



ANNUAL REPORT of SHARE PROJECT

(Stations at High Altitude for Research on the Environment)

2011

SHARE
Stations at High Altitude for Research on the Environment

SHARE PROJECT FRAMEWORK

Project Manager: Paolo Bonasoni (CNR-ISAC)

Executive Coordinator: Elisa Vuillermoz (Ev-K2-CNR)

ACTIVITY SECTOR	WORK PACKAGE		THEMATIC AREA
Scientific Research and Climate Coordinator <i>P. Bonasoni (ISAC-CNR)</i>	WP 1	Integrated Project for climatic, environmental and geophysical monitoring, on local, regional and global scales: Asia (Himalaya-Karakorum) Africa (Ruwendori) Europe (Alps and Apennines) South America (Cordillera Real)	WP 1.1 Atmosphere P. Cristofanelli (ISAC-CNR)
			WP 1.2 Glaciology C. Smiraglia – G. Diolaiuti (University of Milan)
			WP 1.3 Water Resources R. de Bernardi (Ev-K2-CNR)
			WP 1.4 Biodiversity and natural resources S. Lovari (University of Siena) G. Rossi (University of Pavia)
			WP 1.5 Medicine A. Cogo (University of Ferrara)
Technological Research and Climate Coordinator <i>P. Laj (CNRS-LGGE)</i> <i>G.P. Verza (Ev-K2-CNR)</i>	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 Coordinator <i>M.T. Melis (University of Cagliari)</i>	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 Coordinator <i>To be defined</i>	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.	

Scientific Secretariat: E. Vuillermoz, R. Toffolon, V. Carminati, P. Stocchi (Ev-K2-CNR)

Communication Office: F. Steffanoni (Ev-K2-CNR)

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WP 1:

Scientific Research and Climate

Reference Person:

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Institute of Atmospheric Sciences and Climate of the Italian National Research Council (ISAC-CNR)

WP 1.1 Atmosphere

Reference Person:

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Institute of Atmospheric Sciences and Climate of the Italian National Research Council (ISAC-CNR)

Objectives foreseen in 2011

- 1) Definition of the variability, on different time scales, of climate-altering and reactive gases in mountain areas representative of the background conditions of the lower troposphere.
- 2) Study of processes and mechanisms of interaction among mountain ranges and atmospheric circulation.
- 3) Characterization of the physicochemical properties of aerosols in high altitude areas.
- 4) Definition of the influence of the transport of air-masses influenced by polluted or natural processes on climate-altering and reactive compounds in mountain areas.
- 5) Assessment of climate impacts linked to variations in climate-altering and reactive compounds in mountain areas.
- 6) Continuation of meteorological and radiometric observations carried out by AWSs (Automatic Weather Stations) installed in Khumbu Valley (Pheriche, Namche, Lukla, Pyramid, Kala Patthar, Changri Nup) and in Baltoro basin (Askole, Urdukas and Concordia).
- 7) Implementation of semi-automatic routines for the validation of radiometric and meteorological data recorded from the AWSs.
- 8) By an appropriate reference system, continuation of in-situ calibration activities of meteorological and radiometric data acquired by the AWSs placed along the Khumbu Valley.
- 9) Installation at Laboratory-Observatory Pyramid of a system for monitoring of Mercury in atmosphere, in the framework of GMOS (Global Mercury Observation System) project.

Results obtained in 2011

Long-term observations of atmospheric compounds (gas and aerosol), meteorological parameters and LW and SW solar radiation fluxes are continuing at the global stations WMO-GAW "O.Vittori" at Monte Cimone and Nepal Climate Observatory-Pyramid (NCO-P).

Observation at weather and radiometric AWS belonging to the SHARE network are also on-going: according to the WMO guidelines regarding the implementation of measurements by AWS, new validation

methodologies of the acquired data were defined. Moreover, in this area, a new AWS was installed at the Concordia site, on Baltoro Glacier, where glacial tongues coming from K2 (Godwin-Austen Glacier), Broad Peak (Broad Peak Glacier), Gasherbrum (Abruzzi Glacier) meet.

In the framework of the agreement with University of La Paz and CNRS, LGGE, IRD, PSI, LCSE, ISAC-CNR and Ev-K2-CNR, a contribution was made in the definition of the measuring programs and in the implementation of the observation systems, with particular attention to surface ozone measurements and data acquisition, at GAW-WMO in Chacaltaya (Bolivia).

Mercury measurements in atmosphere, at Laboratory-Observatory Pyramid, in the framework of the GMOS project were started.

In particular in 2011 the following scientific results were achieved:

1) Identification of the frequency of acute pollution events at the WMO-GAW NCO-P station over the period 2006 - 2010 (Marinoni et al., 2011).

2) Study of the fluorinated gases trends over Himalayas, with analysis of high concentration episodes and an assessment of source areas (Maione et al., ACP, 2011).

3) Study of the local meteorology and synoptic scale circulation at Mt Rwenzori (Lentini et al., GFDQ, in press).

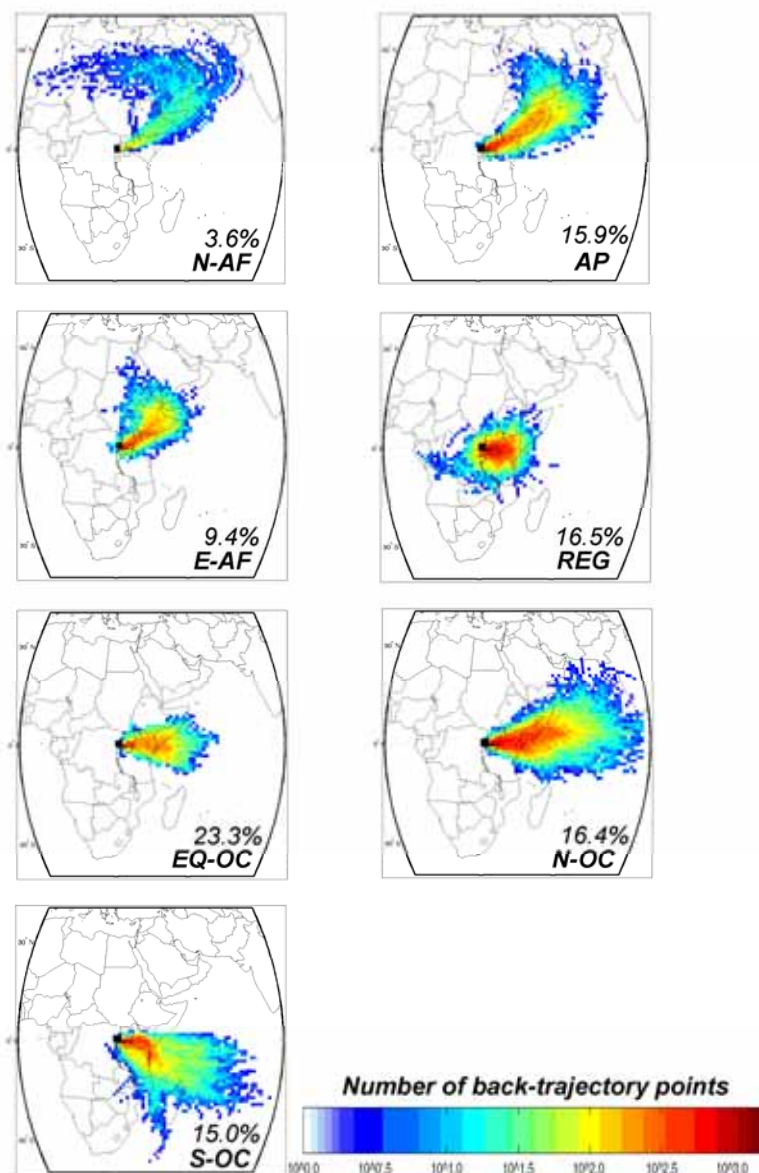
4) Study of the seasonal scale variability of aerosol size distribution at the WMO-GAW station "O. Vittori" at Monte Cimone (Asmi et al., ACP, 2011).

5) Study of the contribution of primary and secondary aerosol to the total number of particles in Europe and at Monte Cimone (Reddington et al., 2011).

6) Study of the climatology of the atmospheric aerosol radiative properties at the WMO-GAW station "O. Vittori" on Monte Cimone (Andrews et al., Atmos. Res., 2011).

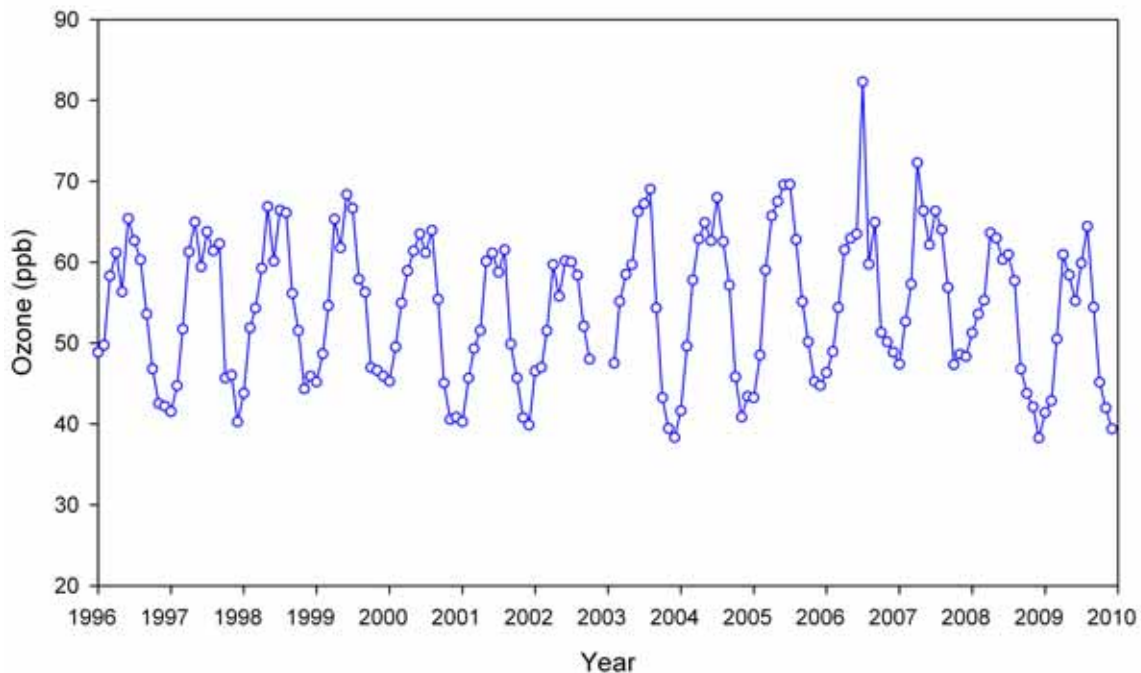
7) A methodology for calculating the "baseline" of climate-altering compounds at Mt. Cimone has been quantified (Giostra et al., Atmos. Environ. 2011).

