.

The importance of such an observation network in Italy lies in the fact that high altitude monitoring stations are the first “sentinels” perceiving the climate changes involving mountain ecosystem.

One of these important “sentinel” is at Monte Cimone (2165m asl), the highest peak of the Italian Northern Apennines, where the Institute of Atmospheric Sciences and Climate of the Italian National Research Council, manages the Italian Climate Observatory “O. Vittori” (ICO-OV), one of the 34th global stations of Global Atmosphere Watch program of WMO. This station, part of the **SHARE** network, is hosted within the infrastructures of the Italian Air Force Meteorological Service (IAF-MS) Observatory.

The researches performed at the ICO-OV lead to a better understating of the role played by different atmospheric processes in determining the background properties of atmospheric aerosol and trace gases over Northern Italy and the Mediterranean Basin, a region particularly affected by anthropogenic climate change. In particular, due to several implications in meteorology, air quality and climate change issues, the analysis of the atmospheric aerosol represent a key action. This station laid the basis for the creation of the Nepal Climate Observatory - Pyramid in Himalaya which is the world's highest “sentinel” for global studies on climate, since 2006. More recently, a new research station has been set up at the Stelvio National Park in Italy, at an altitude of 3200 m a.s.l. to study the seasonal evolution of climate and glaciers.

Pilot
Projects

SHARE

Stations at High Altitude for Research on the Environment

SHARE *abc*

Stations at **H**igh **A**ltitude for **R**esearch on the **E**nvironment

The Nepal Climate Observatory - Pyramid (Nepal, 27.95N, 86.82E) was installed at 5079 m a.s.l. in February 2006 in the high Khumbu valley, above the timber line in a rocky and mossy environment, not far from the base camp area of Mount Everest. This observatory is running in the framework of the UNEP Atmospheric Brown Clouds ABC Project and it became a "Global GAW Station" in 2010 within the WMO Global Atmospheric Watch program. A second observatory of the SHARE network will soon be installed in Pakistan, some preliminary studies are ongoing to define a well representative site in the Baltistan area.

The weather conditions characterizing the high Himalayas, thanks to continuous observations began in March 2006 at NCO-P, have been carefully studied and published in the ACP - Atmospheric Chemistry and Physics Journal, Special Issue "Atmospheric brown cloud in the Himalayas". In particular, the seasonal trends, time series and black carbon variability

related to weather conditions, mineral particles, ozone and ABC's typical constituents that may strongly influence the radiative forcing, were analyzed.

The pollutants' concentration (BC, O₃, PMs) shows a well defined daily cycle (afternoon maximum) and a significant seasonal variation (pre-monsoon maximum). Despite its location in the heart of a remote area, the NCO-P is influenced by the transport of pollution from the southern Nepal regions and the Indo-Gangetic plain, with surprisingly high point values. In order to characterize the best area for the installation of PCO-K, the synoptic circulation was established through the calculation of back trajectories and the analysis of meteorological observations of two AWS nearby the Baltoro glacier. An analysis of the MODIS AOD's values provided additional information for the atmospheric characterization of the area.



Benefits

Collect atmospheric data to improve the understanding of the pollution transport phenomenon and associated impacts on human health and environment

Make available innovative data on climate and atmospheric monitoring in high-altitude mountainous regions, relevant to the development of analytical and predictive models that will be provided to decision makers, stakeholders and the scientific community

Provide a scientific contribution for the definition of appropriate mitigation policies, especially in areas heavily affected by black carbon emissions in order to reduce the atmospheric concentration of these carbon particles, to positively influence the climate and reduce global warming

Contribute to the study of the ABC phenomenon in other remote areas, also in response to local governments' requests, to better understand the effects of climate change on agriculture, health and water supply





SHARE *paprika*

Stations at High Altitude for Research on the Environment

Cryospheric responses to Anthropogenic Pressures in the Hindu Kush-Himalaya regions: impacts on water resources, agriculture and society and social adaptation in Nepal and Pakistan: regional climate observations and future scenarios. SHARE-PAPRIKA is a three year project (2010-2013) composed of two sub-projects: PAPRIKA-KARAKORUM funded by Ev-K2-CNR and PAPRIKA-HIMALAYA funded by CNRS. The PAPRIKA project focuses on current and future evolution of the cryospheric system in response to global and regional environmental changes and their consequences on water resources in main lan-

dscape units within Nepal (PAPRIKA-NEPAL) and PAKISTAN (PAPRIKA-KARAKORUM). It analyzes the physical and chemical processes acting on the evolution of the cryosphere, their evolution in a changing climate and their impact on water resource dynamics at regional scale. It also addresses perceptions and representations of the water resource and of the water availability changes, on subsequent adaptations already implemented, and on territorial and social restructurings taking into account indigenous peoples' knowledge on potential changes in natural resources and environmental hazards.

Benefits

Assessing the effects due to a change of water resources on agriculture, food security and energy production

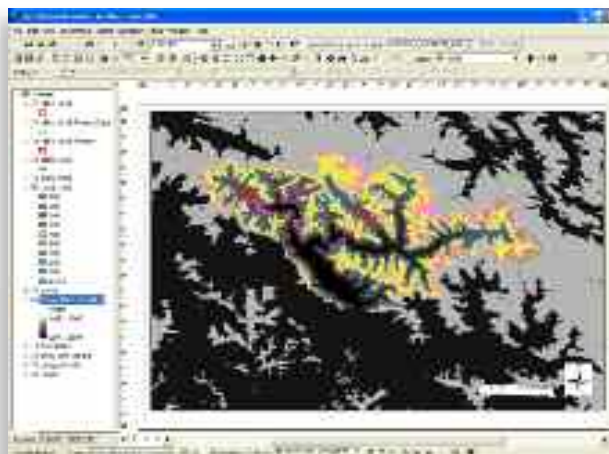
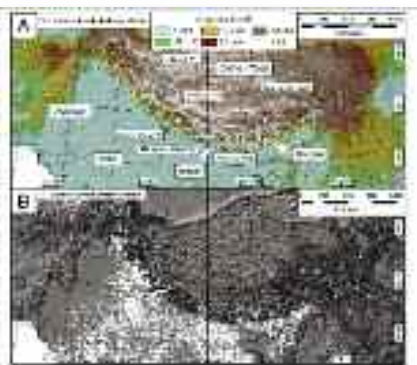
Improve the knowledge of the glaciers dynamics in the Karakorum/Himalaya region and the effects of black carbon deposition on the glacier surface (reduced albedo)

Facilitate the access to data on water availability in Nepal and Pakistan

Perform a scientific assessment on the causes and consequences of changes in water availability in the HKH region to guide the economic and environmental development of these territories

Examine the change in water availability in the Karakorum/Himalaya region and compare it with the involved people's perceptions of climate change

Share information on water availability with local communities and institutions in order to implement action plans to prevent further deterioration of the volume of water resources



SHARE Stelvio

Stations at High Altitude for Research on the Environment

The **SHARE** STELVIO project is composed by three main Work Packages (WPs) managed by the Ev-K2-CNR Committee and developed by the University of Milan, National Research Council and Polytechnic Institute of Milan and two WPs realized and coordinated by the Italian Lombardy Foundation for the Environment. The project is scheduled according to a three-year-long program which will be carried out by the several research units in close cooperation. Each WP is devoted to study and deepen specific topics and its results will permit to reach the main research aim (i.e.: to analyse the climatic and atmospheric variability and its effect on the park's water resources, consisting of both fresh waters and snow, ice and permafrost). The three WPs coordinated by Ev-K2-CNR are focusing on:

WP 1: this unit will analyze the cryosphere variability (i.e.: snow, ice and permafrost) due to the ongoing climate change and it will evaluate effects and impacts on water resources of the Park;

WP 2: this unit will investigate on the climate change impacts on fresh water resources (i.e.: rivers and lakes) deepening the analysis of their features

WP 3: this unit will contribute to the study of atmospheric and climate variability in the Park and assess its impacts on the cryosphere and hydrosphere.

This project is an inter and multi-disciplinary program and it is characterized by a close and effective collaboration among all researchers involved.

Connections and mutual relations among the analyzed systems (atmosphere, hydrosphere and cryosphere) are numerous; for example, atmospheric changes may impact both inland waters quality and cryosphere, on the other hand cryospheric variations (intensity modification and nivo-glacial ablation rates) in turn may affect the availability of water in the Park.



Benefits

Ensure a constant monitoring to provide long-term continuous atmospheric, climatic and environmental data used to perform global assessments on climate change and on its effects in the Stelvio National Park

Provide new atmospheric observations to integrate the European monitoring networks, bridging the gap in knowledge of the high-altitudes atmosphere conditions in the southern Alps

Make available an 'open air park-observatory' model, reproducible in other parks





SHARE *Seed Bank*

Stations at High Altitude for Research on the Environment

The aim of this project is to study the Sagarmatha National Park's flora (Mt. Everest area), with a particular attention to alpine and nival species, to complete a list of locally growing plants, mostly at highest altitude, their current location and to make prediction about their future distribution, in relation to seed dispersion and germination capacity, topography, altitude and present and future climatic conditions.

The climate change effects on the existing

flora may be identified and the evolution of Himalayan flora in the coming years may be predicted (i.e. non-alpine species colonization in higher-altitude localized areas, Alpine species extinction, new competitions between plant species, etc) Last but not least, the ability of these seeds to survive outside their natural habitat, in high-tech structures normally used for the storage of seeds and embryos for long time (seed bank), will be assessed.

Benefits

Build the first seed bank in the Himalayas, at a local authority (Nepal Academy of Science and Technology - NAST) in order to safeguard the plant biodiversity in the Everest park (endemic species, medicinal and wild plants)

Assess the climate change impacts on the Himalayan alpine plants by developing appropriate models

Conserving endangered plant species throughout seed conservation in a technologically advanced structure such as the seed bank

Collect more complete information to enable the promotion of innovative plant biodiversity research activities at local and international level

Promote the transfer and application of scientific knowledge to local partners toward a sustainable development

Involve local population to initiate controlled cultivation projects



SHARE *Snow Leopard*

Stations at High Altitude for Research on the Environment

This project is centred on the count of snow leopards and common leopards, as well as their main/alternative prey. Analyses of food habits, movements and habitat use of snow and common leopards have also been included. The study area lies between Namche (3440 m a.s.l.) and Phortse (3849 m a.s.l.) villages, up to Gokyo Lake (4750 m a.s.l.), encompassing the upper catchment of the Dudh Kosi river, as well as the lower part of the Cho-Oyu Valley. Counts of snow leopards and common leopards have been carried out through DNA analyses from scats collected monthly along fixed itineraries (nearly 150 km). These analyses may assess species, individual and sex to which the faecal samples belong. Relative prey

densities (ungulates/alternative prey, e.g. large pheasants: monal, blood pheasant, snowcock) have been estimated monthly, by counting individuals along fixed itineraries. Leopards' diets have been studied through scat analysis: prey are identified on the basis of hair micro-characters and other indigestible remains. Prey selection is estimated by comparing the relative abundance (availability) of main prey species with that found in the diet (use). Information on ranging movements and habitat use of leopards will be obtained through genetic analyses of scats, GIS analyses (satellite imagery, land-use vegetation maps) and, possibly, satellite radiotracking (pending permits).

Benefits

Safeguard animal biodiversity in the Sagarmatha National Park with particular attention to large mammals

Improve the knowledge of climate change effects threatening the survival of all animal species accustomed to cold climates

Increase the involvement of local populations and institutes in monitoring activities and management of wildlife resources



SHARE

Ice Core

Stations at High Altitude for Research on the Environment



The project aims to collect and preserve non-polar ice cores to set up a permanent archive available for the international scientific community.