8) Definition of long-term trends of ozone concentration at the WMO-GAW station "O. Vittori" on Monte Cimone (Cristofanelli et al., 2011).



Frequency of synoptic-scale circulations at Mt. Rwenzori (Lentini et al., 2011)

- 9) Quantification, through inverse modelling, of fluorinated greenhouse gas emissions on a European scale (Brunner et al., ACP, 2011).
- 10) Study of molecular hydrogen budget derived from continuous observations at several European stations (Yver et al., ACP, 2011).
- 11) Long-term characterization of mineral aerosol transport phenomena at WMO-GAW station "O. Vittori" on Monte Cimone (Zaccaria, Thesis 2011).



Long-term trend of surface ozone at the WMO-GAW global station "O. Vittori" at Monte Cimone (Cristofanelli et al., 2011)

Objectives foreseen in 2012

- 1) Continuation of the observation activities conducted at the measuring stations belonging to the SHARE network and data entry into reference databases (GAW-WMO, UNEP-ABC, SHARE Geonetwork, AERONET, ACTRIS).
- 2) Definition of the variability, on different time scales, of climate-altering and chemically reactive compounds in mountain areas which represent the background conditions of the lower troposphere.
- 3) Study of processes and mechanisms of interaction among mountain ranges and atmospheric circulation.
- 4) Characterization of the physicochemical properties of aerosols in high altitude areas.
- 5) Definition of the influence of the transport of air-masses influenced by polluted or natural processes on climate-altering and reactive compounds in mountain areas.
- 6) Assessment of climate impacts linked to changes in climate-altering and chemically reactive compounds in mountain areas.
- 7) Study of indoor pollution in the high Himalayas.
- 8) Calibration and checking of AWS installed in Himalaya and Karakorum.

SHARE - ABC

Project Coordinators:

Paolo Bonasoni

Paolo Cristofanelli

Institute of Atmospheric Sciences and Climate of the Italian National Research Council (ISAC-CNR)

Objectives foreseen in 2011

- 1) Determination of trace and climate-altering gases variability.
- 2) Determination of temporal variability of aerosol pollution chemical and physical.
- 3) Characterization of background conditions in a high altitude site in the Southern Himalayas.
- 4) Identification of the stratosphere-troposphere exchange contributions to the concentration of surface ozone in the Southern Himalayas.
- 5) Identification of mineral aerosol transports from North Africa, Arabian Peninsula, Central Asia, and evaluation of their contribution to PM10 mass and atmospheric aerosol physical-chemical characterization changes.
- 6) Identification of polluted air mass transports (local, regional, large-scale) and evaluation of their contribution to the concentration of trace gases and aerosol particles.
- 7) Evaluation of radiative forcing related to the variation of atmospheric composition due to the transport of air masses rich in natural and anthropogenic aerosol.
- 8) Evaluation of the relation between the atmospheric transport of high concentrations of absorbing aerosol and the deposition on snow or ice covered surfaces in the upper Kumbu valley.
- 9) Characterization of atmospheric background conditions in a high altitude site in the Karakorum range.

Results obtained in 2011

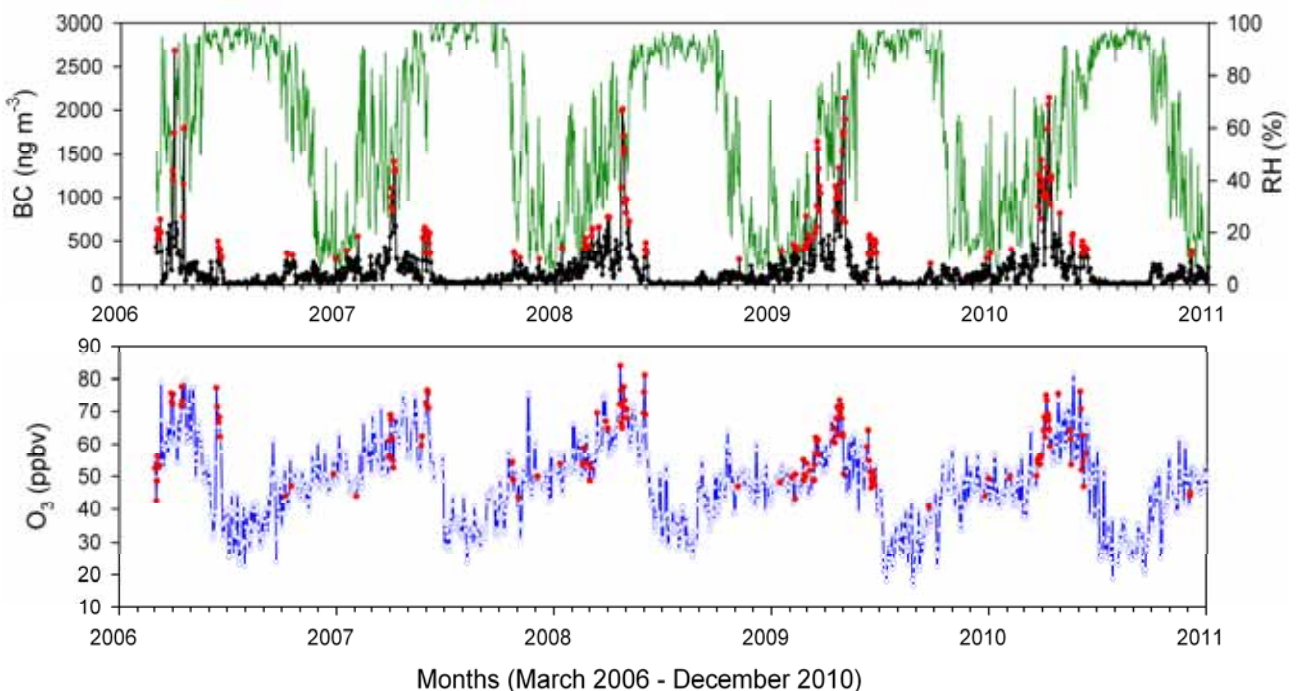
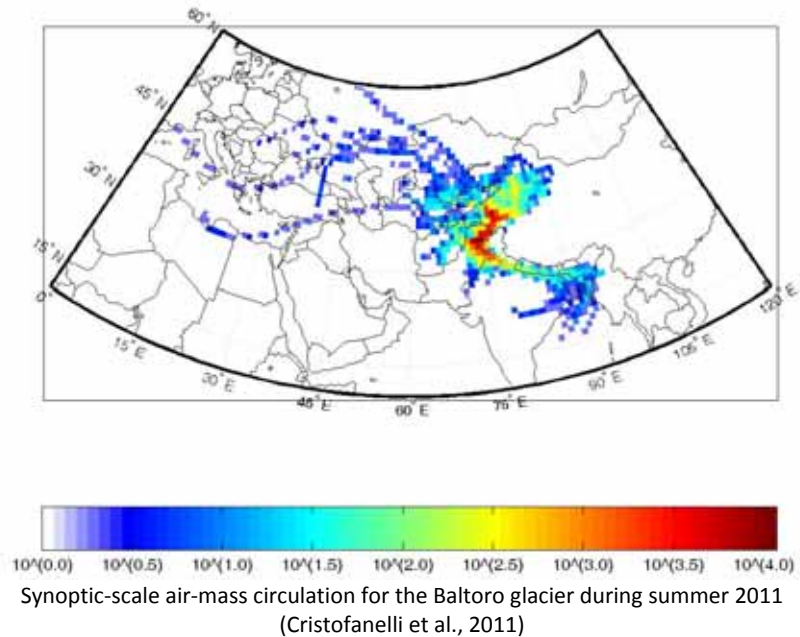
Observations of atmospheric compounds (gas and aerosol), meteorological parameters and LW and SW solar radiation fluxes are continuing at the global station WMO-GAW NCO-P. In Spring 2011, at NCO-P, an instruments calibration and maintenance campaign was performed, during which a new system for radiometric measurements was also installed. In the same period, a campaign was carried out to study the sources of black carbon through the use of a 7-Wavelength Aethalometer.

Measurement activities continued at the automatic weather stations belonging to the SHARE network in the Khumbu valley and Baltoro area. In this context, in spring and autumn 2011, at NCO-P the first in-situ checks of meteorological and radiometric data acquired by Pyramid, Kala Patthar and Periche AWS stations were performed through a special reference system developed thanks to the collaboration among ISAC-CNR, ENEA/UTMEA-TER and Ev-K2-CNR.

During summer 2011, in the framework of a feasibility study to identify the future site for installing the ABC station in Pakistan, an experimental campaign was carried out to evaluate the PM10 variability on the Baltoro glacier, in collaboration with the PAPRIKA-Karakorum and SEED (Social Economic Environmental Development) projects. In Italy, synoptic-scale atmospheric circulation analysis was carried out for the northern region of Pakistan in 2005-2009 and the 2011 summer campaign.

Are also carried out the following activities:

- 1) Study of fluorinated gases trends in the Himalayas, with analysis of high concentration episodes and an assessment of source areas (Maione et al., ACP 2011).
- 2) Identification of the frequency of acute pollution events at the WMO-GAW NCO-P station over the period 2006 - 2010 (Marinoni et al., 2011).
- 3) Estimation of black carbon concentration in snow samples collected in the upper Khumbu valley (Cozic et al., 2011).
- 4) First study of the PM₁₀ trend in the Baltoro Glacier area (Cristofanelli et al., 2011).

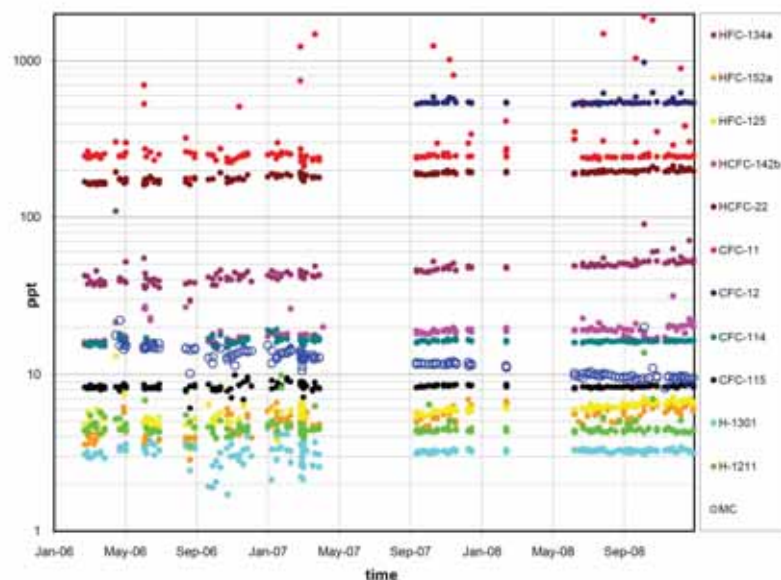


Time series of daily concentrations of black carbon (black, BC), relative humidity (green, RH) and ozone (blue, O₃) at NCO-P from March 2006 to December 2010. In red: acute pollution events (Marinoni et al., 2011)

Objectives foreseen in 2012

- 1) Continuation of the ongoing measurement activities at the GAW-WMO NCO-P global station.
- 2) Performance of spring and fall campaigns concerning the instrument calibration and maintenance activities operating at NCO-P station.

- 3) Classification of synoptic-scale processes that may facilitate the transport of stratospheric air masses to NCO-P and southern Himalayas areas.
- 4) Implementation of semi-automatic routines for the validation of meteorological and radiometric data acquired from AWS.
- 5) Evaluation of the interannual variability of ozone and black carbon concentrations in the Himalayas.
- 6) Study of the contribution that biomass burning phenomena may have in defining black carbon and ozone variability in the Himalayas.
- 7) Study of PM₁₀ variability in the Baltoro area and evaluation of the role of mineral aerosol natural sources.
- 8) Study of the influence that synoptic-scale circulation may have in the definition of rainfall in the Baltoro – Karakorum area.



Time series of anthropic halocarbon at the NCO-P (Maione et al., 2011).

SHARE - EVEREST

Project Coordinators:

Elisa Vuillermoz - Gian Pietro Verza

Ev-K2-CNR

Paolo Cristofanelli - Paolo Bonasoni

Institute of Atmospheric Sciences and Climate of the Italian National Research Council (ISAC-CNR)

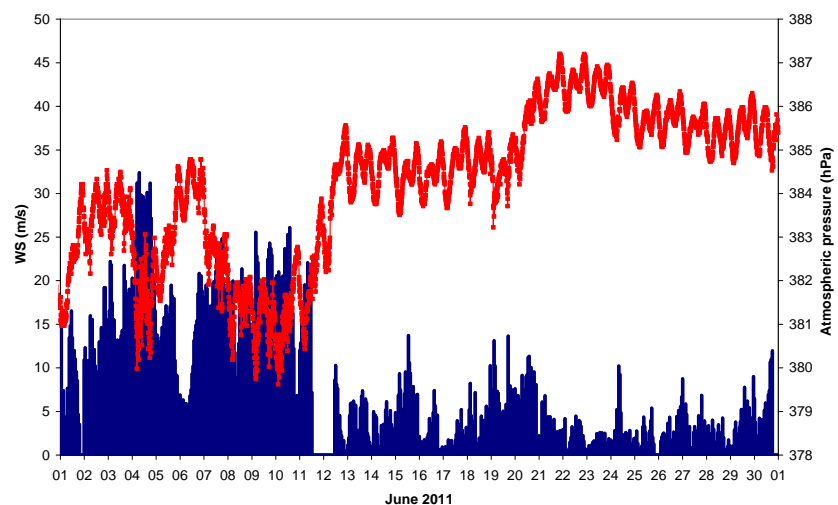
Pilot Project

Objectives foreseen in 2011

- 1) To develop an innovative weather station in order to carry out atmospheric pressure, relative humidity and air temperature measurements on Everest's summit.
- 2) Installation of a meteorological station on Everest's summit in the framework of the "SHARE Everest 2011" project.
- 3) To develop and to install an Automatic Weather Station at South Col to replace the old station installed in May 2008.
- 4) To develop a new transmission system able to download data obtained from "Everest" station and AWS "South Col" in real time.
- 5) Validation of data from "Everest" and "South Col" AWS.

Results obtained in 2011

- 1) Implementation, at ISAC-CNR, of energy management, temperature control and data recording/transmission measurement systems, for the "Everest" AWS.
- 2) Engineering of acquisition and processing of signals from "Everest" station and two twin AWS to be installed at South Col.
- 3) Development of "Everest" station and implementation of working test at ISAC-CNR, in Bologna.
- 4) Development of the twin "South Col" AWSs and implementation of working test at LSI- LASTEM.
- 5) Preliminary tests of "Everest" station and "South Col" AWS at Pyramid - International Laboratory Observatory (May 2011).
- 6) Installation of the twin "South Col" AWS during SHARE - EVEREST 2011 campaign (the installation of the "Everest" AWS was not possible due to bad weather conditions).
- 7) In September 2011, at Monte Cimone ("O. Vittori" station of CNR-ISAC), further tests were carried out in order to verify the functioning of both sensors installed at the

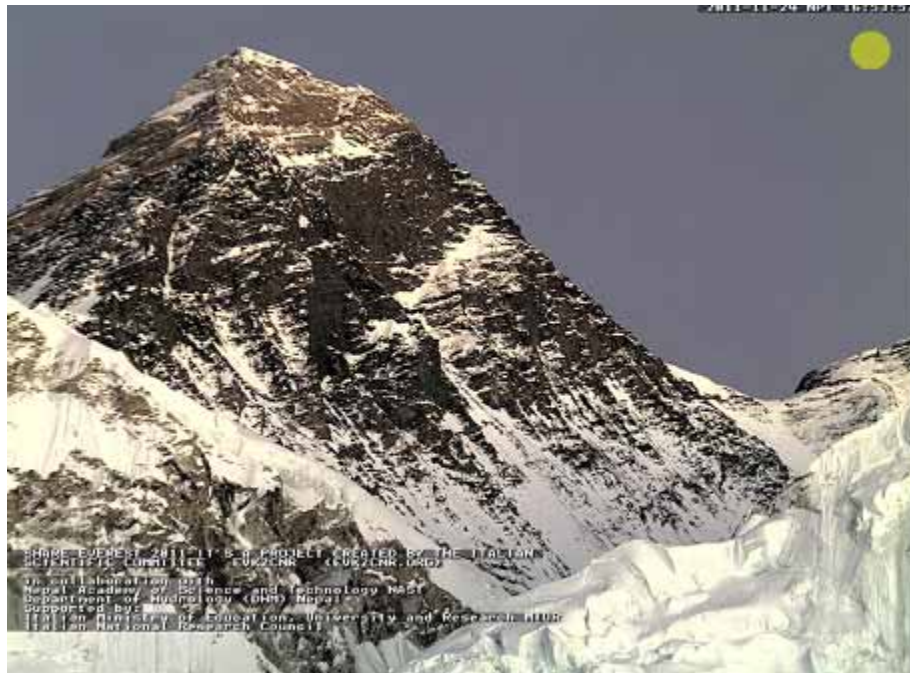


Everest- South Col, 8.000 m asl: hourly behaviour of wind speed (blue) and atmospheric pressure (red) during June 2011.

“Everest” station and of the data transmission system.

9) Validation of meteorological and radiometric data recorded at South Col during the 2008-2009 period, and since May 2011.

10) Installation at Kala-Patthar (5.600 m slm) of a web cam able to transmit the picture of Everest’s summit in real time.



Picture of Everest’s summit by Kala-Patthar web-cam

Objectives foreseen in 2012

- 1)** Continuation of validation activities of South Col AWS data and data transfer in the reference data-bases.
- 2)** Study of the sub-tropical jet stream variability and of summer monsoon onset/decay periods through the investigation of meteorological and radiometric data recorded at South Col AWS.
- 3)** Replacement of systems, currently not working, at South Col AWS.
- 4)** Feasibility study for the future installation of a station on Everest’s summit.

WP 1.2 Glaciology

Reference People:

Claudio Smiraglia

Guglielmina Diolaiuti

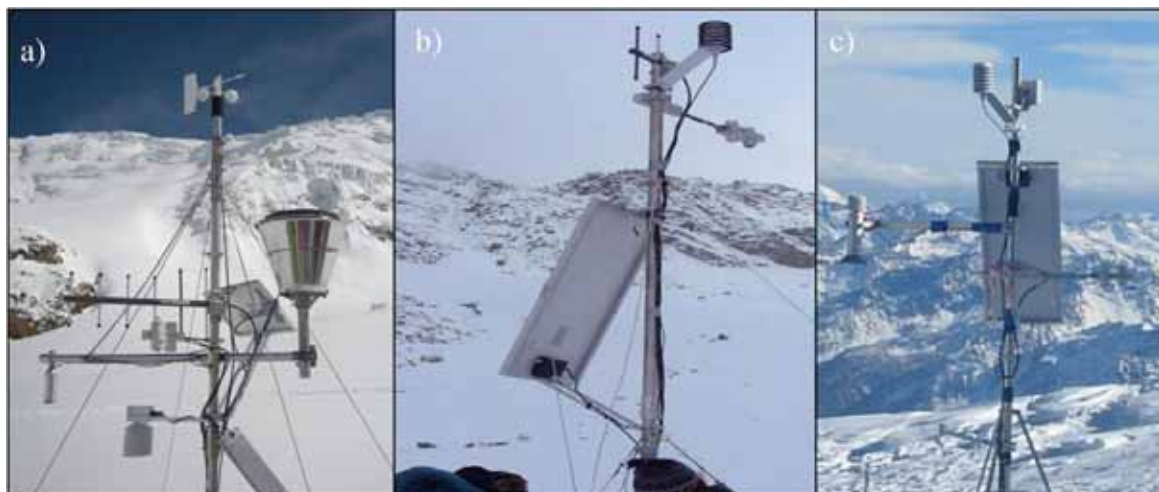
Department of Earth Sciences "A. Desio" – University of Milano

Objectives foreseen in 2011

- 1)** Describing the glacier micrometeorology by analysing data collected through the SHARE Alpine network (Automatic Weather Station-AWS- located on the Forni Glacier, upper Valtellina, Lombardy; AWS placed on the Dosedè Glacier, Val Viola, Lombardy and AWS on the Gigante Glacier, Mont Blanc Massif).
- 2)** Calculating the glacier energy budget at the Alpine AWS sites (through the analysis of the energy fluxes measured by the AWSs).
- 3)** Distributing snow accumulation and calculating SWE (snow water equivalent) by analysing snow depth and features from snow pits and snow thicknesses from GPR (ground penetrating radar) investigations.
- 4)** Modelling the water budget of a glacierized Alpine basin (the Dosedè Glacier basin, Val Viola, Lombardy) and calibrating the model through comparisons with discharge field measurements (from the SHARE satellite station named Hydro) This activity will be performed in cooperation with the POLIMI DIIAR staff (PhD D. Bocchiola).
- 5)** Analysing rock temperatures measured at different depths (0.5-10-30-50 cm) at a high elevation site in the Alps (3430 m, Mont Blanc Massif, SHARE permafrost station). The results will improve knowledge on rock degradation and weathering processes at high elevations. This activity will be performed in cooperation with the INSUBRIA University staff (Prof. PhD M. Guglielmin).
- 6)** Analysing glacier and meteo data collected in extra Alpine areas (Karakorum and Himalaya, also in the framework of the Paprika and SEED projects), to describe glacier behaviour and evolution and to calculate the energy budget and the mass balance on some selected glaciers.