The main objective is to create a non-polar ice cores heritage, obtaining and grouping ice cores from glaciers at risk. The risk is double: both dramatic reduction and

hence loss of information, and changes of temperature conditions and subsequent loss and / or alteration of pollution information.

Benefits

Safeguard the natural heritage characterized by glaciers at risk of disappearing

Enable the international scientific community to take advantage of the unique information concerning climate change contained in the permanent record of ice cores

Provide data that allows the reconstruction of the glacial climate trend relative to the last centuries with a very high resolution

SHARE

High Elevation

Stations at High Altitude for Research on the Environment



High Elevation (HE) is an initiative within the Gewex Hydroclimatic Panel (GHP), formerly the "Coordinated Energy and water cycle Observations Project (CEOP)", a project which is encompassed by the "Global Energy and Water cycle Experiment (GEWEX)", promoted by the World Climate Research Programme (WCRP) of the World Meteorological Organization. In this framework, HE is identified as "regional study" and it encompasses a series of climate and monitoring reference stations.

HE is meant to be a concerted, international and interdisciplinary effort aimed at increasing knowledge on the physical and dynamic processes at high elevations, thus contributing to global climate and water cycle studies, including the effects on the sustainability of the fragile mountain ecosystems.

The High Elevation Programme, aims to study multi-scale variability of energy and water cycles in high elevation areas, improving observations, modeling and management of data.

Benefits

Strengthen collaboration with national and international research institutes to increase knowledge on the water and energy cycle in high altitude mountain areas, at a global level

Improve the quality of the observations and of the management of the collected data

SHARE

Gard Khumbu

Stations at High Altitude for Research on the Environment

This project is focusing its attention on the study of indoor pollution and its effects on the health of Khumbu Valley's populations, through spirometry tests, questionnaires, echocardiography and endothelial function tests and comparing collected data with the information on indoor and outdoor pollution.

Indoor pollution has been recognized as a pre-eminent health problem at global scale, especially among rural populations in developing countries, where biomass

burning for cooking and house heating is often associated with a bad ventilation of the buildings. Moreover, in developing countries and at high altitudes, the population's exposition to pollution is greater. The pathologies directly correlated to pollution include some important respiratory, ophthalmological and cardiovascular diseases.



Benefits

Evaluate the effects of indoor air pollution on the local population aiming at improving their life style with particular attention to those individuals, such as women and children, mostly at risk

Promote and provide new technologies that reduce carbon and particulate matter emissions and monitor the results

Transmit information and provide practical advice to decision makers and stakeholders for the formulation of appropriate environmental policies

Collaborate with other international programs and initiatives promoted by agencies such as UNEP and WHO (e.g. Surya, ABC Health)

Nano

SHARE

Stations at High Altitude for Research on the Environment

This project foresees the realization of a sophisticated environmental monitoring system called NANO-SHARE.

This innovative, technological and integrated system is modulate and it is suitable for monitoring in extreme environmental conditions where the

installation of a fully- equipped permanent laboratory or standard monitoring station may be too difficult or expensive.

Moreover this system is equipped with a real time data transmission system and it uses renewable energy sources, in order to ensure a low environmental impact.



Benefits

Collect and share high-altitude research data and information with the whole scientific community, local authorities and institutions

Store in a single and integrated information system for mountain areas the information related to Atmosphere and Climate, Biodiversity, Capacity Building, Dataset, Earth Sciences, Economics and Social Systems, Energy, Health, Interactive Resources, Maps and Graphics, SatImage, high-altitude stations, Glaciology

Provide a structured information system supporting the management of mountain resources

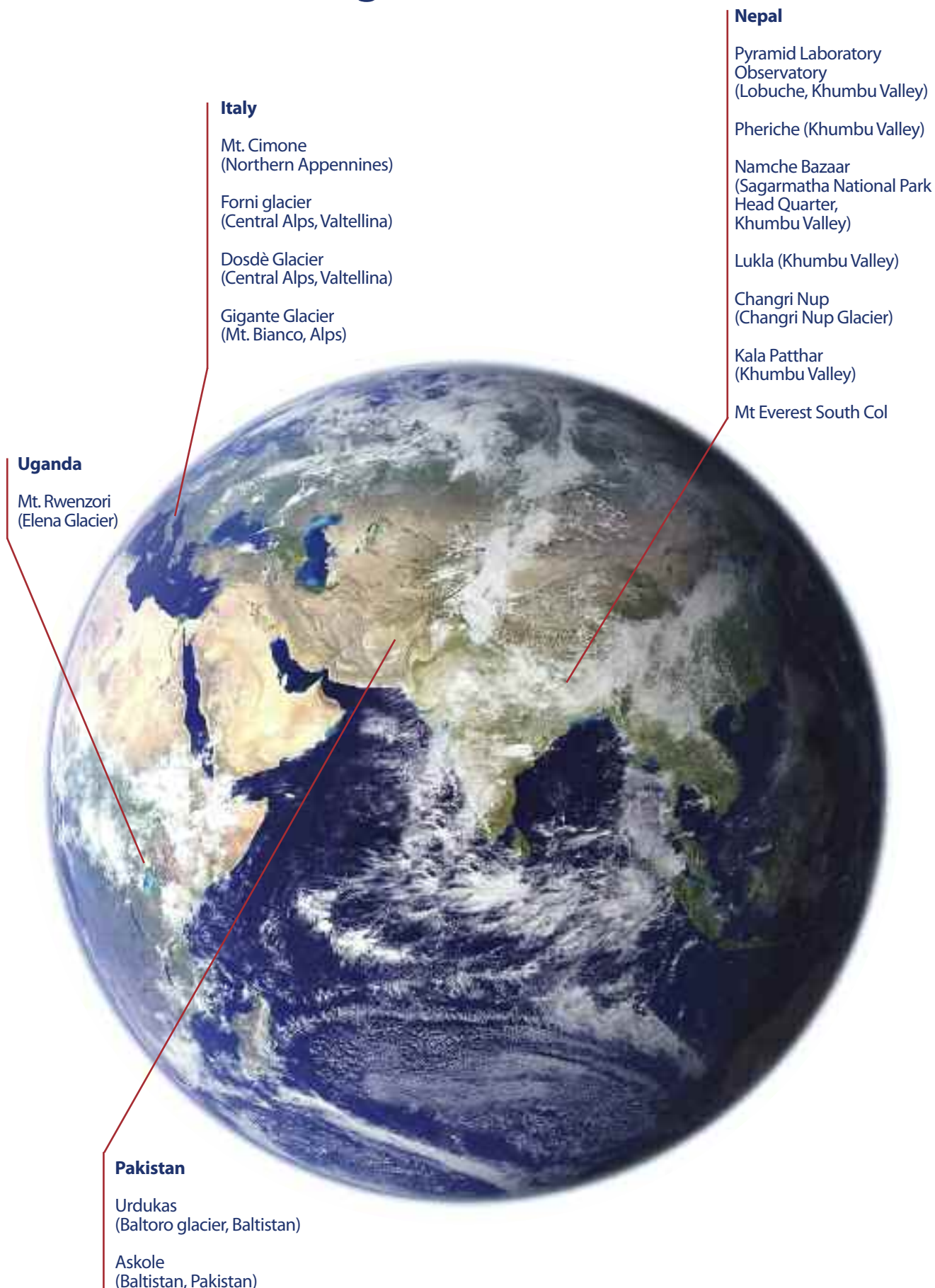


Monitoring
Network

SHARE

Stations at High Altitude for Research on the Environment

SHARE Monitoring network



SHARE Monitoring Network

Installation site	Nation/Continent		Station	Characteristics	Altitude (m slm.)
Mt. Cimone (Northern Appennines)	Italy	Europe	"Ottavio Vittori " Research Station:	Atmospheric monitoring station	2,165
Forni glacier (Central Alps, Valtellina)	Italy	Europe	-	Automatic weather station	2,669
Dosdè Glacier (Central Alps, Valtellina)	Italy	Europe	-	Automatic weather station	2,740
Gigante Glacier (Mt. Bianco, Alps)	Italy	Europe	-	Automatic weather station	3,500
Pyramid Laboratory Observatory (Lobuche, Khumbu Valley)	Nepal	Asia	Nepal Climate Observatory-Pyramid (ABC-Pyramid)	Atmospheric monitoring station	5,079
			GPS Master	GPS station	5,050
			AWS0, AWS1; AWS CEOP	Automatic weather stations	5,050
			DORIS	Orbitographic station	5,050
Pheriche (Khumbu Valley)	Nepal	Asia	AWS2	Automatic weather station	4,258
Namche Bazaar (Sagarmatha National Park Head Quarter, Khumbu Valley)	Nepal	Asia	AWS NP	Automatic weather station	3,560
Lukla (Khumbu Valley)	Nepal	Asia	AWS3	Automatic weather station	2,660
Changri Nup (Changri Nup Glacier)	Nepal	Asia	AWS-CN	Automatic weather station	5,700
Kala Patthar (Khumbu Valley)	Nepal	Asia	AWS-KP	Automatic weather station	5,600
Mt Everest South Col	Nepal	Asia	AWS-CS	Automatic weather station	8,000
Urdukas (Baltoro glacier, Baltistan)	Pakistan	Asia	AWS PK1	Automatic weather station	3,926
Askole (Baltistan, Pakistan)	Pakistan	Asia	AWS PK2	Automatic weather station	3,015
Mt. Rwenzori (Elena Glacier)	Uganda	Africa	AWS RW	Automatic weather station	4,700



Collaborations
international
research
Programs

SHARE

Stations at High Altitude for Research on the Environment

ABC
Atmospheric Brown Clouds
(stazione NCO-P)

CEOP
Coordinate Energy and Water Cycle
Observations Project (Stazioni Pyramid
Meteo Network, Nepal; Pakistan Karakorum
Network, Pakistan; O. Vittori Research
Station, AWS Forni, Italia)

AERONET
AErosol RObotic NETwork
(Stazione Ev-K2-CNR, Nepal)

GAW
Global Atmosphere Watch (Stazione
Everest-Pyramid, Nepal; Ottavio Vittori
Research Station, Italia)

EUSAAR
European Supersites for Atmospheric
Aerosol Research (Ottavio Vittori Research
Station, Italia)

UNEP
United Nations Environment Programme

GEO
Group on Earth Observations

ILTER
International Long-term Ecological
Research Network

Mountain Initiative

Share and international research programs

ABC - Atmospheric Brown Clouds (NCO-P station)

This UNEP monitoring program was created to study the impact of "atmospheric brown clouds" consisting of polluting substances, through the implementation of an aerosol observation network. The first ABC stations, as shown in the picture, were installed at sea level. With the expansion of the pollution phenomenon, however, in order to better understand causes and effects, it was deemed of vital

importance to extend the monitoring area. UNEP is still attracting the attention of many international research institutions on the importance of the ABC phenomenon, with the interest to promote at global level, mitigation strategies aimed at reducing emissions of atmospheric pollutants.
<http://www.rrcap.unep.org/abc/>



CEOP – Coordinate Energy and Water Cycle Observations Project (Pyramid Meteo Stations Network, Nepal; Pakistan Karakorum Network, Pakistan; O. Vittori Research Station, AWS Forni, Italia)

Most of the stations included in the SHARE project, are included in a more complex network belonging to an international program called CEOP, recently renamed Gewex Hydroclimatic Panel, GEWEX / WMO, and currently under renovation phase.

The network includes more than 50 reference sites that cover a large area, characterized by different climatic regimes, from arctic to tropical climate. The stations are located at different altitudes, from sea level to about 5000 m.



AERONET - AErosol RObotic NETwork (Ev-K2-CNR Station, Nepal)

AERONET comprises a network of ground stations belonging to different international agencies, institutes and universities and targeted at monitoring aerosols. The main aim is to analyze the optical properties of these particles, validating the data produced by satellites. The network requires the use of special instruments, which undergo standard procedures for calibration and data processing.