Results obtained in 2011

- 1)** Data from the SHARE Alpine network were analysed and the glacier micro meteorology at the AWS sites (Forni, Dosedè, Gigante) was described. Some results are reported in two international papers.



From left to right: AWS1 Forni (a), AWS Dosedè-Levissima (b), AWS Monte Bianco-Osram (c).

- 2) The point energy balance was evaluated for Forni and Dosedè glaciers by analysing data collected from the SHARE AWSs. The analysis of Forni data was also performed in the framework of the SHARE STELVIO project.
- 3) Modelling the distribution of snow cover and calculating SWE (snow water equivalent) by analysing snow depth and features from snow pits and snow thicknesses from GPR (ground penetrating radar) investigations at the Dosedè Glacier surface. These analyses were performed also with the support of Levissima Sanpellegrino Spa. A paper is in preparation.
- 4) Modelling the water budget of a glacierized Alpine basin (the Dosedè Glacier basin, Val Viola, Lombardy) is an on line activity. Currently, the model is being calibrated through comparisons with discharge field measurements (from the AWS Share Hydro). This activity is performed in cooperation with the POLIMI DIIAR staff (PhD D. Bocchiola).
- 5) The analysis of rock temperatures measured at different depths (0.5-10-30-50 cm) at a high elevation site on the Alps (3430 m, Mont Blanc Massif, SHARE permafrost station) is an on line activity. Up to now a record of hourly 3-year data sets (2008-2009, 2009-2010 and 2010-2011) has been analysed. Results will be reported in a paper currently being written with UNINSUBRIA staff (Prof. PhD M. Guglielmin).
- 6) Analysis of extra Alpine glacier data to describe glacier behaviour in the Karakorum area. In particular, attention was paid to surging glaciers (see Mayer et al, 2011) and to the hydrology of sample basins (Bocchiola et al., 2011).

Objectives foreseen in 2012

- 1) Maintenance of the SHARE Alpine network, also including the “satellite stations” (for measuring rock temperatures and meltwater discharge).
- 2) Distributing energy budget and mass balance at the Forni Glacier surface by analysing the AWS1 Forni data (to be performed in the framework of the SHARE STELVIO project and in cooperation with Prof. M Maugeri, UNIMI Fisica).
- 3) Completion of the model for evaluating meltwater discharge in the Dosedè Glacier basin (to be performed in cooperation with the POLIMI DIIAR staff, PhD D. Bocchiola).
- 4) Analysis of glacier data from extra Alpine areas (Karakorum and Himalaya) to describe glacier behaviour and evolution. In particular, the Glacier Inventory of the Central Karakoram National Park (in the framework of SEED and PAPRIKA project) will be completed and the regional SWE (for the CKNP area) will be evaluated over a time frame of 10 years by analysing MODIS data. Furthermore, the point energy and mass balance will be calculated of a sample glacier of the Himalayas (Nepal), where a SHARE AWS has been running since 2010.
- 5) The survey of rock temperature data will continue, followed by data analysis to contribute to an improvement in knowledge on Alpine permafrost (in cooperation with UNINSUBRIA, prof. PhD M. Guglielmin).
- 6) The start of the project “Plan de accion para la conservacion de glaciers ante el cambio climatico” aims to quantify recent variations of a representative sample of Chilean glaciers through direct (glaciological, meteorological, topographical) and indirect (geophysical) reliefs in order to collect data that could be compared with the information already made available by previous monitoring programs.

This project proposes the installation and the start of a permanent monitoring network of glaciological, meteorological and water resources in Chile for studying their variability during time.

SHARE - STELVIO

Un Parco – Osservatorio per lo studio dei Cambiamenti Climatici e Ambientali in alta quota

Project Coordinator:

Guglielmina Diolaiuti

Department of Earth Sciences “A. Desio” – University of Milano

Pilot Project

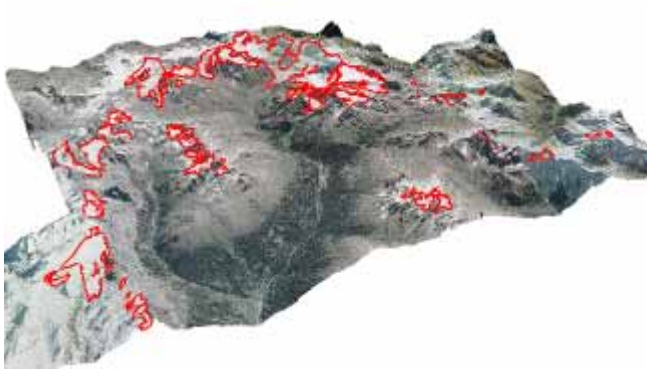
Objectives foreseen in 2011

- 1) Assessment of the glacier coverage in the Stelvio National Park area (Lombardy sector) to produce the Park Glacier Inventory. Aerial photos, orthophotos and maps dating back to 1954, 1981, 1992, 1999, 2003 and 2007 will be analysed in a GIS environment thus permitting to describe half a century of Alpine glacier history. Surface and geometry variations of glaciers will be quantified (WP 1: Cryosphere).
- 2) Assessment of number and surface coverage of lakes in the Stelvio National Park area (Lombardy sector) to produce the Park Lake Inventory. Aerial photos, orthophotos and maps dating back to 1954, 1981, 1992, 1999, 2003 and 2007 will be analysed in a GIS environment thus permitting to describe half a century of history of lakes in the Park area. Surface and geometry variations of lakes will be quantified (WP 2: Water quality).
- 3) Maintenance of the surveying site named AWS1 Forni at the surface of Forni, the largest Italian valley glacier. The AWS 1 Forni has been running since Autumn 2005 and it collects meteo and energy data to describe glacier micro-meteorology, to evaluate glacier energy budget and to calculate glacier mass balance (WP1: Cryosphere).
- 4) Maintenance of the surveying site named Stelvio-Permafrost. This is a hole 235 m deep which has been drilled into the rock at the Stelvio Pass (ca. 3000 m asl). The drilling was performed in the framework of the SHARE STELVIO project. The deep hole is equipped with thermistors and loggers to measure rock temperatures from surface down to the bottom where permafrost was found (WP1: Cryosphere).
- 5) Testing a self-maintained surveying system to measure the main climate and environmental parameters at the melting surface of the Forni Glacier (2700 m slm) during the 2011 ablation season (WP3: Atmosphere).
- 6) Water sampling at some selected lakes located in the park area at high elevations to describe water chemical, physical and biological features (WP2: Water quality).
- 7) Surveying the Forni Glacier surface to describe albedo variability during the 2011 ablation season. Particular attention will be paid to the different glacier surface types (debris covered or not and, in cases of debris coverage: sparse, rare or abundant). Moreover, glacier ablation and accumulation have to be field measured (also for evaluating the reliability of glacier mass balance model). (WP1: Cryosphere).
- 8) Modelling the dynamics of the Forni Glacier tongue (WP1: Cryosphere in cooperation with WP4 FLA).
- 9) Analysing the relations among Climate Change and high elevation natural systems (WP4 FLA).
- 10) Disseminating the first results coming from the SHARE Stelvio project (WP5 FLA in cooperation with EvK2CNR).

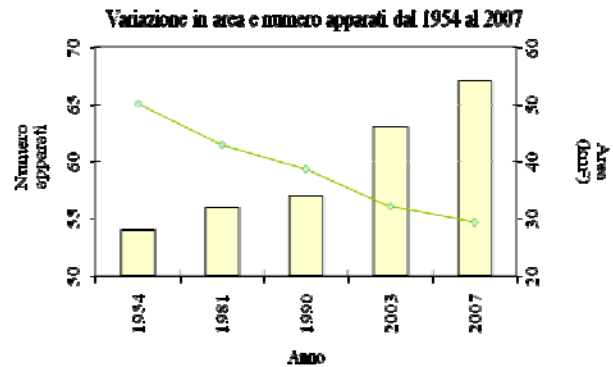
Results obtained in 2011

- 1) The Stelvio Park Glacier Inventory (Lombardy Sectors) was compiled. The glacier data were analysed in the time frame 1954-2007 (with comparisons in the following sub time-windows: 1954-1981-1992-1999-2003-2007). The UNIMI researchers prepared a data base and several shape files reporting all the glacier

data. This study permitted the quantification of the glacier shrinkage occurring over the last half a century, which turned out to equal an area decrease of about 40%. The glacier retreat was observed to be accelerating in the very recent period (1999-2007).



Areal and number variations of Gruppo Ortles-Cevedale glaciers (Lombardy sector)



Areal and number variations of glaciers

2) The Stelvio Park Lake Inventory (Lombardy Sectors) was compiled. The Lake data were analysed in the time frame 1954-2007 (with comparisons in the following sub time-windows: 1954-1981-1992-1999-2003-2007). The CNR IRSA researchers are preparing a data base and several shape files reporting all the lake data.



AWS Forni



Drilling at Passo dello Stelvio for permafrost monitoring

3) The AWS1 Forni was periodically checked and operated (by technicians and researchers from UNIMI and EvK2CNR). The AWS are collecting data which are used to calculate the glacier energy budget and then the mass changes. The results are reported with further details in a paper accepted for publication in an international journal.

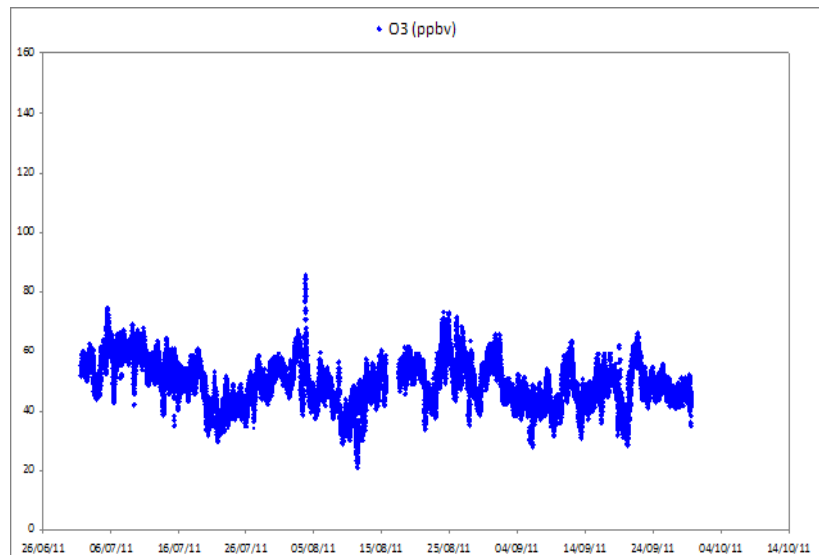
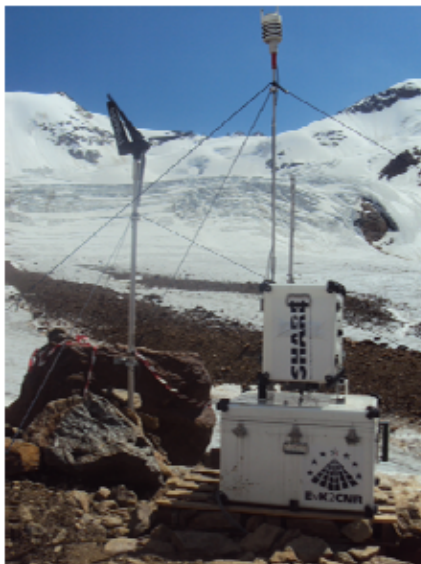
4) The surveying site Stelvio-Permafrost was periodically checked (by the researchers from UNINSUBRIA). This permitted the acquisition of rock temperature data from the surface down to a depth of 235 m over a period of 1 year. The bottom of the hole was found to be permanently frozen, thus highlighting the presence of permafrost.

5) The NANO-SHARE surveying system to measure the main climate and environmental parameters was tested at the melting surface of the Forni Glacier (ca. 2700 m asl). The system, transported by helicopter, was running from 30 June 2011 to 30 September 2011. This summer field work was also performed in the framework of the SHARE TECH *pilot project*, which supported the activity and provided the SHARE-BOX system. The research was carried out by scientists and technicians from CNR-ISAC Bologna, CNRS-LGGE Grenoble and Ev-K2-CNR Committee Bergamo.

6) On some selected lakes in the Stelvio National Park water samplings were performed. This activity was carried out by researchers and technicians from CNR IRSA and CNR ISE, who visited the sampling sites in July, August and September 2011. The water samples will be analysed to describe lake chemical, physical and biological features.



The transport of NANO-SHARE to Forni Glacier.



NANO-SHARE on the Forni glacier (left) and ozone behaviour during the field campaign (right)

7) Albedo measurements were performed by UNIMI scientists at the melting surface of the Forni Glacier to describe albedo variability in relation with glacier surface conditions (debris free area vs debris covered ice and, in the latter case, with rock debris: abundant, sparse or rare). Moreover, ice ablation and snow accumulation were field measured to check and calibrate the glacier mass balance model.



Sampling activities in lakes at Stelvio National Park

8) A model describing the Forni Glacier tongue dynamics in an on line project. It is to be developed by researchers from UNIMI, UNICATT and FLA. The model aims to reproduce the glacier tongue dynamics and then to describe glacier geometry (length and volume) variability. For this, the methods introduced by Wallinga et al. 1998 are being followed. In addition, the glacier response time was estimated by applying the Oerlemans (2007) method.

9) Analyses to evaluate rates and magnitude of Climate Change impacts on natural systems were performed on some selected areas of the Stelvio National Park by researchers from FLA (POLIMI, UNICATT, UNI-INSUBRIA). This work provided further details on the relationships among permafrost presence and pattern and marmots.



Forni Glacier

10) In the framework of observation and dissemination activities, a web-cam was installed in the Forni Glacier area to acquire periodical (hourly) glacier pictures and to share them through a dedicated web site. The web cam is installed at the Branca Hut (2493 m asl) and the photos are available at the site: <http://www.umbriameteo.com/webcam/ghiacciaiodeiforni/>.

Objectives foreseen in 2012

1) Maintenance of the AWS1 Forni survey site at the surface of Forni, the largest Italian valley glacier. The AWS 1 Forni has been running since Autumn 2005 and it collects meteo and energy data for describing glacier micro-meteorology, evaluating glacier energy budget and calculating glacier mass balance (WP1: Cryosphere).

2) Maintenance of the Stelvio-Permafrost survey site. This is a 235 m-deep hole, which has been drilled into the rock at the Stelvio Pass (ca. 3000 m asl). The drilling was performed in the framework of the SHARE STELVIO project. The deep hole is equipped with thermistors and loggers to measure rock temperatures from surface down to the bottom where permafrost was found (WP1: Cryosphere).

3) The Park Lake Inventory has to be completed. Aerial photos, orthophotos and maps dating back to 1954, 1981, 1992, 1999, 2003 and 2007 will be analysed in a GIS environment, permitting the description of half a century of history of lakes in the Park area. Surface and geometry variations of lakes will be quantified (WP 2: Water quality).

4) The analysis of the water samples (surveyed at some selected lakes in summer 2011) will be performed to describe water chemical, physical and biological features (WP2: Water quality).

5) The water discharges due to ice and snow melting will be evaluated and modelled. In addition, field surveys will be performed to check and validate the data modelling. Particular attention will be paid to the Forni Glacier area, to describe meltwater runoff and to forecast the future water availability under different climate change scenarios (WP1: Cryosphere).

6) Modelling the dynamics of the Forni Glacier tongue (WP1: Cryosphere in cooperation with WP4 FLA).

7) Study of trend of atmospheric compounds monitored in the framework of this project, and characterization of transport processes.

- 8)** Installation of monitoring systems for meteo-atmospheric monitoring at high altitudes, and further installation of a autonomous system of environmental monitoring on the surface of the Forni Glacier (WP3: Atmosphere).
- 8)** Analysis of the relation between Climate Change and high altitude natural systems (WP4 FLA).
- 9)** Dissemination of the results coming from the SHARE Stelvio project (WP5 FLA in cooperation with EvK2CNR).

SHARE PAPRIKA - KARAKORUM

Project Coordinator:

Antonello Provenzale

Institute of Atmospheric Sciences and Climate of the Italian National Research Council (ISAC-CNR)

Objectives foreseen in 2011

- 1) Ablation and accumulation measurements along the Baltoro Glacier and analysis of remote sensing products (ASTER, LANDSAT and MODIS) and GIS processing.
- 2) Hydrological field campaigns and installation of the new in-situ station for hydrological measurements.
- 3) Measurement campaign for aerosol characterisation in the Baltoro Glacier region.
- 4) Measurement campaign for water quality assessment and analyses of water samples.
- 5) Analysis of meteorological and atmospheric composition data measured at two AWS installed in the proximity of the Baltoro Glacier.
- 6) Global model simulations, including aerosol dynamics, for the reference decade 2000-2010.
- 7) Setting of precipitation downscaling techniques.
- 8) Development of a new model for snow cover dynamics.
- 9) Preliminary results from the hydrological model forced with standard future scenarios.

Results obtained in 2011

1) An experimental campaign was carried out during summer 2011 on the Baltoro glacier to perform measurements of ablation and accumulation rate at high altitude and debris cover thickness, which will be used in models of glacier dynamics.

2) Two hydrological measurement campaigns were carried out and a new measurement station installed to perform experiments aimed at estimating flow velocity.

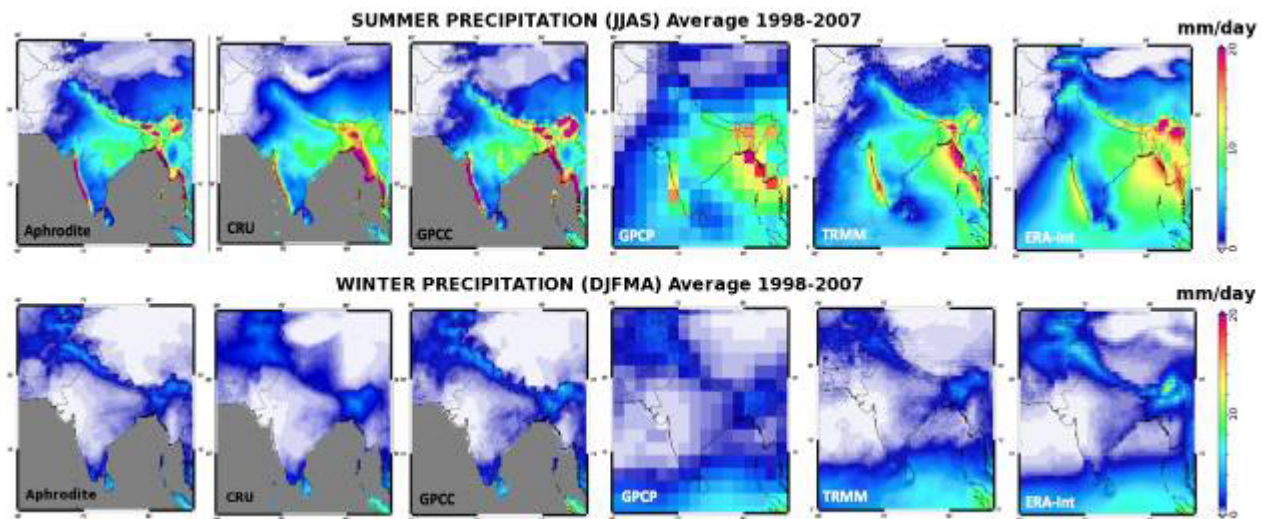
3) One measurement campaign was carried out at the Urdukas campsite making use of the portable equipment called "SHARE BOX" for air quality and aerosol load measurements.

4) Water samples were collected for analyses of water quality.

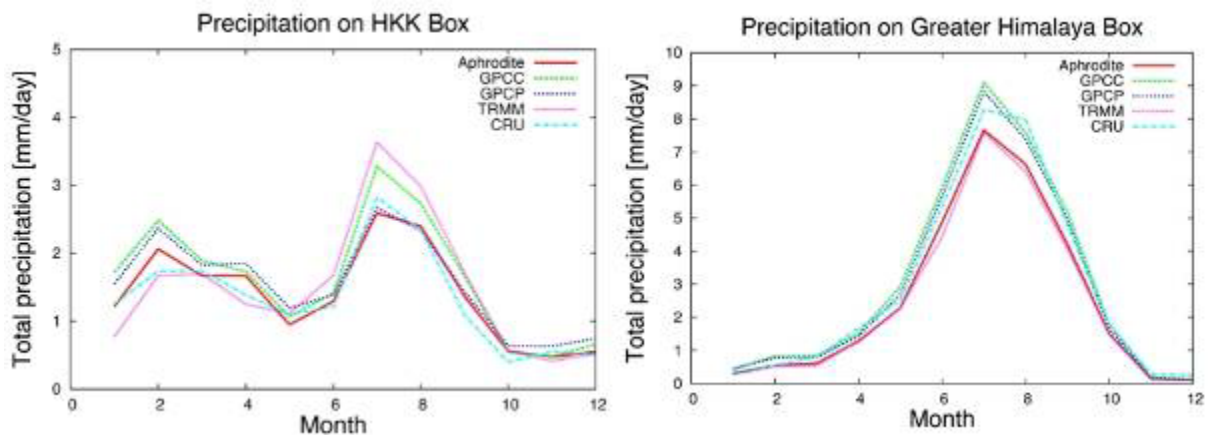
5) The suite of meteorological parameters, including temperature, precipitation, relative humidity, pressure, incoming radiation, wind speed and direction, measured at the Askole and Urdukas AWSs in the Baltoro Valley was analysed. In particular, precipitation data were analysed in comparison with other rainfall estimates, such as those provided by the TRMM satellite, other gridded in-situ data sets (e.g., APHRODITE, GPCC, CRU), and ERA and NCEP reanalyses. The synergy of all these data allowed a complete meteo-climatic characterization of the Upper Indus Basin and the study of the interaction between western weather patterns and monsoon circulation in the Northern Pakistan region.