The information collected offers a global picture of optical properties, as well as the analysis of the quantity of precipitations in different geographic regions, subject to different aerosol regimes. This NASA monitoring network includes over a hundred photometers, distributed across the globe, both at sea level and in mountain areas.



GAW - Global Atmosphere Watch (Everest-Pyramid Research Station, Nepal; Ottavio Vittori Research Station, Italy)

The GAW program created a global network of observatories and monitoring stations to analyze the background composition of the atmosphere. Since 2010, the NCO-P in Himalayas and Monte Cimone observatories have been recognized 'Global Station' in the framework of the Global Atmospheric Watch/WMO program. The GAW/WMO project provides data supporting the scientific community in the

study of the changes in the atmospheric physical-chemical properties, that may affect the environment. The main parameters monitored are: greenhouse gases, ozone and UV radiation, closely related to the recent climate changes and producing effects on the biological community, but also some reactive gases and precipitations chemistry, which play an essential role in the study of atmospheric pollution.



UNEP – United Nations Environment Programme

Ev-K2-CNR is collaborating with UNEP- Nairobi in the framework of the Atmospheric Brown Clouds program started in Asia in 2003, which now has become a global scale project, developing a monitoring program for Africa and Latin America.

Ev-K2-CNR, thanks to the activities carried out in Himalaya and Karakorum regions through the SHARE project, represents the main reference for high altitude atmospheric monitoring sites.



EUSAAR - European Supersites for Atmospheric Aerosol Research (Ottavio Vittori Research Station, Italy)



This European Union sponsored project (EU-funded I3 Integrated Infrastructures Initiatives), was set up within the framework of the scientific and technological development program "Structuring the European Research Area - Support for Research Infrastructures".

The main goals are: to integrate the atmospheric aerosol measurements taken in a network of 20 high level European observatories (supersites); to contribute to a policy-making support system concerning air quality, long term transport of pollutants, and climate change; to consolidate European monitoring efforts to assure their continuation even after the end of projects, encouraging networking initiatives and joint research initiatives.

GEO - Group on Earth Observations



The **SHARE** project, with its research activities and its stations network has been included in the GEO 2009-2011 Work Plan, in the following sub-task: EC-09-02d: Vulnerability of Mountain Regions. Recently, SHARE has been reconfirmed in the GEO 2012-2015 Work Plan.

GEO is reviewing its action plan, in order to strengthen the partnerships among sub-

tasks and to promote activities that are closely in line with GEO's priorities, to increase the contributions in the Global Earth Observations Systems of Systems (GEOSS). GEOSS is a very complex database, which will collect information related to all environmental and climate change fields. GEOSS will be an important reference point for the international scientific community, for governments and international agencies, that will help to better face climate change impacts and to develop appropriate adaptation strategies.

ILTER - International Long-term Ecological Research Network



Long term global ecological research programs have grown rapidly, reflecting the importance of studies aimed at solving complex environmental problems. In this context, groups of scientists have started activities to create national networks. Currently, ILTER includes 26 sites, representative of different ecosystems in North America, the Caribbean, the Pacific and Antarctica, including deserts, estuaries,

lakes, oceans, coral reefs, prairies, forests, alpine and arctic tundra, urban and agricultural areas. In Italy, a consortium of promoting institutions, with the participation of the Ministry of Forests, CNR and various Italian universities has given rise to the LTER-Italy network, including, along with Italian locations, the Nepalese site of Pyramid lakes, where Ev-K2-CNR researchers have been carrying out ecological investigations for several years.

Mountain Initiative



The Mountain Initiative has been promoted by the Nepal Government, Ministry of Environment and ICIMOD, in December 2009 as a result of COP 16.

The aim of this initiative is to generate scientific basis to better understand climate change scenarios and to provide specific and adequate measures to mitigate the negative impacts of climate change on mountains. There is still a lack of scientific knowledge especially on mountains glaciers located in tropical zones. Mountain Initiative is expected to

generate knowledge and to increase the role of mountains' villages not only in multi-lateral environmental agreements, but also at national and regional levels. In this first phase, the Mountain Initiative is building a technical forum and transferring knowledge through its network, to address gaps in the knowledge and understanding of environmental phenomena linked to climate change in mountainous regions.

Within this framework, the research activities carried out by Ev-K2-CNR in the SHARE project and the results achieved so far may provide an important support to this initiative, both in terms of improving knowledge related to climate change effects on the ecosystem and of promoting mitigation and adaptation strategies.

International Collaboration

The project activities and data provide a contribution to the most important International projects concerning climate changes issue:



United Nations Environmental Programme (UNEP) – Project Atmospheric Brown Clouds (ABC)

- NCO-P station: Exploratory Site of ABC Network
- Ev-K2-CNR membro delegato di ABC Science Team



World Meteorological Organization (WMO) – Global Atmosphere Watch (GAW)

- Everest Pyramid: Global station of GAW Network
- Monte Cimone: Global station of GAW Network



World Climate Research Programme (WCRP) – Global Energy and Water Cycle Experiment (GEWEX)- Coordinated Energy and Water Cycle Observation Project (CEOP)

- Lukla, Namche, Pheriche, Pyramid AWSs: CAMP Himalayas Reference sites
- Askole and Urdukas AWSs: Pakistan Karakorum Reference sites
- Forni AWS and Monte Cimone Observatory: Italy Reference sites
- Ev-K2-CNR delegate chair of the CEOP High Elevations working group



NASA / Goddard Space Flight Center (GSFC)

Aerosol Robotic Network (AERONET)

- Ev-K2-CNR Cimel at Pyramid is part of the AERONET Network



International Long Term Ecological Network (ILTER)

- Pyramid lakes (Inferiore and Superiore) included in the network



Institutional
Recognitions

SHARE

Stations at High Altitude for Research on the Environment

WHO - GAW
UNFCCC
GEWEX

Institutional Recognition

WMO – GAW :

Upgrade of the Regional GAW Station Everest – Pyramid (Nepal) to a Global GAW
(September 8, 2010)

1



- 2 -

Taking into consideration the importance of the station and its critical position for global observations and the extended measurement programme, the JSC DPAG-EPAG noted that it is very grateful to Italy for having received this proposal and that it strongly supports its endorsement, with a few recommendations that are listed below.

We would like to draw your attention to point 6 in Box 9 of the GAW Strategic Plan, which is related to the regular data submission to the appropriate WMO/GAW World Data Centre (WDC). The deadline of submission is no later than 1 year after the measurements are performed. The importance of data submission was stressed virtually by all JSC members and some suggested that the station status would be conditional on this requirement. Please, make sure that the data are submitted at the proper time. At the moment, only surface ozone is reported, to the World Data Centre for Greenhouse Gases (WDCGG).


Additional suggestions by the JSC DPAG-EPAG are listed below.

- 1) The aerosol sampling procedures recommended in GAW report no. 153 should be followed for aerosol measurements.
- 2) Precipitation chemistry data from this region would address a huge data void for the region. Given the difficult logistics, it is recommended to provide more information to the GAW Precipitation Scientific Advisory Group (SAG) to determine if this would be reasonable and practical.
- 3) It is recommended to consider including a sensor for CO measurements in the measurement programme.
- 4) Measurements of VOCs would be a very useful addition to test the idea of transport of pollution from the Indian sub-continent into the Himalayas. As flask samples can be collected, it is recommended to analyze the flasks for VOCs and possibly organic nitrates (if proper contact with analytical labs is established).
- 5) UV measurements should be added to the data collection -- at least a broadband instrument. There is some UV expertise in Nepal through the GAW UV SAG, so there should be some local assistance available for instance calibrations.
- 6) Halocarbon data measured from discrete samples should be submitted to WDCGG.

Please let us know if it is feasible to implement these recommendations of the JSC DPAG-EPAG and what kind of assistance WMO/GAW and the SAGs can provide you.

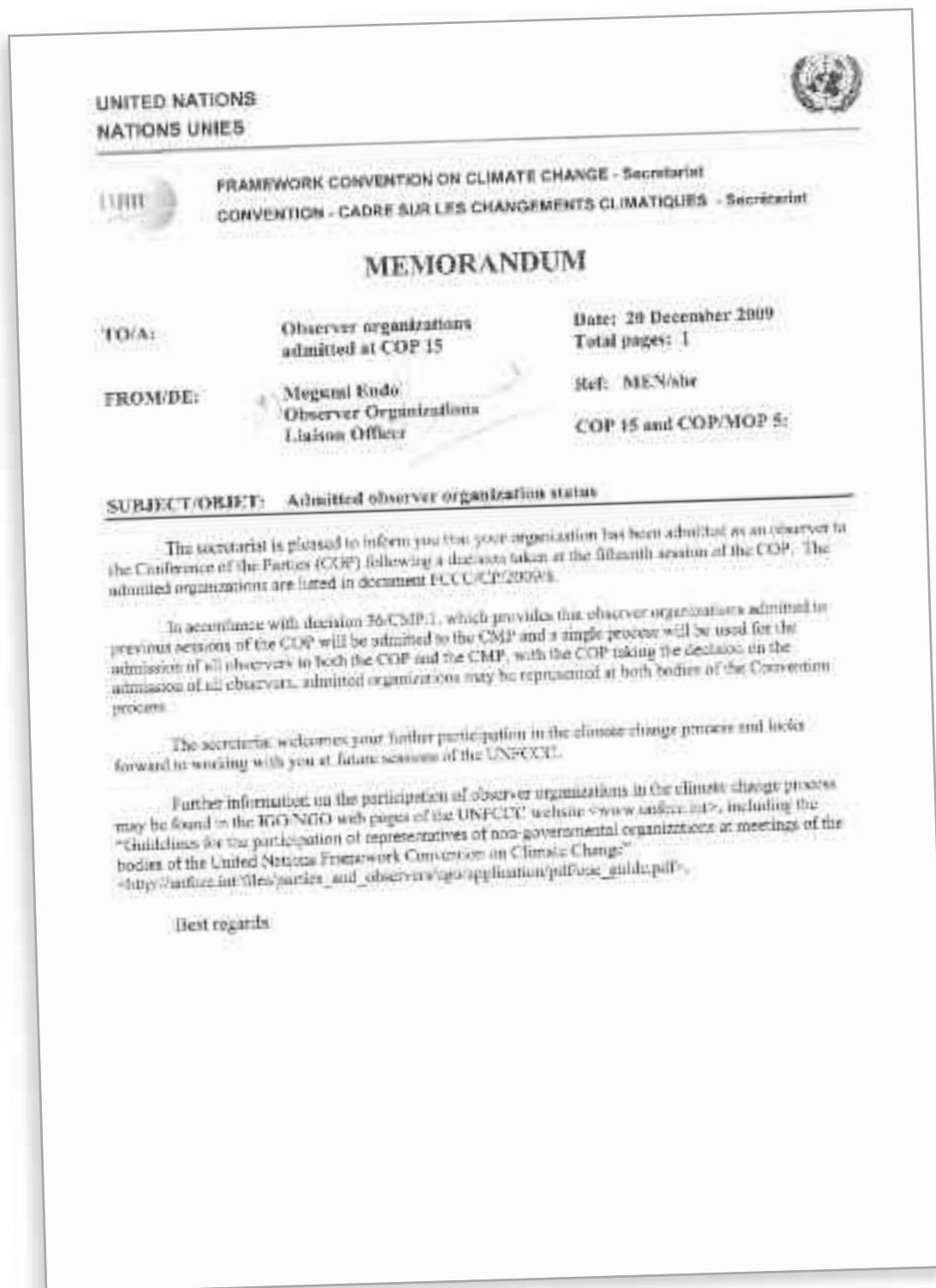
We are very pleased to confirm the upgrade of the Everest-Pyramid Regional GAW station to a Global GAW station and look forward to our continued fruitful collaboration.