Hydrologic field mission



Summer precipitation (JJAS), multiannual average 1998-2007 and winter precipitation (DJFMA), multiannual average 1998-2007.

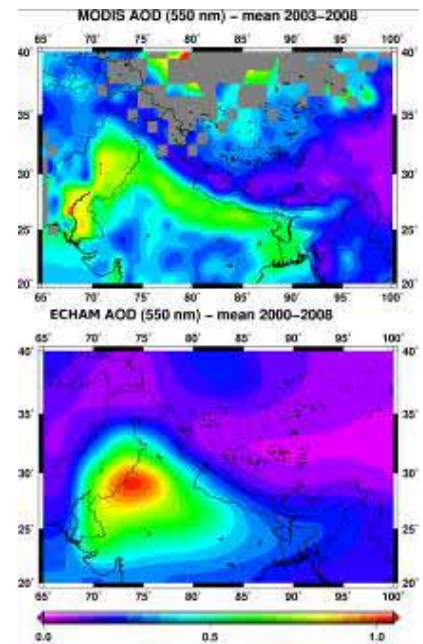


Annual cycle of precipitation on HKK Box and on Greater Himalaya Box

- 6) A global climate model simulation was carried out using a state-of-the-art coupled atmosphere-ocean model, with the implementation of aerosol dynamics and chemistry. Several atmosphere-only simulations were performed with the model ECHAM/HAM and compared with satellite measurements (e.g., MODIS).
- 7) Precipitation downscaling techniques were validated, to be then implemented in numerical models.
- 8) A careful analysis of the several models for snow cover dynamics was performed to select the most suitable model to fulfil the project objectives.
- 9) Preliminary runoff estimates in the Shigar river catchment were obtained using a minimal hydrological model tuned against observed ground climatic data from a number of stations in the area, in situ measured ice ablation data, and remotely sensed snow cover data. The future precipitation and temperature fields for a reference decade from a state-of-the-art model have been fed to the hydrological model adopting different glacier cover scenarios.

Objectives foreseen in 2012

- 1)** Second campaign for ablation and accumulation measurements on the Baltoro Glacier.
- 2)** Third campaign for hydrological measurements.
- 3)** Measurement campaign for aerosol characterization and load in the Baltoro glacier region.
- 4)** Collection and analysis of new snow and water samples for chemical analysis.
- 5)** Analysis of the interaction between western weather patterns and the Indian monsoon in the region of Northern Pakistan, to better understand precipitation amounts and distribution during summer and winter in the Karakoram.
- 6)** Global climate model simulations and climate change scenario analyses.
- 7)** Regional climate model simulations for the 2000-2010 reference periods.
- 8)** Atmospheric dynamics simulations with non-hydrostatic models in the Upper Indus Basin region.
- 9)** Application and implementation of stochastic downscaling procedures for precipitation.
- 10)** Implementation of snow cover dynamics model.
- 11)** Further runs with the hydrological model driven by global and regional climate model simulations.



Satellite observations (MODIS AOD) and atmospheric simulation (ECHAM AOD)

WP 1.3 Water Resources

Reference Person:

Riccardo de Bernardi

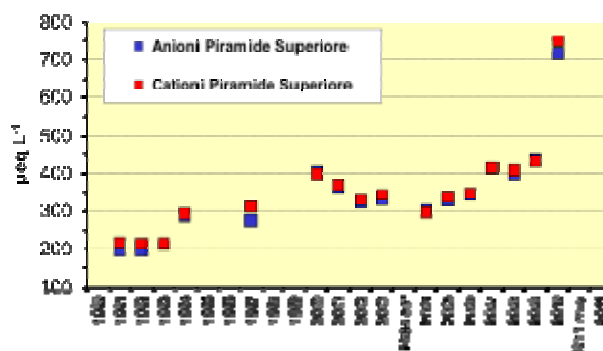
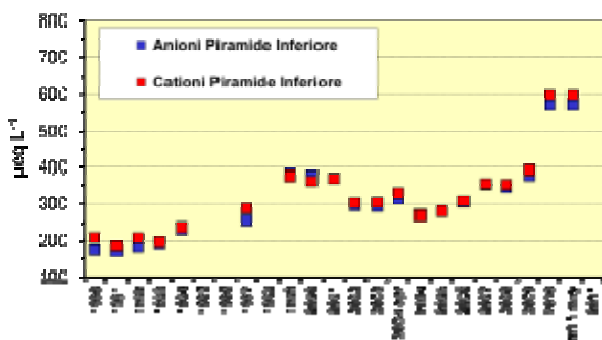
Ev-K2-CNR

Objectives foreseen in 2011

- 1) Reorganization of research activities related to the study of water resources in the framework of SHARE (WP 1.3 Water Resources) according to the demands of donors and international scientific community.
- 2) Planning of scientific research activities for the next year 2012-2013 in the framework of WP 1.3 of SHARE.
- 3) Continuation of time series of both chemical composition and lacustrine thermal dynamics in two lakes near the Pyramid, which began 20 years ago at the request of ILTER (International Long Term Ecological Research).

Results obtained in 2011

- 1) EV-K2-CNR, ISE-CNR and IRSA-CNR defined the WP 1.3 programme and the research activities concerning the study of water resources in some survey sites in Asia, Europe and Africa, and their qualitative and quantitative variations.
- 2) In the framework of the project "Limnological and paleolimnological research activities in high altitude remote areas lakes in the context of International Long Term Ecological Research (ILTER) global network" chemical analyses were performed on samples taken in Autumn 2010 and in Spring 2011.



Trend in concentrations of anions and cations in the Upper and Lower Pyramid Lakes in the period of 1990- 2011.

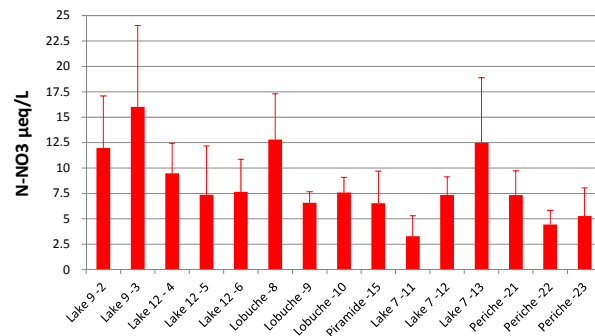
Data concerning the last samplings show a marked increase of solute concentrations, in particular those of calcium and sulphate, as compared to the previous period (the collection of new data in 2012 will permit the verification of this trend and the identification of possible causes, also through the use of available meteorological data).

In October 2011 the technical staff of Ev-K2-CNR, in collaboration with ISE-CNR, undertook the maintenance of chains of thermistors, which obtain the temperatures of the water column in two lakes near Pyramid. The validation of the data downloaded on this occasion is in progress.

- 3) The research activities carried out on nitrogen circulation in high altitude environments and chemical characterization of flowing water located between 4.200 and 5.300 m asl were finalized.



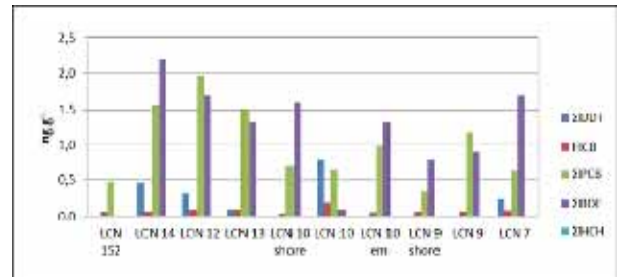
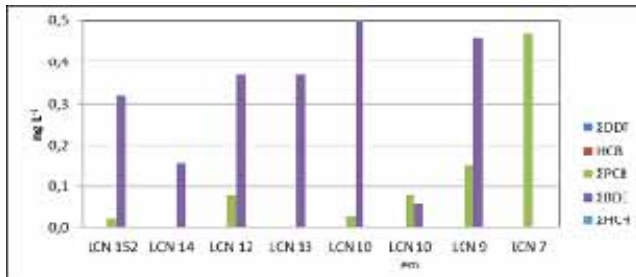
Sampling site in the basin of Lake 12



Nitrogen concentrations measured at selected sites. The mean is shown, while bars indicate the standard deviation

In particular, a comparison was made among the nitrate and ammonium concentrations of all samples collected in the same area of water flow, precipitation, rain and lakes. On analysis, nitrate concentrations turned out to be significantly higher in water flow than in the other two matrices with similar concentrations.

4) The study of organic micropollutants highlighted a moderate contamination by organochlorine compounds in the soil and lakes in this area, leading to the exclusion of the presence of local contaminated sources. Conversely, the presence of IPA was found in soil, showing an inverse relation with altitude between 2.700 m and 5.300 m asl.



DDT, HCB, PCB, PBDE and HCH concentration in water samples of lakes (left) and lacustrine deposits (right).

Objectives foreseen in 2012

BIODIVERSITY (Andrea Lami)

A research campaign in Khumbu region will be undertaken, to study several lacustrine environments (5 or 6 lakes), their tributaries (if present) and their effluents, focusing attention on: macrobenthos, benthonic diatoms and zooplankton. This should lead to an understanding of which part and what share of lacustrine biodiversity can be attributed to tributaries. Outcomes of this field mission will be compared with previous data.

LAGHI (Michela Rogora)

1) Chemical analysis in two Pyramid lakes will continue, to be added to those of other water bodies that will be sampled in 2012.

2) A census of hydrological information, available and in acquisition, will begin in order to evaluate the hydrological balance of the two Pyramid lakes, as an indicator of lacustrine dynamics in response to meteorological variations in this areas.

PRECIPITATIONS (Raffaella Baletrini)

The overall objective of this project coincides with that of GAW Programme, which consists of monitoring the evolution of long term of atmospheric composition and its properties on a global and regional scale, in order to assess the role of climate change and other environmental phenomena. The specific objectives concern: the study of temporal evolutions of main chemical species present in precipitations in order to create a long-term series; the quantifications of flux of atmospheric deposition of main chemical species; the identification of main chemical and physics processes responsible for the formation and transport of some chemical species; comparison between the chemistry of precipitation and that of aerosols; and, the definition of the role of atmospheric depositions in biogeochemical cycles (e.g. nitrogen).

The methodologies and activities will follow the GAW protocols foreseeing the daily sampling of wet depositions.

RIVERS (Franco Salerno)

In 2012 the following activities are foreseen:

- 1) Campaign for hydrometer installation in Sagarmatha National Park (Nepal).
- 2) Development of climatic temperature and precipitation series for Sagarmatha National Park (Nepal).
- 3) Evaluation of climate change impact on hydrology in Sagarmatha National Park.

WP 1.4.1 Animal Biodiversity

SHARE SNOW-LEOPARD

Pilot Project

Project Coordinator:

Sandro Lovari

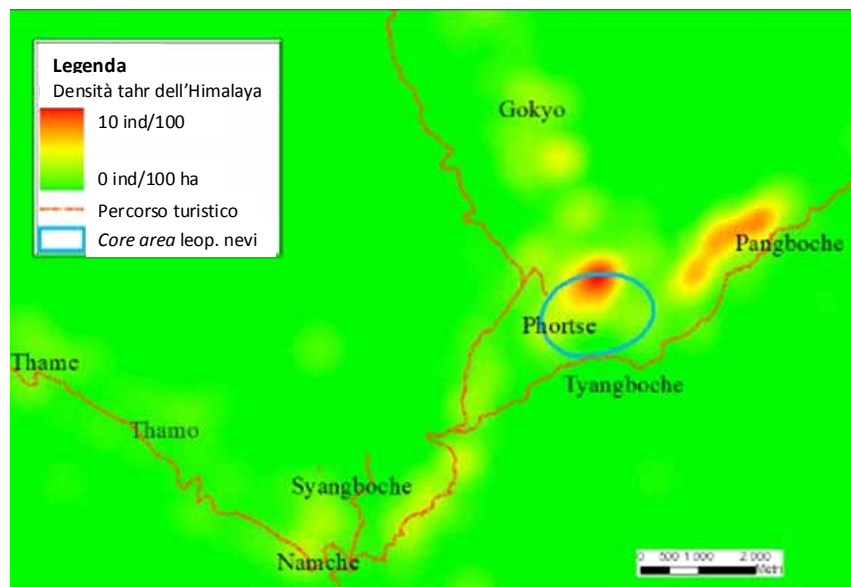
Department of Environmental Sciences – University of Siena

Objectives foreseen in 2011

- 1) Continuation of data collection in the field to estimate the minimum number of snow leopards, common leopards, Himalayan tahr and musk deer in Sagarmatha National Park.
- 2) Analysis of habitat and trophic spectrum overlap between snow leopard and common leopard in Sagarmatha National Park.

Results obtained in 2011

- 1) In SNP, the habitats used by the two leopard species were found to be only partially overlapping. In these areas, the snow leopard has selected shrub and herbaceous vegetation areas while avoiding dense forest, cultivated field and fallow. Conversely, the common leopard has generally chosen forested areas and has avoided open land.
- 2) The diet of both leopard species in SNP is composed mainly of Himalayan tahr, musk deer and cattle. The diet of the common leopard seasonally overlaps (24-82%) with the diet of the snow leopard. The diet of the snow leopard overlaps with the diet of the common leopard to a lesser extent (6-20%)

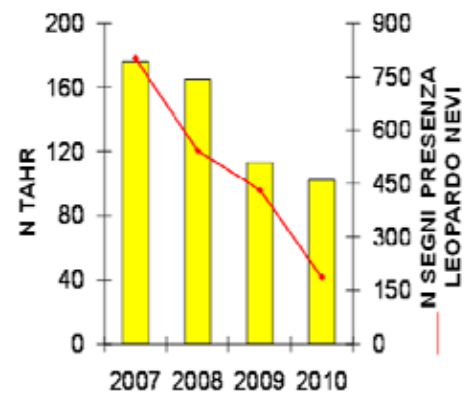


Localisation of the area with highest intensity of use (25% of the localisations of genetically identified scats: core area) of the snow leopard in relation to the density of Himalayan tahr in Sagarmatha National Park.

3) The distribution of the snow leopard's signs is strongly influenced by the tahr distribution. Predation by the snow leopard has almost halved tahr numbers, strongly reducing the younger segments, mainly preyed upon in the first summer of life.

The strong reduction of tahr has had a significant effect on the snow leopard population, reduced to just two individuals in 2010, against the five individuals in 2007. The number of snow leopard signs has also plummeted in the last four years.

From January 2011 the Department of National Parks and Wildlife Conservation (DNPWC) has not granted the necessary permits to the project staff to carry out field work in SNP. Therefore, the collection of data has been temporarily halted.



Variations, during the years, of the minimum number of Himalayan tahr and of number of signs of the presence of snow leopards in the Sagarmatha National Park.

Objectives foreseen in 2012

(feasible only after the possible issue of necessary permits)

In 2012, it would be desirable to continue data collection in the field to:

- 1) estimate the minimum number of snow leopards, common leopards, Himalayan tahr and musk deer;
- 2) evaluate the numerical trends of snow leopards, common leopards, Himalayan tahr and musk deer populations;
- 3) analyse habitat and food overlaps among snow and common leopards, with the aim of evaluating the long-term interactions between snow leopards and common leopards and the study of prey-predator dynamics.

The prerequisite for the realization of the above goals is the recognition, by the Nepalese Government Authorities, of the legitimacy of this research activity, without which data collection in the field will be impossible.

In parallel, elaboration of data collected in the previous years and their publication is also expected.

The transfer of research activity from SNP (managed by DNPWC) to Manaslu Conservation Area (managed by the *National Trust for Nature Conservation*) is under evaluation.

WP 1.4.2 Vegetal Biodiversity

Reference person:

Graziano Rossi

Department of Environmental and Earth Sciences – University of Pavia

Objectives foreseen in 2011

- 1) Research activities on germination of alpine species in a scenario of climate change in the Himalayas, European Alps and Apennines.
- 2) Predicted distribution and extinction model of two target species studied during the field expedition in the Khumbu Valley in October 2010.
- 3) Publication of a paper on seed longevity of alpine plants preserved in germplasm bank.
- 4) Heatwave effects on the reproduction of alpine species in the Northern Apennines.

Results obtained in 2011

- 1) The field data collected in October 2010 in Khumbu Valley were processed and a paper is now being prepared, predicting the effect of temperature increase on two target species growing in the Pyramid area.
- 2) Publication of a paper on the conservation of alpine plant seeds in germplasm bank, which shows that species that live at high altitude can be successfully stored for a short time in seed banks.
- 3) In the Alps, in the Dosdè Glacier area (Valtellina, Sondrio), already monitored by glaciologists of the University of Milan as part of the Stelvio SHARE project, a field study is ongoing on the effects of rising temperature on foreland alpine plant species. The study, concerning seed germination of different species, conducted between 2010 and 2011 was concluded. A paper on this issue is now being prepared.
- 4) In the North Apennines the effect of heatwaves on germination of some alpine species growing at Monte Cimone area is currently being tested. At present, this study is carried out at the University of Pavia laboratories, in collaboration with ISAC-CNR Bologna, which collaborates in the activities concerning climatic study, also supplying data from the O. Vittori” CNR station.

Objectives foreseen in 2012

- 1) Publication of two papers: one on the effects of climate change on foreland alpine species seed germination in the Alps; the other on modelling distribution of two Himalayan species growing in the Pyramid area, regarding seed dispersion mediated by wind in a scenario of climate change.
- 2) End of field experiment in Val Dosdè, data processing and writing of a paper.
- 3) End of laboratory experiment on the effects of heatwaves on germination of North Apennine alpine species, data processing and writing of a paper.
- 4) Start of research activities in the Karakorum region (Pakistan).
- 5) Continuation of activities in Nepal, according to the Nepalese rules and permits for seed collection of local authorization.

SHARE HIMALAYAN SEED BANK

Pilot Project

Project Coordinator:

Graziano Rossi

Department of Environmental and Earth Sciences – University of Pavia

Objectives foreseen in 2011

- 1) Purchase of equipment to start the activities of the Himalayan Seed Bank.
- 2) Training for Himalayan Seed Bank staff.
- 3) Start of field collection and conservation activities at NAST Himalayan Seed Bank.
- 4) Start of eco-physiological studies on Himalayan seeds at Pavia Lombardy Seed Bank.

Results obtained in 2011

1) The project of HSB was discussed and refined at length with NAST staff (Dr. D. Bhuj). At the end of May, NAST provided two rooms where the HSB should be arranged. The purchase of basic equipment (phase I of Himalayan Seed Bank Project) was begun.

One of the researchers selected by NAST to work at the facilities of the Himalayan Seed Bank (Dr. Deepa Dhital) won a grant to stay 4 months in Pavia (CICOPS). From January 2012, she will be hosted in Pavia, where she will undergo a training period at the Lombardy Seed Bank.

2) Plant species collected during the expedition held in autumn 2010, resulting in about 100 taxa, were identified to genus level (all) and to specie level (mostly). The identification was carried out consulting the Tribhuvan University herbarium and the National Herbarium of Godavari (Kathmandu).



Species mapped in Himalayan area: Leontopodium monocephalum Edgew, Anaphalis xylorhiza Sch. Bip. ex Hook. f. e Waldheimia glabra (Decne.) Regel

3) A training Workshop on Seed Biology was organized at Kathmandu in June 2011 in collaboration with NAST. It was attended by many Nepalese organizations (universities, public and private research institutions, including representatives from the Ministry of Forestry and the Ministry of Agriculture [NARC]).



Training-Workshop on seed biology, 2 June 2011, Kathmandu

Objectives foreseen in 2012

Foreseen objectives, i.e. seed collection fundamental to continuing research activities, entirely depend on the necessary permits, already requested, from local Nepalese authorities, and at present not still granted.

WP 1.5 Environmental Medicine and Human Health

SHARE GARD-KHUMBU

Pilot Project

Project Coordinator:

Annalisa Cogo

Clinica Pneumologica e Centro Studi Biomedici applicati allo Sport – University of Ferrara

Objectives foreseen in 2011

- 1) Respiratory health analysis of local population in Khumbu Valley where the use of biomass as fuel is frequent, and is burnt on open fireplaces for cooking and heating purposes.
- 2) Analysis of cardiovascular function on the same population.
- 3) Analysis of house typology/ventilation and of environmental pollution (measure of CO).