Yours sincerely,


(J. Longo)
for the Secretary-General

UNFCCC:

Admission of Ev-K2-CNR Committee as Observer Organization to the Conference of the Parties
(December 20, 2009)



WCRP – Gewex:

Introduction of SHARE (Stations at High Altitude for Research on the Environment) stations as reference stations in the World Climate Research Programme (WCRP) Global Energy and Water Cycle Experiment (GEWEX Coordinated Energy and Water Cycle Observations Project (CEOP) Phase II Network



GLOBAL ENERGY AND WATER CYCLE EXPERIMENT
World Climate Research Programme

August 4, 2009

Dr. Paolo Bonasoni
CNR-ISAC / Ev-K2-CNR Committee
Via Gobetti, 101 – 40129 Bologna, Italy

Dear Dr. Bonasoni,

Further to a request to include the Italian Alps and Apennines, Himalayas, Karakorum, and Pakistan Stations in the World Climate Research Programme (WCRP) Global Energy and Water Cycle Experiment (GEWEX Coordinated Energy and Water Cycle Observations Project (CEOP) Phase II Network, we are pleased to inform you that we accept these as Reference Stations in our Network. We are taking this action with the knowledge that these Stations will provide excellent contributions to the existing CEOP network of stations. We know, for example, that the Regional Hydroclimate Project (RHP) Monsoon Asian Hydro-Atmospheric Science Research and prediction Initiative (MAHASRI) has stations within its regional boundaries that are associated with the group of sites maintained in the network for which your organization is partly responsible.

More information about CEOP Data Management processes and protocols please refer to the Internet at: <http://www.eol.ucar.edu/projects/ceop/dm/>. In addition, please contact Dr. Steve Williams (sfw@ucar.edu) who is responsible for the organizing and supervising CEOP data management. Dr. Williams can provide you with practical details about the data submission process to the CEOP archive.

Kind Regards,

A handwritten signature in dark ink, appearing to read "Thomas Ackerman".

Thomas Ackerman
Chair, GEWEX Scientific Steering Group

International GEWEX Project Office (IGPO)
8403 Colesville Road, Suite 1550, Silver Spring, MD 20910 USA
Telephone: 1-240-485-1855 Fax: 1-240-485-1818 E-mail: gewex@gewex.org Web: www.gewex.org



GLOBAL ENERGY AND WATER CYCLE EXPERIMENT
World Climate Research Programme

August 4, 2009

Mr. Agostino Da Polenza
Ev-K2-CNR Committee
Via San Bernardino, 145
24126 Bergamo, Italy

Dear Mr. Da Polenza,

Further to a request to include the Italian Alps and Apennines, Himalayas, Karakorum, and Pakistan Stations in the World Climate Research Programme (WCRP) Global Energy and Water Cycle Experiment (GEWEX Coordinated Energy and Water Cycle Observations Project (CEOP) Phase II Network, we are pleased to inform you that we accept these as Reference Stations in our Network. We are taking this action with the knowledge that these Stations will provide excellent contributions to the existing CEOP network of stations. We know, for example, that the Regional Hydroclimate Project (RHP) Monsoon Asian Hydro-Atmospheric Science Research and prediction Initiative (MAHASRI) has stations within its regional boundaries that are associated with the group of sites maintained in the network for which your organization is partly responsible.

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GLOBAL ENERGY AND WATER CYCLE EXPERIMENT
World Climate Research Programme

August 4, 2009

Dr. Nazzareno Diodato
MetROBS Committee
Contrada Monte Pino – 82100 Benevento, Italy

Dear Dr. Diodato,

Further to a request to include the Italian Alps and Apennines, Himalayas, Karakorum, and Pakistan Stations in the World Climate Research Programme (WCRP) Global Energy and Water Cycle Experiment (GEWEX Coordinated Energy and Water Cycle Observations Project (CEOP) Phase II Network, we are pleased to inform you that we accept these as Reference Stations in our Network. We are taking this action with the knowledge that these Stations will provide excellent contributions to the existing CEOP network of stations. We know, for example, that the Regional Hydroclimate Project (RHP) Monsoon Asian Hydro-Atmospheric Science Research and prediction Initiative (MAHASRI) has stations within its regional boundaries that are associated with the group of sites maintained in the network for which your organization is partly responsible.

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GLOBAL ENERGY AND WATER CYCLE EXPERIMENT
World Climate Research Programme

August 4, 2009

Dr. Guglielmina Diolaiuti
University of Milan-Earth Sciences Department "Ardito Desio"
Via Mangiagalli 34 – 20133 Milano, Italy

Dear Dr. Diolaiuti,

Further to a request to include the Italian Alps and Apennines, Himalayas, Karakorum, and Pakistan Stations in the World Climate Research Programme (WCRP) Global Energy and Water Cycle Experiment (GEWEX Coordinated Energy and Water Cycle Observations Project (CEOP) Phase II Network, we are pleased to inform you that we accept these as Reference Stations in our Network. We are taking this action with the knowledge that these Stations will provide excellent contributions to the existing CEOP network of stations. We know, for example, that the Regional Hydroclimate Project (RHP) Monsoon Asian Hydro-Atmospheric Science Research and prediction Initiative (MAHASRI) has stations within its regional boundaries that are associated with the group of sites maintained in the network for which your organization is partly responsible.

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Agreements
and
Collaborations

SHARE

Stations at High Altitude for Research on the Environment

Agreements and collaborations

institution	Subject	Agreement	Duration	Year
ITALIA				
CNR Istituto di Ricerca sulle Acque	Participation to the SHARE-STELVIO project	Research agreement	Multi-year	2010
CNR – Istituto di Scienze dell'Atmosfera e del clima	Participation to the SHARE project	Operational agreement	Multi-year	2010
	Participation to the SHARE-ABC project	Operational agreement	Multi-year	2008
	Participation to the SHARE-STELVIO project	Research agreement	Multi-year	2010
	Participation to the NANO-SHARE project	Operational agreement	Year's	2011
CNR – Istituto per lo studio degli Ecosistemi	Limnological and Paleo-Limnological Research Activities in high altitude remote areas	Operational agreement	Multi-year	2008
	Participation to the SHARE-Paprika Italy project	Operational agreement	Multi-year	2010
	Participation to the SHARE project	Operational agreement	Multi-year	2010
Istituto Nazionale di Geofisica e Vulcanologia	Participation to the SHARE project	Framework agreement	Multi-year	2010
	Participation to the SHARE-Paprika Italy project	Operational agreement	Multi-year	2010
Università dell'Aquila - CETEMPS	Participation to the SHARE – WP1-WP2	Scientific cooperation agreement	Multi-year	2009
International Centre for Theoretical Physics	Participation to the SHARE project	Framework agreement	Multi-year	2010
	Participation to the SHARE-Paprika Italy project	Operational agreement	Multi-year	2010
Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile - ENEA	Participation to the SHARE project – calibration activities	Agreement	Year's	2010
Centro Euro-Mediterraneo per i Cambiamenti Climatici	Participation to the SHARE project	Framework agreement	Multi-year	2010
Università di Milano Dipartimento di Scienze della Terra "A. Desio"	Participation to the SHARE project	Framework agreement	Multi-year	2010
	Participation to the SHARE-STELVIO project	Operational agreement	Multi-year	2010
	Participation to the SHARE Paprika Italy project	Operational agreement	Multi-year	2010
	Participation to SHARE – glacial AWS	Operational agreement	Multi-year	2011
Università Insubria – Dipartimento di Biologia Strutturale e Funzionale	Participation to the SHARE-STELVIO project	Research agreement	Multi-year	2010
Università di Siena – Dipartimento di Scienze Ambientali	Participation to the SHARE – Mammiferi SNP project	Contribution letter	Year's	2010
Università di Pavia – Dipartimento di Ecologia del Territorio	Participation to the SHARE project	Framework agreement	Multi-year	2011
	Participation to the SHARE – Seed Bank project	Contribution letter	Year's	2010
Università di Ferrara Dipartimento di Malattie Apparato Respiratorio	Participation to the SHARE – GARD project	Contribution letter	Year's	2010
Associazione di Protezione Ambientale Umana Dimora	Scientific research activities in the Rwenzori National Park region (Uganda)	Agreement	Multi-year	2008

institution	Subject	Agreement	Duration	Year
EUROPA				
Université Joseph Fourier	Partecipation to the SHARE project	Addendum of agreement	Multi-year	2009

institution	Subject	Agreement	Duration	Year
NEPAL				
DHM – Department of Hydrology and Meteorology (Government of Nepal)	High altitude weather stations network management	Memorandum of Understanding	Multi-year	2008
NAST – Nepal Academy of Science and Technology	Himalayan Seed Bank	Research agreement	Multi-year	2010

institution	Subject	Agreement	Duration	Year
PAKISTAN				
PMD – Pakistan Meteorological Department	High altitude weather stations network management	Memorandum of Understanding	Multi-year	2008

institution	Subject	Agreement	Duration	Year
UGANDA				
UMD – Ugandan Meteorological Department	High altitude weather stations network management	Memorandum of Understanding		2009

institution	Subject	Agreement	Duration	Year
AMERICA				
UMSA – Universidad Mayor de San Andres	Management of Chacaltaya station	Scientific cooperation agreement	Multi-year	2010



SHARE

Stations at High Altitude for Research on the Environment

National Partners



Istituto di Scienze
dell'Atmosfera e del Clima

Istituto di Ricerca sulle Acque

Istituto per lo Studio
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Università di Urbino
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Università di Cagliari
Dipartimento di Scienze della Terra



Politecnico di Milano
Facoltà di Ingegneria Civile
Ambientale e Territoriale



CMCC - Centro Euro-Mediterraneo per i Cambiamenti Climatici



Comitato Glaciologico
Italiano



ICTP
International Centre for Theoretical Physics



Associazione 'L'Umana Dimora'



LSI - Lastem



COREPLA
(Consorzio Nazionale per la Raccolta,
il Riciclaggio ed il Recupero
dei Rifiuti di Imballaggi in Plastica)



Università di Milano
Dipartimento di Scienze
della Terra "A. Desio"



Università di Ferrara
Centro studi biomedici
applicati allo sport



Università di Pavia
Dipartimento di Scienze
della Terra e Ambientali

International Partners



World Meteorological Organization



United Nations Environment Programme



Laboratoire de Glaciologie et Géophysique de l'Environnement

Laboratoire de Météorologie Physique



Université Joseph Fourier, France



Centre National d'Etudes Spatiales (CNES) Service DORIS, France



IRD - Institut de recherche pour le Développement



University of Innsbruck



Delft University of Technology, Netherlands



Bavarian Academy of Sciences and Humanity, Germany



Nepal Academy of Sciences and Technology (NAST), Nepal



Department of Hydrology and Meteorology (DHM)



Pakistan Meteorological department (PMD)



Uganda Wildlife Authority, Uganda

Department of Meteorology Uganda



University of the Witwatersrand School of Geography, Arch. & Environment Studies, South Africa



SHARE

Stations at High Altitude for Research on the Environment

Events

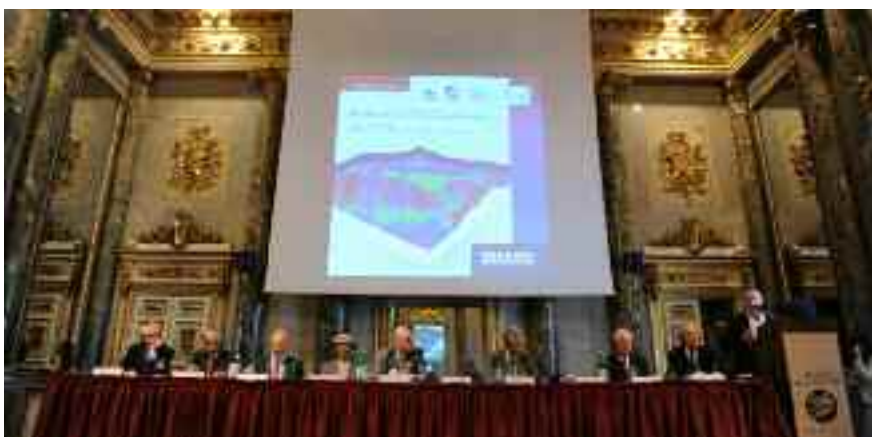
International Conference: "Mountains: Energy, water and food for life. The SHARE project: understanding the impacts of climate change"

This conference, organised by the Ev-K2-CNR Committee, the Municipality of Milan - Department of Mobility, Transport and Environment, City of Milan Expo 2015 Committee and CNR - National Research Council was held in Milan at Circolo della Stampa – Palazzo Serbelloni.

The day concluded with a round table discussion featuring several experts who addressed the debate on high-altitude climate research stressing the importance of environmental monitoring and the construction and integration of networks.

After the opening session with greetings from the authorities, the conference continued with a Lectio Magistralis on "Management of integrated environmental change through the development and dissemination of scientific knowledge (an example)" held by Dr. Aziz Ali Najam, the first vice chancellor of the Karakorum International University. This speech was followed by a first session on environmental and climatic research conducted in mountainous regions. In this occasion a number of experts presented their researches in several areas: atmosphere and climate, water resources, energy, biodiversity, health, economy and adaptive strategies and food security. The following day of work began with the second session dedicated to the presentation of the SHARE project - Phase II, with the contribution of many researchers working for the SHARE project.

May 27 - 28, 2009, Milan, Italy



2nd Meeting of ABC Observatory Group

During the ABC project Science Team (ST) meeting, held in Bangkok in December 2006, the need to harmonize collected data by creating a unique central archive at the UNEP-RRCA offices, was emerged.

The following year the Science Team met in Seoul, in August, and decided to establish a group dedicated to monitoring activities (Observatory Group) formed by the researchers involved in gathering and validating data and in managing the observers, which met for the first time in May 2008. On July 7 - 8, 2009 the second meeting of the ABC Observatory Group was held in Pathumthani, and Dr. Paolo Bonasoni and Dr. Elisa Vuillermoz participated on behalf of Ev-K2-CNR Committee.

The specific objectives of the meetings were:

- to share information about measurements, data, their management and experiences on the management of the observers (problems and solutions), their operation and the maintenance of equipment;

- to suggest the parameters to be monitored to assess the Atmospheric Brown Clouds impacts on human health, and the sites where they can be observed;

- to propose solutions to improve the current ABC observers, with a particular regard to their monitoring capabilities (parameters, location etc.).

During this meeting the Ev-K2-CNR representatives presented:

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- to suggest the parameters to be monitored to assess the Atmospheric Brown Clouds impacts on human health, and the sites where they can be observed;

- to propose solutions to improve the current ABC observers, with a particular regard to their monitoring capabilities (parameters, location etc.).

July 7 - 8, 2009, Pathumthani, Thailand



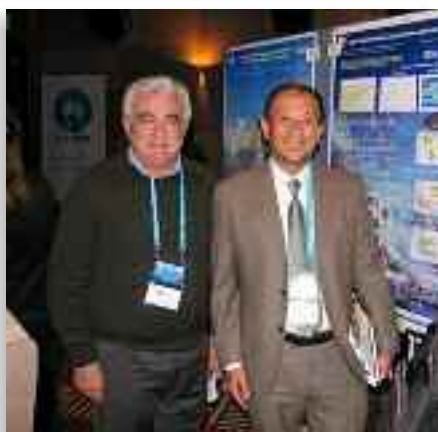
Poster Session: "High Elevations Sciences"

August 24 - 28, 2009, Melbourne, Australia

During the conferences organised by GEWEX (Global Energy and Water Cycle Experiment) and ILEAPS (Integrated Land Ecosystem-Atmosphere Processes Study Science Conference) in the summer of 2009, a poster session on "High Elevations Sciences" was organised and it focused on different environmental issues such as hydrology, climatology, glaciology, aerosol studies, main long-range transport mechanisms studies, limnology and paleolimno-

logy in order to understand how the ongoing changes in hydro-physical and hydro-chemical processes negatively affect ecosystems.

In this occasion, over 20 posters were presented and the role of high-altitude remote areas, now widely recognized as ecosystems sensitive to climate change, was strengthened.



Atmospheric Brown Clouds Science and Impact Symposium and ABC Science Team Meeting

During this Symposium the main ABC Project achievements related to scientific monitoring and research activities linked to the project's network of observers, and to impact studies on agriculture and human health effects studies, were presented. At the same time the annual meeting of the ABC Project Scientific Committee was held

to present the planning of future activities, with a particular attention to the integration of researches related to Black Carbon impact on glacial melting and to the extension of the ABC project in Africa and America.

November 22 - 24, 2009, Seoul, Korea



GEO Work Plan Symposium 2010

May 17 -19, 2010, Pretoria, South Africa

Following the inclusion of the SHARE Project into the GEO 2009-2011 Work Plan as the "Vulnerability on Mountain Regions" task leader, the first workshop open to all tasks representatives was held in Pretoria. This Symposium allowed to get an overview of the Work Plan, to understand possible interactions, the mechanisms of the project and the contribution to the GEOSS (Global Earth Observation System of Systems) implementation. The main topics discussed were: observations and methods of standar-

dization and data archiving from ground stations, satellites, and modelling simulations. These activities are coordinated by Prof. Toshio Koike, former president of the CEOP project. The Ev-K2-CNR Committee presented the SHARE contribution aiming to activate potential interactions with JRC-ISPRA researchers and to increase the concern of GEO Coordinators on the 'Mountains' topic.

ACP Symposium 2010

From June 8 to 10, 2010, the Symposium on "Atmospheric Chemistry and Physics at Mountain Sites" was held in Interlaken, Switzerland. In this occasion, many international researchers attended the event and presented the results of their researches, conducted in high altitude areas and related to environmental issues such as: variability and changes in the atmosphere chemical composition, main characteristics of air masses, clouds physics and chemistry, aerosol-clouds interaction, trace of air masses trajectories, etc.

During the various sessions the following poster were presented: i) "Tropospheric ozone and black carbon variations during heat waves at the Monte Cimone high mountain station (Italy, 2154 m a.s.l.) ii) "High black carbon levels up to 5000 m a.s.l. in the Himalayas: four years of continuous observations at NCO-P" iii) "Identification and study of mineral dust transport at the Himalayas Nepal Climate Observatory – Pyramid (5079 m a.s.l.)" iv) "Atmospheric equivalent concentration and black carbon deposition in Himalayan region during pre-monsoon

season: observations at the NCO-P site and comparison with GOCART and SPRINTARS model simulations" v) "Evaluation of a "continental" baseline for assessing long term trends of climate altering gases at a European mountain site" vi) "Halogenated greenhouse gases at the ABC Nepal Climate Observatory – Pyramid (5079 m a.s.l., Himalayas) vii) "A three year record of molecular hydrogen and carbon monoxide at a European mountain site" viii) "New particles formation and ultrafine aerosol climatology at a high Alpine site (Jungfrauoch, 3580 m a.s.l.)".

June 8 -10, 2010, Interlaken, Switzerland



International Expert Consultation Meeting: Mountain Initiative on Climate Change

September 23 - 24, 2010, Kathmandu, Nepal

From September 23 to 24, 2010, the Ministry of Environment of Nepal and the International Centre for Integrated Mountain Development (ICIMOD) organised the "International Expert Consultation Meeting on Mountain Initiative", in Kathmandu, Nepal.

The main objective of this meeting was to prepare a scheme indicating the priorities concerning the problems that, in the last period, are affecting mountainous regions, and that soon will be proposed to the Ministerial Conference and to the United Nations Framework Convention on Climate Change (UNFCCC).

In addition, this meeting aimed to strengthen the mountain initiatives proposed by the Nepalese government in terms of capacity building, development of knowledge and population awareness, at a global and regional level, concerning the problems that are more and more affecting mountain ecosystems. The conclusions of this meeting, characterized by individual presentations combined with moments of

collective discussion, were shared with the participants of the COP-16 held in Cancun, Mexico on December 2010.

In this occasion, Ev-K2-CNR presented the SHARE project and the contributions it may give to such an initiative.



ABC – Africa Consultation

August 23 - 24, 2010, Nairobi, Kenya

From August 23 to 24, 2010, the Ev-K2-CNR Committee attended the first Atmospheric Brown clouds (ABC) meeting - Africa Consultation, organised by UNEP in the presence of local stakeholders. During the meeting, the numerous researchers involved showed their researches and the contributions they could provide in case that the ABC activities were implemented in Africa.

As pointed out by Mr. Surendra Shrestha (UNEP), the ABC project was promoted by UNEP in 2002 with the aim of studying this atmospheric phenomenon and its impacts, mainly in Asia.

Over time, on the basis of the performed researches and achieved results, UNEP decided to expand the project in other regions

such as Africa.

In this context, following the meeting, the drafting of a white paper concerning the activities to be carried out in the African continent to support the ABC project is ongoing.

During this event, the SHARE activities conducted at Ruwenzori AWS station, installed in 2006 at 4,750 m a.s.l., near the Elena glacier, in Uganda, were presented. In this region the atmospheric conditions are strongly influenced by interactions between the mountainous chains and the moist air masses coming from Congo, responsible for very humid conditions and frequent rains.



3rd Meeting of ABC Observatory Group

October 21 - 23, 2010, Bangkok, Thailand

From October 21 to 23, 2010, Dr. Elisa Vuillemoz and Dr. Angela Marinoni (ISAC -CNR), on behalf of Ev-K2-CNR Committee, participated to the third meeting of the ABC Observatory Group, held in Bangkok. In particular they presented the activities concerning the NCO-P station in Nepal and the future PCO-K station that will be installed in Pakistan in 2011-2012.

This meeting aimed to:

- share technical and scientific management protocols of the observers and in particular the obtained scientific results, calibration procedures, maintenance of the instrumentation and their limitations and problems;
- optimize monitoring and Black Carbon (BC) analysis methods through the organization of inter-calibration campaigns aiming at comparing measures;

- develop predictive models designed to assess the ABCs impacts on climate, hydrological cycle, agriculture, etc.

During the meeting, Ev-K2-CNR Committee representatives presented:

- the NCO-P station and research activities;
- the main results of monitoring activities at NCO-P, presented in the ACP Special Issue: "Atmospheric Brown Clouds in the Himalayas";
- prospects for improving the quality of measures following the recent NCO-P station recognition as a Global Station within the WMO-GAW Network and research activities related to the monitoring of Black Carbon and its impact on glaciers;
- the implementation plan for the new Pakistan Climate Observatory in Karakorum.

15th Meeting of the GEO Science and Technology Committee

September 28 -29, 2010, Rome, Italy

The "Fifteenth Meeting of GEO Science and Technology Committee", held at the Institute for Environmental Protection and Research, ISPRA, saw the participation of the Ev-K2-CNR Committee which aimed to give visibility to the SHARE project and strengthen collaboration with research groups already involved in GEO.

During this meeting, the recent activities conducted within the two tasks included in the "Science and Technology" area: ST-09-01 "Catalyzing Research and Development Resources for GEOSS" and ST-09-02 "Promoting Awareness and Benefits of GEO in the Science and Technology Community", were illustrated. Moreover, the implementation of the Roadmap regarding the Science and Technology area was also discussed.

All sub-tasks' representatives of the Science and Technology area, involved in the GEO implementation plan, attended this meeting and focused their discussion on identi-

fying the guidelines to present at the Ministerial Summit in Beijing in November 2010.

Conference of the Parties - COP 16

From December 1 to 4, 2010, Dr. Paolo Bonasoni, SHARE Coordinator, and Dr. Elisa Vuillermoz, Ev-K2-CNR Scientific Projects Coordinator, on behalf of the Ev-K2-CNR Committee, attended the United Nations Climate Change Conference, COP16.

During the last world summit on climate change, in 2009, the 'mountains' topic was particularly neglected, hence in this latest edition an attempt was made to address the attention of the "Big of the Earth" on high altitude areas, through the organization of various side events.

In this context, Ev-K2-CNR representatives were involved in two side event dedicated to the sustainable development of mountains.

The first, "Mountains in Peril: Mainstreaming the sustainable mountain development agenda into climate change agreements" was organised by ICIMOD and took place on December 2.

This event mainly addressed topics related to adaptation and mitigation strategies in the Hindu Kush Himalaya Karakorum (HKKH) mountain areas, presenting activities and actions carried out by the governments of Nepal, India and Bhutan. Moreover, the results of scientific research on climate change applied to atmosphere, glaciology and biodiversity, were shown. Researchers and local governments had a significant opportunity for interacting and sharing information and this also led to useful insights for the Central Asia mountain regions representatives that, at the end of the ICIMOD side event, presented the researches and initiatives ongoing in the Tajikistan and Kyrgyzstan regions.

The intervention of Dr. Paolo Bonasoni focused on the effects that black carbon and ozone might have on mountains. These two pollutants compounds, if present in high concentrations in the atmosphere, favour atmospheric warming thus contributing to 'global warming', as much as CO₂, the main greenhouse gas. It was stressed that, unlike CO₂, these two climate-altering compounds are characterized by a significantly lower time spent in the atmosphere, hence a reduction of BC and O₃ precursors emissions may reduce their impact on global warming. Furthermore, BC and O₃ may damage human health and the environment, including agriculture. Black carbon plays a double role, it has a direct impact on glaciers and acts indirectly on water. In fact, as evidenced by several



studies conducted by Ev-K2-CNR at the NCO-P GAW station, the presence of high concentrations of black carbon at high altitudes brings this highly-absorbing particles to deposit on the surface of Himalayan glaciers, reducing their reflectance conditions, and increasing the amount of absorbed solar radiation thus favouring their early fusion.

The second side event, which saw the active participation of Ev-K2-CNR Committee, was promoted by the Nepalese government and focused on the Mountain Alliance Initiative, the mountain countries "coalition" aiming to protect glaciers and mountain ranges from global warming, proposed by the Nepalese government a year ago after the COP 15 summit. Nepal, the Himalayan developing country, "hosts" Mt. Everest and 75% of its territory is spread over mountains and hills. Nepal's ecosystem is one of the most endangered to climate change hence, through this initiative, the local government wanted to bring his experience to the international attention.

Ev-K2-CNR Committee was invited to attend this event as a member of the Mountain Initiative Scientific Expert Group, and this allowed Dr. Paolo Bonasoni and Dr. Elisa Vuillermoz to share the results of the researches conducted so far in the HKKH region, as well as strengthening relations with the institutional representatives of the Government of Nepal, and in particular with the Ministry of Environment.

December 1 - 4, 2010, Cancun, Mexico

Conference 'The Italian research to support policies for the mountains'

This conference, aiming to raise the challenge of launching a 'National program for the research on mountains' to encourage mountains recovery and development was organised by the National Research Council (CNR) on February 8th, at the CNR headquarters in Rome.

Representatives of the institutions including Gianni Alemanno, Mayor of Rome, Erminio Quartiani, President of the Friends of the Mountains Group of the Parliament, the Presidents of ISPRA and of the Italian Geographic Society, researchers, operators, experts, representatives of central and local administrations, climbers and hikers. This meeting provided an opportunity to examine topics of common interest such as environment, business, tourism, infrastructure, scientific research, sports, education.

To ensure an effective and sustainable development of mountain areas and their integration "the launch of a National Program for the research on mountains, which can support governments and policy makers to identify strengths and weaknesses and then to perform strategic actions to enhance mountainous lands, which represent a large part of the entire national territory" is necessary, said Giuseppe Cavarretta, Director of the CNR - Department of Earth and Environment. "Environmental protection and risks reduction, water resources, energy, forest industry and animal husbandry development, agrotouristic system development, public services strengthening, and population, education system, tourism and mountain sports growth are some of the priorities for a lasting sustainable development of mountains areas. Scenarios that, with the scientific research support may lead to the revitalization of these areas in the best interest of the country".



February 8, 2011, Rome, Italy

Press Release “SHARE Everest 2011 – Italian science is back onto the roof of the world”

Back to 8000 m of height on Mt. Everest, to reinstate the South Col weather station installed in 2008 by the EvK2Cnr Committee: flagship of the SHARE (Stations at High Altitude for Research on the Environment) International Environmental Project, the South Col Automatic Weather Station (AWS) is the first weather station in the world providing weather measurements at such an altitude.

The mission, which is carried out in close cooperation with the Italian Minister for Education, University and Research (MIUR) and the National Research Council (CNR), was presented on April 20th, in a press conference in Rome, where Minister of University, Education and Research, Mariastella Gelmini said herself proud of a project like SHARE, which is going to bring, once more, the Italian excellence in high-altitude scientific research up to the highest mountain in the world, in the 150th anniversary of Italy's national unification.

The South Col mission has left Italy on April

22nd, and will be back to Italy in early June. Expedition chief is Agostino Da Polenza, Ev-K2-CNR Committee's president, who will coordinate the works from the Pyramid Laboratory-Observatory, installed at 5050 m a.s.l. on the Everest slopes. On the field there will be Gianpietro Verza (person in charge of Ev-K2-CNR's monitoring stations) and mountaineers Daniele Bernasconi, 39, president of the Ragni di Lecco mountaineering society, and Daniele Nardi, 35, from Sezze in Latium region. They will have the task of working at 8000 m of height to re-install the weather station, and to report about the mission with images and pictures. The scientific supervision is in the hands of Dr. Paolo Bonasoni (SHARE Project coordinator) and of Dr. Elisa Vuillermoz (responsible of Ev-K2-CNR's environmental projects).

The press conference was opened by Agostino Da Polenza, Ev-K2-CNR Committee's president, who presented the expedition, followed by Enrico Brugnoli, director of CNR Earth and Environment

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April 20, 2011, Rome, Italy



Department, who spoke about high-altitude environmental monitoring, an Italian excellence in world's research.

Paolo Bonasoni introduced the SHARE Project and opened a live connection with the Pyramid Laboratory, 5050 m a.s.l. in Nepal, where Gianpietro Verza is currently working with a group of the SHARE researchers.

"You reach points of excellence not only because you are at such a high altitude – Minister Mariastella Gelmini said, talking live with the Pyramid – but because the scientific results you are able to produce are of absolute excellence. We are proud of you, because you are bringing Italian expertise all over the world".

The Minister, after congratulating Gianpietro Verza and the Ev-K2-CNR's team, asked Angela Marinoni, CNR-ISAC researcher for SHARE, how they are spending their time at more than 5000 m of height. "It is really impossible to get bored – Marinoni replied – the job is plentiful and intense and the days are full with the monitoring, checking and calibration of the instruments, which are very delicate".


"Heartfelt congratulations for such an undertaking – the Minister added – Italy is proud of being internationally represented by such a Project which was conceived in Italy, encompasses international institutions and universities, creates synergies and yields to tangible outcomes also on our territory. SHARE is a project which allows us to promote our technologies. Seeing you there on the Everest with the Italian flag behind your shoulders is a source of pride for us all." "Yesterday the National Research Plan was presented: – Minister Gelmini concluded – it is the steering instrument of scientific research and it was bound to include the SHARE Project, which is so apt in creating international synergies and in proving how our Country can produce such exceptional talents. Therefore, as a Minister, I am deeply grateful to you all for your passion and dedication. SHARE is a jewel for research, and research should have more space on the media."

But what will be, in practice, the target of the SHARE Everest 2011 mission?

"The mission will re-install the weather sensor at South Col – ISAC-CNR Paolo Bonasoni, SHARE Project Coordinator, explains – where we already performed some tests for some months in 2008. It is a unique station, if you consider the 8000 m

asl altitude, and it is particularly important because it will be able to record information in continuous, which will make it possible to perform direct analyses and comparisons with other analyses. These measurements at the South Col can, moreover, provide us with information regarding the presence of an intense Western atmospheric current (the Subtropical Jet Stream) over the Himalayas. The yearly variability of such a jet stream is used as an indicator of the onset and the end of the summer monsoonal circulation. Moreover, this current influences episodes of transport of stratospheric masses to the troposphere, as shown by the analyses performed at the Nepal Climate Observatory – the Pyramid (NCO-P). At the same time, the South Col station becomes the endpoint of a network of measurement sites all over the Khumbu Valley starting from Lukla, 2500 m asl, to other 7 sites, encompassing the Pyramid, with the NCO-P. The NCO-P itself, last year, obtained the status of global station in the frame of the Global Atmospheric Watch (GAW) Programme of the World Meteorological Organization (WMO), thus becoming the 33rd monitoring focal point for the Earth's atmospheric composition: the highest point in this network, and the first Italian one, although beyond the national borders, to obtain such a prestigious status". Thanks to the integration of the information originating at the South Col and those coming from the Khumbu Valley SHARE station network, the SHARE project positively contributes to the improvement of atmospheric circulation studies at an international level.

The reinstatement of observations at the South Col will take place by means of the reinstallation of a station which will provide meteorological data from the roof of the world in real time, thus creating a continuous and unique flux of data, of a pre-eminent importance for a better characterization of the Himalayan climate. The South Col station will be equipped with new and technologically-advanced sensors for measuring temperature, humidity, wind speed and direction, whereas the sensors from the previous installation will be used for measuring pressure and radiation. Support and energy supply systems will be optimized, and the transmission system will be re-established, considering its good functioning during the 2008 test campaign.



Researchers
and
Collaborators

SHARE

Stations at High Altitude for Research on the Environment

Researcher involved in the project

Prof Aizen Vladimir	University of Idaho, Department of Geology, College of Science, Moscow, USA
Prof. Andrade Marcos	Universidad Mayor de San Andres, La Paz, Bolivia
Prof. Anfodillo Tommaso	Università di Padova, Dipartimento di Territorio e Sistemi Agro Forestali, Legnaro, Padova
Dr. Angelini Fabio	CNR - Istituto di Scienze dell'Atmosfera e del Clima, Roma
Dr. Arnaud Yves	CNRS - Laboratoire de Glaciologie et Géophysique de l'Environnement, Grenoble, France
Dr. Aubriot Olivia	CNRS - Centre d'Etudes Himalayennes, Villejuif, France
Dr. Balestrini Raffaella	CNR - Istituto di ricerca sulle Acque, Brugherio
Dr. Baskaradas James	Istituto Nazionale di Geofisica e Vulcanologia, Roma
Dr. Benedict Sam	CEOP International Coordination Office, Colorado, USA
Dr. Bertolani Raffaella	CNR - Istituto di ricerca sulle Acque, Brugherio
Prof. Bhattarai Hom Nath	Nepal Academy for Science and Technology, Kathmandu, Nepal
Prof. Bianchi Alberto	Politecnico di Milano, DIIAR, Milano
Dr. Bianchi Cesidio	Istituto Nazionale di Geofisica e Vulcanologia, Roma
Dr. Bocchiola Daniele	Politecnico di Milano, DIIAR, Milano
Dr. Bocci Anna	Università di Siena, Dipartimento di Scienze Ambientali, Siena
Dr. Bonacina Costante	Università di Brescia, Dipartimento di Ingegneria Civile, Architettura, Territorio e Ambiente, Brescia
Dr. Bonafe' Ubaldo	CNR - Istituto di Scienze dell'Atmosfera e del Clima, Bologna
Dr. Bonasoni Paolo	CNR - Istituto di Scienze dell'Atmosfera e del Clima, Bologna
Dr. Busilacchio Marcella	Università dell'Aquila, Centro di Eccellenza per l'integrazione di Tecniche di Telerilevamento e Modellistica Numerica per la Previsione di Eventi Meteorologici Severi, Aquila
Dr. Cafarella Lili	Istituto Nazionale di Geofisica e Vulcanologia, Roma
Dr. Cagnazzo Chiara	Centro Euro Mediterraneo per i Cambiamenti Climatici, Bologna
Dr. Calzolari Francescopiero	CNR - Istituto di Scienze dell'Atmosfera e del Clima, Bologna
Prof. Carosi Rodolfo	Università degli Studi di Pisa, Dipartimento di Scienze della Terra, Pisa
Prof. Carrer Marco	Università di Padova, Dipartimento Sistemi Agro Forestali, Padova
Dr. Chaudry Qamar-uz Zaman	Pakistan Meteorological Department, Islamabad, Pakistan
Dr. Chevalier Pierre	CNRS - Laboratoire Hydro Sciences Montpellier, Montpellier, France

Prof. Cogo Annalisa	Università di Ferrara, Clinica Pneumologica e Centro Studi Biomedici applicati allo Sport, Ferrara
Dr. Cozic Julie	CNRS - Laboratoire de Glaciologie et Géophysique de l'Environnement, Grenoble, France
Dr. Cristofanelli Paolo	CNR - Istituto di Scienze dell'Atmosfera e del Clima, Bologna
Dr. D'Agata Carlo	Università di Milano, Dipartimento di Scienze della Terra, Milano
Dr. De Bernardi Riccardo	Istituto per lo Studio degli Ecosistemi CNR, Verbania, Pallanza
Dr. De Paolis Adolfo	CNR - Istituto di ricerca sulle Acque, Brugherio
Dr. Decesari Stefano	CNR - Istituto di Scienze dell'Atmosfera e del Clima, Bologna
Dr. Dessì Francesco	Università di Cagliari, Dipartimento di Telerilevamento e GIS, Cagliari
Dr. Di Biagio Claudia	ENEA, Roma
Dr. Di Carlo Piero	Università dell'Aquila, Centro di Eccellenza per l'integrazione di Tecniche di Telerilevamento e Modellistica Numerica per la Previsione di Eventi Meteorologici Severi, Coppito (AQ)
Dr. Di Sarra Giorgio Alcide	ENEA, Roma
Dr. Diolaiuti Guglielmina	Università di Milano, Dipartimento di Scienze della Terra, Milano
Dr. Duchi Rocco	Istituto di Scienze dell'Atmosfera e del Clima CNR, Bologna
Dr. Facchini Maria Cristina	Istituto di Scienze dell'Atmosfera e del Clima CNR, Bologna
Dr. Fierli Federico	Istituto di Scienze dell'Atmosfera e del Clima CNR, Bologna
Dr. Fuzzi Sandro	Istituto di Scienze dell'Atmosfera e del Clima CNR, Bologna
Dr. Gallée Hubert	Laboratoire de Glaciologie et Géophysique de l'Environnement, Grenoble, France
Prof. Gatto Marino	Politecnico di Milano, Dipartimento di Elettronica e Informazione, Milano
Dr. Ginot Patrick	Laboratoire de Glaciologie et Géophysique de l'Environnement, Grenoble, France
Prof. Giorgi Filippo	International Centre for Theoretical Physics, Trieste
Dr. Gobbi Gianpaolo	Istituto di Scienze dell'Atmosfera e del Clima CNR, Roma
Ms. Goda Akiko	Department of Civil Engineering, School of Engineering, University of Tokyo, Japan
Dr. Greenwood Gregory	University of Bern, Institute of Geography, Bern, Switzerland
Dr. Gualdi Silvio	Centro Euro Mediterraneo per i Cambiamenti Climatici, Bologna
Prof. Guglielmin Mauro	Università Insubria, Dipartimento di Biologia Strutturale e Funzionale, Varese

Dr. Guillizzoni Piero	Istituto per lo Studio degli Ecosistemi CNR, Verbania Pallanza
Dr. Guzzella Licia	Istituto di Ricerca Sulle Acque CNR, Brugherio (MB)
Prof. Koike Toshio	Department of Civil Engineering, School of Engineering, University of Tokyo, Japan
Dr. Laj Paolo	Laboratoire de Glaciologie et Géophysique de l'Environnement, Grenoble, France
Dr. Lami Andrea	Istituto per lo Studio degli Ecosistemi CNR, Verbania Pallanza
Dr. Lapi Mita	Fondazione Lombardia per l'Ambiente, Milano
Dr. Lau William K. M.	Goddard Earth Science and Technology Center, Greenbelt, USA
Prof. Lovari Sandro	Università di Siena, Dipartimento di Scienze Ambientali, Siena
Prof. Ma Yaoming	Institute of Tibetan Plateau Research, Chinese Academy of Sciences
Dr. Maggi Valter	Università degli Studi di Milano Bicocca, Dipartimento di Scienze dell'Ambiente e del Territorio, Milano
Dr. Maione Michela	Università di Urbino, Istituto di Scienze Chimiche, Urbino
Dr. Marchetto Aldo	Istituto per lo Studio degli Ecosistemi CNR, Verbania Pallanza
Dr. Marinoni Angela	Istituto di Scienze dell'Atmosfera e del Clima CNR, Bologna
Dr. Mariotti Annarita	ENEA - Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile, Roma
Dr. Mayer Christoph	Bavarian Academy of Science and Humanities, München, Germany
Dr. Melis Maria Teresa	Università di Cagliari, Dipartimento di Telerilevamento e GIS, Cagliari
Dr. Menegoz Martin	CNRS - Laboratoire de Glaciologie et Géophysique de l'Environnement, Grenoble, France
Prof. Menenti Massimo	Delft University and Technology, Delft, The Netherlands
Prof. Messerli Bruno	University of Bern, Institute of Geography, Bern, Switzerland
Dr. Mihalcea Claudia	Università di Milano, Dipartimento di Scienze della Terra, Milano
Prof. Navarra Antonio	Centro Euro Mediterraneo per i Cambiamenti Climatici, Bologna
Dr. Oggioni Alessandro	CNR - Istituto per lo Studio degli Ecosistemi, Verbania Pallanza
Dr. Orsenigo Simone	Università di Pavia, Dipartimento di Scienze della Terra e dell'Ambiente, Pavia
Prof. Pirrone Nicola	CNR - Istituto sull'Inquinamento Atmosferico, Monterotondo
Prof. Poretti Giorgio	Università di Trieste, Dipartimento di Scienze Matematiche, Trieste
Dr. Provenzale Antonello	CNR - Istituto di Scienze dell'Atmosfera e del Clima, Torino

Prof. Psenner Roland	University of Innsbruck, Institute of Zoology and Limnology, Innsbruck, Austria
Prof. Rajbhandari Nirmal Hari	Nepal Department of Hydrology and Meteorology. Kathmandu, Nepal
Dr. Rogora Michela	CNR - Istituto per lo Studio degli Ecosistemi, Verbania Pallanza
Dr. Rolfo Franco	Università di Torino, Dipartimento di Scienze Mineralogiche e Petrologiche, Torino
Prof. Rossi Graziano	Università di Pavia, Dipartimento di Scienze della Terra e dell'Ambiente, Pavia
Prof. Rosso Renzo	Politecnico di Milano, DIIAR, Milano
Dr. Rulli Maria Cristina	Politecnico di Milano, DIIAR, Milano
Dr. Salerno Franco	CNR - Istituto di Ricerca Sulle Acque, Brugherio
Dr. Schild Andreas	ICIMOD, Kathmandu, Nepal
Dr. Sellegri Karine	Observatoire Physique du Globe University Clermont Ferrand, OPGC LaMP, France
Dr. Senese Antonella	Università di Milano, Dipartimento di Scienze della Terra, Milano
Prof. Sharma Suresh Raj	Kathmandu University, Kathmandu, Nepal
Dr. Smadja Joelle	CNRS - Centre d'Etudes Himalayennes, Villejuif, France
Prof. Smiraglia Claudio	Università di Milano, Dipartimento di Scienze della Terra, Milano
Dr. Solmon Fabien	International Centre for Theoretical Physics, Trieste
Prof. Sommaruga Ruben	University of Innsbruck, Institute of Ecology, Innsbruck, Austria
Dr. Soncini Andrea	Politecnico di Milano, DIIAR, Milano
Prof. Tabacco Ignazio Ezio	Università di Milano, Dipartimento di Scienze della Terra, Milano
Prof. Tamagawa Katsunori	Department of Civil Engineering, School of Engineering, University of Tokyo, Japan
Dr. Tartari Gianni	CNR - Istituto di Ricerca Sulle Acque, Brugherio
Prof. Thomas Axel	Institute of Geography, Johannes Gutenberg University Mainz, Mainz, Germany
Prof. Ueno Kenichi	University of Tsukuba, Graduate School of Life and Environment Science, Tsukuba, Japan
Dr. Urbini Stefano	Istituto Nazionale di Geofisica e Vulcanologia, Roma
Dr. Vagnon Patric	CNRS - Laboratoire de Glaciologie et Géophysique de l'Environnement, Grenoble, France

Prof. Vassena Giorgio	Università degli studi di Brescia, Dipartimento di Ingegneria Civile, Architettura, Territorio e Ambiente, Brescia
Prof. Veerabhadran Ramanathan	Center for Clouds, Chemistry and Climate (C4), Scripps Institution of Oceanography (SIO), University of California, San Diego (UCSD), USA
Dr. Venzac Hervè	Observatoire Physique du Globe- University Clermont-Ferrand, OPGC - LaMP, France
Dr. Villani Paolo	Observatoire Physique du Globe- University Clermont-Ferrand, OPGC - LaMP, France
Dr. Von Hardenberg Jost	CNR - Istituto di Scienze dell'Atmosfera e del Clima, Torino
Dr. Vuillermoz Elisa	Ev-K2-CNR, Bergamo
Dr. Williams Steve	NCAR/ Earth Observing Laboratory (EOL), Boulder, USA
Dr. Yasunari Teppei	Goddard Earth Science and Technology Center, Greenbelt, USA
Prof. Zaratti Francesco	Universidad Mayor de San Andres, La Paz, Bolivia
Dr. Zin Isabella	Laboratoire d'étude des Transferts en Hydrologie et Environnement (LTHE), Grenoble, France
Dr. Zirizzotti Achille	Istituto Nazionale di Geofisica e Vulcanologia, Roma

A satellite view of Earth from space, showing the curvature of the planet and various geographical features like clouds, land, and water. The image is dark, with the Earth's surface being the primary light source.

SHARE

Stations at High Altitude for Research on the Environment

Workplan 2009-2015



Stations at High Altitude for Research on the Environment

Activity	2009	2010	2011	2012	2013	2014	2015
Maintaining, developing and operating the existing monitoring stations SHARE	●	●	●	●	●	●	●
Realization and operation of 5 new stations SHARE Master in the countries currently studied	●	●	●	●	●		
Integration of the international SHARE stations in the main networks of scientific and environmental monitoring	●	●	●	●	●		
Consolidation of a group of scientific experts	●	●	●				
Establishment of the Italian network of high-altitude background monitoring stations which are 12 in total (5 in the Alps, 4 in the Apennines, 1+1+1 on the islands)		●	●	●	●		
Long-term monitoring program in Italy and in all other countries under study	●	●	●	●	●	●	●
Scientific investigations in the following fields: atmospheric science; meteorology and climate; glaciology; hydrology; limnology and paleolimnology; geophysics and natural hazards; remote sensing; topography (basic cartographic references, biodiversity)	●	●	●	●	●		
Interdisciplinary studies of environmental impacts on water resources, biodiversity, agricultural and forest resources and human health	●	●	●	●	●	●	●
Realization of annual activities to disseminate information among involved researchers	●	●	●	●	●	●	
Dissemination of scientific results						●	●
Implementation of a strategic plan for institutional capacity building and technology transfer to the countries under study	●	●					
Annual seminars to disseminate scientific results at a political level			●		●		●
Implementation of the SHARE climatic-environmental Information System for Italy		●	●				
Implementation of the SHARE climatic-environmental Information System for Europe				●			
International campaign to promote the SHARE Information System			●				
Will to repeat the experience of the SHARE Information System as a climatic-environmental database in the countries under study too				●			

Activity	2009	2010	2011	2012	2013	2014	2015
Collection, validation and archiving of the data obtained from the NCO-P station	●	●	●				
Analysis and processing of data resulting from the measurements carried out at the NCO-P station	●	●	●				
Contributions to international databases	●	●	●				
Dissemination of scientific results through publications, involvement, conferences, etc	●	●	●				
Training of foreign technicians and researchers (validation processes, archiving and data processing), in Italy and in situ	●	●	●				

Activity	2009	2010	2011	2012	2013	2014	2015
Micro-meteorological study on the Forni glacier and on the actual extension of the Alpine cryosphere in the park Characterize and quantify the amount of snow in the park		●	●	●			
Modelling the spatial and temporal variability of the water runoff resulting from the nivo-glacial fusion		●	●				
Physical-chemical, morphologic and hydrologic analysis of proglacial lakes and streams				●			
Space-time analysis of morphological and hydrological changes		●	●	●			
Identification of the monitoring site in terms of meteorological and atmospheric parameters and instrumentation preparation		●					
Continuous weather observations and intensive field campaigns		●	●	●			
Weather data analysis		●	●	●			
Aerosol samples analysis			●	●			
Data submission to databases		●	●	●			
Presentation of results at conferences			●	●			
Presentation of results in scientific journals				●			

Activity	2009	2010	2011	2012	2013	2014	2015
Field campaigns and data collection in the SNP (monitoring of snow leopard, common leopard and their prey)	●	●	●	●			
Genetic analysis of the collected biological samples		●	●	●			
Data processing and analysis of the climate change effects on animal biodiversity		●	●	●			
Radio tracking			●	●			
Dissemination of results		●	●	●			
Participation in meetings and workshops		●	●	●			

Activity	2009	2010	2011	2012	2013	2014	2015
Installation of the Himalayan Seed Bank at NAST (phase 1)			●				
Installation of the Himalayan Seed Bank at NAST (phase 2)				●			
Installation of the Himalayan Seed Bank at NAST (phase 3)					●		
Training of local researchers in Kathmandu (seed bank management)			●	●	●		
Field activities in the SNP for the plants' inventory			●				
In situ campaigns to collect seeds			●	●			
Transfer of methods and procedures to local researchers for the storage of seeds			●	●			
Setting up the herbarium			●	●	●		
Germination research in Italy and training for local researchers					●		
Germination tests				●	●		
Reintroduction of the grown plants					●		
Dissemination of results			●	●	●		

Activity	2009	2010	2011	2012	2013	2014	2015
WEB GIS archive: implementation and update			●	●	●	●	●
Identification of the sites known to filing climate record			●				
First drilling campaign of previously studied sites and analysis			●	●			
Second drilling campaign of new sites and analysis			●	●	●		
Design, construction and installation of Cryopreservation Centre			●	●	●	●	●
Communication and dissemination			●	●	●	●	●

Attività	2009	2010	2011	2012	2013	2014	2015
Field missions at Baltoro and glaciological and hydrological data collection		●	●	●			
Radar test on the Baltoro			●				
Site identification for the installation of the PCO-K station			●				
Installation of the PCO-K station			●				
Weather observation and data analysis			●	●	●		
Installation of a new AWS on Baltoro			●				
Meteorological data collection and analysis			●	●	●		
Elaboration of predictive models (in the fields of glaciology, atmospheric and hydrological)			●	●	●		
Dissemination of results and participation to workshops			●	●	●		
Training activities for PhD students		●	●	●	●		
Collection of data in databases					●		

Activity	2009	2010	2011	2012	2013	2014	2015
Field campaigns	●		●	●	●	●	●
Spirometry tests and questionnaires addressed to local people living in the Thame village	●		●	●	●	●	●
Collected data analysis	●	●	●	●	●	●	●
Interaction with local institutions and development of new partnerships			●	●	●	●	
Studies on the households' ventilation		●					
Participation in international meetings		●		●		●	
Dissemination of results			●	●	●		

Activity	2009	2010	2011	2012	2013	2014	2015
Nano-SHARE designing	●						
Components engineering and development of the Nano-SHARE prototype	●	●					
Nano-SHARE testing at three sites in the countries under study		●	●				
Create and maintain relations with industries and implement the Nano-SHARE business plan			●				
Taking action to facilitate the provision of funding for the purchase of Nano-SHARE in developing countries				●			

Share final balance

		2005	2006	2007	2008	2009	2010	euro
RICERCA E SVILUPPO	Staff	€ 45.000.00	€ 135.000.00	€123.000.00	€185.000.00	€365.000.00	€598.000.00	€1.451.000.00
	Instruments, building and functioning	€173.000.00	€273.000.00	€478.000.00	€855.000.00	€1.600.000.00	€1.885.000.00	€5.264.000.00
	Tavels and Missions	€27.000.00	€63.000.00	€14.000.00	€98.000.00	€196.000.00	€452.000.00	€850.000.00
	Dissemination and promotion activities conferences and meetings (partecipations organization) and publications	€25.000.00	€25.000.00	€25.000.00	€25.000.00	€48.000.00	€89.000.00	€237.000.00
	Overheads (9%)	€24.300.00	€44.640.00	€57.600.00	€104.670.00	€198.810.00	€272.160.00	€702.160.00
	TOT. RICERCA E SVILUPPO	€294.300.00	€540.640.00	€697.600.00	€1.267.670.00	€2.400.810.00	€3.296.160.00	€8.504.180.00

Share Budget

		2011	2012	2013	2014	2015	euro
1. SCIENTIFIC RESEARCH	Staff	€175.500.00	€175.500.00	€175.500.00	€273.500.00	€233.000.00	€1.032.500.00
	Instruments, building and functioning	€930.000.00	€850.000.00	€1.650.000.00	€1.270.000.00	€800.000.000	€5.500.000.00
	Tavels and Missions	€113.000.00	€75.000.00	€80.000.00	€85.000.00	€85.000.00	€438.000.00
	Dissemination and promotion activities conferences and meetings (partecipations organization) and publications	€20.000.00	€20.000.00	€27.000.00	€35.000.00	€80.000.00	€182.000.00
	Overheads (9%)	€111.465.00	€100.845.00	€173.925.00	€149.670.00	€107.820.00	€643.725.000
	SCIENTIFIC RESEARCH SUB -TOTAL	€1.349.965.00	€1.221.345.00	€2.106.425.00	€1.812.670.00	€1.305.820.00	€7.796.225.00
2. SHARE TECH	Staff	€169.000.00	€169.000.00	€130.000.00	€104.000.00	€104.000.00	€676.000.00
	Instruments, building and functioning	€650.000.00	€650.000.00	€650.000.00	€550.000.00	€550.000.00	€3.050.000.00
	Tavels and Missions	€40.000.00	€40.000.00	€40.000.00	€40.000.00	€40.000.00	€200.000.00
	Dissemination and promotion activities conferences and meetings (partecipations organization) and publications	€35.000.00	€35.000.00	€10.000.00	€35.000.00	€75.000.00	€190.000.00
	Overheads (9%)	€80.460.00	€80.460.00	€74.700.00	€65.610.00	€69.210.00	€102.060.00
	SHARE TECH SUB - TOTAL	€947.460.00	€947.460.00	€904.700.00	€794.610.00	€838.210.00	€1.236.060.00
3. INFORMATION SYSTEM	Staff	€117.000.00	€117.000.00	€117.000.00	€104.000.00	€136.500.00	€552.500.00
	Instruments, building and functioning	€70.000.00	€35.000.00	€25.000.00	€550.000.00	€25.000.00	€440.000.00
	Tavels and Missions	€20.000.00	€20.000.00	€20.000.00	€40.000.00	€45.000.00	€140.000.00
	Dissemination and promotion activities conferences and meetings (partecipations organization) and publications	€25.000.00	€25.000.00	€25.000.00	€35.000.00	€80.000.00	€190.000.00
	Overheads (9%)	€20.880.00	€17.730.00	€16.830.00	€65.610.00	€25.785.00	€102.060.00
	INFORMATION SYSTEM SUB - TOTAL	€252.880.00	€214.730.00	€203.830.00	€794.610.00	€312.285.00	€1.236.060.00
4. CAPACITY BUILDING	Staff	€110.500.00	€110.500.00	€110.500.00	€110.500.00	€110.500.00	€552.500.00
	Training courses in Italia	€130.000.00	€130.000.00	€60.000.00	€60.000.00	€60.000.00	€440.000.00
	Foreign training courses	€30.000.00	€35.000.00	€25.000.00	€25.000.00	€25.000.00	€140.000.00
	Institutional awarness compaigns	€40.000.00	€30.000.00	€30.000.00	€40.000.00	€50.000.00	€190.000.00
	Overheads (9%)	€27.945.00	€27.495.00	€20.295.00	€21.945.00	€22.095.00	€119.025.00
	CAPACITY BUILDING SUB - TOTAL	€338.445.00	€332.995.00	€245.795.00	€256.695.00	€267.695.00	€1.441.525.00
5. PILOT PROJECTS	Staff	€250.000.00	€250.000.00	€250.000.00	€250.000.00	€250.000.00	€1.250.000.00
	Instruments, building and functioning	€450.000.00	€400.000.00	€300.000.00	€300.000.00	€300.000.00	€1.700.000.00
	Tavels and Missions	€200.000.00	€200.000.00	€200.000.00	€150.000.00	€150.000.00	€900.000.00
	Dissemination and promotion activities conferences and meetings (partecipations organization) and publications	€40.000.00	€40.000.00	€40.000.00	€45.000.00	€45.000.00	€210.000.00
	Overheads (9%)	€84.600.00	€80.100.00	€71.100.00	€67.050.00	€62.550.00	€365.400.00
	PILOT PROJECTS SUB - TOTAL	€1.024.600.00	€970.100.00	€861.100.00	€812.600.00	€757.550.00	€4.425.400.00
SHARE TOTAL		€3.940.350.00	€3.713.630.00	€4.321.850.00	€3.928.360.00	€3.481.360.00	€19.385.650.00

Share Income

	2011	2012	2013	2014	2015	euro
MIUR: Residuo Odg nG3.198 al DDL 1209; Odg 9/3778-A/65 del 19/11/2010 PNR 2011.2013-Progetto Next DATA						€13.000.000.00
MAE/UNEP- Min. Ambiente- CNR.CNRS- Regional contributions, Technical Districts, world Bank- Proceeds						€6.385.650.00
TOTAL Income						€19.385.650.00



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SHARE

Stations at High Altitude for Research on the Environment

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Book

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Ev-K2-CNR Committee

Via San Bernardino, 145
24126 Bergamo - Italy

Tel. +39 035 3230511

Fax +39 035 3230551

Email: evk2cnr@evk2cnr.org

www.evk2cnr.org