Results obtained in 2011

In 2011, two field missions were carried out: the first in April in Thame village, and the second in October in Pengboche and Phakding villages.



Measurement of cardiac frequency and spirometry test

In Thame, 118 people in total were sampled by means of spirometry tests and cardiogram. Below the results obtained:

- 1) Prevalence of cigarette smoking: 7.6% (7 men; 2 women), therefore a low prevalence;
- 2) Environmental pollution: the use of the portable instrument needed to determine the exhaled CO and to check the environmental air, revealed that the average value of CO exhaled by individuals was of $4,1 \pm 2,7$ ppm. The surveys carried out inside the houses with extinguished fireplace always showed a value of $<3\text{ppm}$, while if the fireplaces were burning inside the houses the surveys showed a value $> 30\text{ppm}$.
- 3) Respiratory functionality: the presence of obstructive ventilatory defects was assessed using the parameter represented by the ratio between forced expiratory volume in the 1st second and the forced vital capacity (FEV1/FVC). In this study, three different criteria were used to evaluate the presence of obstruction:

Criterion n.1: when the ratio FEV1/FVC is < of the absolute value of 70

Criterion n. 2: when the ratio FEV1/FVC is < 88% of the predicted value for all individuals

Criterion n. 3: when the ratio FEV1/FVC is < 88% of the predicted value among men and < 89% of the predicted value among women.

We can observe:

1) Prevalence of chronic obstructive pulmonary disease (COPD)> European population, particularly in the age range between 30 and 60 years.

This hypothesis is confirmed: a population not exposed to outdoor air pollution and with a rare smoking habit, but which uses biomass as fuel on open fire, has a high incidence of COPD.

2) Prevalence of early signs of bronchial obstruction (reduction of the parameter FEF₂₅₋₇₅ < 70%) > the one reported in the literature (42% vs 18%-26%). The FEF₂₅₋₇₅ parameter is reported in many works as a parameter sensitive to the exposition to active and passive smoking and polluted particles.

3) Building ventilation/Respiratory functionality: individuals who show an early marker of bronchial obstruction (FEF₂₅₋₇₅ < 70% of foretold) live mainly in buildings with a less efficient ventilation system.

TABELLA 1 Caratteristiche dei soggetti dello studio				
Anno reclutamento	2008	2011	2008 +2011	2008 e 2011
Soggetti n°	105	49	118	33
M/F	54/51	18/31	60/58	11/22
Età (aa)	40,6±20,4	42,0±19,3	41,1±19,9	44,4±20,5
BMI (kg·m ⁻²)	21±3	21±3	21±3	21±3
Altezza (cm)	159±8	158±7	159±9	156±7
Peso (Kg)	53±9	53±8	54±9	52±7

The features of the individuals studied in relationship with the period of recruitment. Data expressed as Average±SD

TABELLA 3 Soggetti con età ≥ 60aa Campione totale 28 (8M;20F)			
Criterio diagnostico n°	1	2	3
N° soggetti ostruiti	9	10	10
% soggetti rispetto al tot	32%	35,7%	35,7%
M/F	4/5	4/6	4/6
% rispetto al tot M/F	50%-25%		50%±30%
Descrizione del criterio diagnostico per l'individuazione dell'ostruzione bronchiale: n° 1 : VEMS/CVF è < del valore assoluto di 70 n° 2 : VEMS/CVF è < 88% del predetto per tutti i soggetti n° 3 : VEMS/CVF è < 88% predetto uomini e < 89% predetto donne			

Total number of individuals of age ≥ 60 and those with an obstructive deficit, according to the above-mentioned criteria, and relative percentage (%).

In Pengboche and Phakding, 118 individuals in total were sampled by means of spirometry and cardiology tests and data elaboration is ongoing.

Objectives foreseen in 2012

1) Finalization of spirometric and environmental analysis in Dingboche and Chukung villages. The study will be carried out by two Nepalese doctors with Ev-K2-CNR support.

TABELLA 2 Campione totale: 118 soggetti (60M;51F)			
Criterio diagnostico n°	1	2	3
Soggetti ostruiti	15	29	31
% soggetti rispetto al tot	12,7%	24,6%	26,3%
Ostruiti M/F	6/9	13/16	13/18
% rispetto al tot M/F	10%-15,5%	21,7%-27,6%	21,7%-31,0%
Descrizione del criterio diagnostico per l'individuazione dell'ostruzione bronchiale: n° 1 : VEMS/CVF è < del valore assoluto di 70 n° 2 : VEMS/CVF è < 88% del predetto per tutti i soggetti n° 3 : VEMS/CVF è < 88% predetto uomini e < 89% predetto donne			

Total number of evaluated individuals and those with obstructive deficit, according to the above-mentioned criteria, and relative percentage (%).

TABELLA 4 Soggetti con età ≥ 30aa Totale 76 (36M;40F)			
Criterio diagnostico n°	1	2	3
N° soggetti ostruiti	13	20	21
% soggetti rispetto al tot	17%	26%	27,6%
M/F	5/8	9/11	9/12
% rispetto al tot M/F	14%-20%	25%-28%	25%±30%
Descrizione del criterio diagnostico per l'individuazione dell'ostruzione bronchiale: n° 1 : VEMS/CVF è < del valore assoluto di 70 n° 2 : VEMS/CVF è < 88% del predetto per tutti i soggetti n° 3 : VEMS/CVF è < 88% predetto uomini e < 89% predetto donne			

Total number of individuals of age ≥ 30 and those with an obstructive deficit, according to the above-mentioned criteria, and relative percentage (%).

2) Organization of the World Spirometry Day in Nepal (for the first time), on June 27, 2012, according to the European Respiratory Society indications. In this context, agreements with Nepalese doctors have already been made in order to perform Spirometry tests on local population for three days (June 27-28-29, 2012).

3) Analysis of data collected in 2011 and 2012 and drafting of at least one paper.

WP 2:

Technological and climate research

Reference People:

Paolo Laj

Laboratoire de Glaciologie et Geophysique de l'Environnement - Centre National de la Recherche Scientifique LGGE-CNRS

Gian Pietro Verza

EV-K2-CNR

Objectives foreseen in 2011

- 1) Realization and development of a system, measuring temperature, atmospheric pressure and air humidity on Everest summit, combined with a dedicated energy and information transfer system.
- 2) Assembling of a reference mobile weather station for the calibration of Automatic Weather Stations in the Khumbu Valley.
- 3) Realization of the NANO-SHARE system (see the related "Pilot Project").

Results obtained in 2011

1) In the framework of the SHARE Everest 2011 expedition, a system was developed that is able to measure temperature on the Everest summit and to provide information on atmospheric pressure and humidity values. The measured values were acquired by a specific data-logger thanks to a dedicated software. Data and information collected are then transmitted at fixed time intervals to the main server through a special radio transmission system.

The system (see picture) consists of three separable and modular parts: i) Box in fibre-glass and aluminium with silver-copper electrostatic shield, comprising: electronic - electric power and cooling, one-piece low temperature batteries, radio modem unit with external antenna and accessories; ii) Solar panel; iii) Carbon-fiber pole with head for weather sensors; ice screw for anchoring.

At the beginning of 2011, researchers and technicians from CNR-ISAC, Bologna, realized the above prototype designed to monitor temperature, pressure and relative humidity in high mountains areas. During the construction of the station, the instrumentation weight was minimized as far as possible, attaining a total weight of about 5.5 kg, thus facilitating transportation.

The "Everest" system was presented to the Ministry of Education,



Everest summit sensor

University and Research on April 20, 2011, at a press conference chaired by the Minister herself, also in the presence of mountaineers involved in the Everest climb.

2) As part of climate monitoring activities in the Himalayas, a meteorological reference mobile station (AWS QC) was assembled. Thanks to this AWS QC, in spring 2011, experimental calibration campaigns of the Automatic Weather Stations in the Khumbu Valley commenced, and they will continue systematically in order to calibrate all AWSs.

Objectives foreseen in 2012

- 1)** Improvement and implementation of the “Everest” system.
- 2)** Prosecution of the calibration campaigns by using the AWS-QC.

NANO - SHARE

Project Coordinators:

Paolo Laj

Laboratoire de Glaciologie et Geophysique de l'Environnement - Centre National de la Recherche Scientifique LGGE-CNRS

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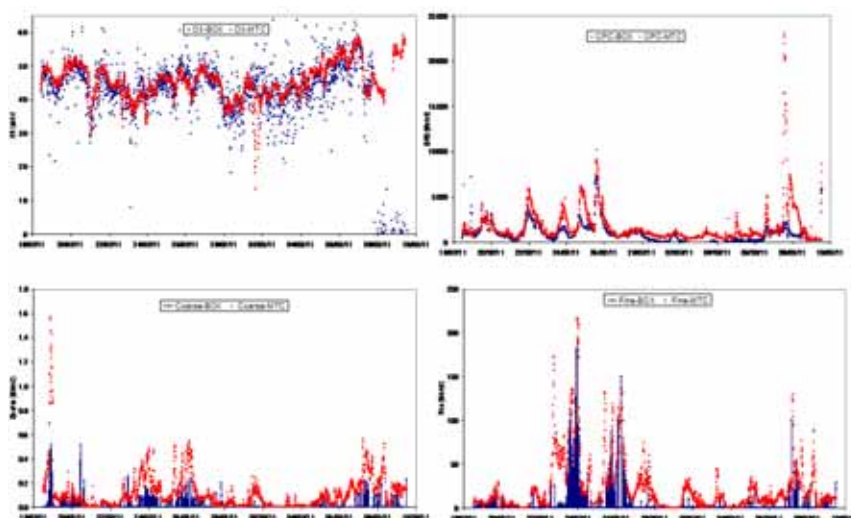
Institute of Atmospheric Sciences and Climate of the Italian National Research Council (ISAC-CNR)

Objectives foreseen in 2011

- 1) NANO-SHARE development and improvement.
- 2) First tests on the glacier to evaluate the proper functioning of the NANO-SHARE prototype; tests are to be performed in the contest of an intensive atmospheric monitoring campaign of the SHARE-Stelvio project.

Results obtained in 2011

- 1) At the beginning of 2011, at the laboratories of the ISAC – CNR Institute, Bologna, the NANO-SHARE system was set up and made ready for the functional tests to be carried out on the terrace of the ISAC – CNR Institute, in Bologna and Monte Cimone (2165 m asl), at the Laboratory of the "O. Vittori" GAW Global Station.
- 2) During the period February-March 2011, NANO-SHARE was installed at the "O. Vittori" station on Monte Cimone, and a series of quality tests on the acquired measurements were conducted, allowing the comparison of the acquired data with the reference data from the GAW station. Particular attention focused on the acquisition system of measurements and control parameters, the evaluations of thermal and meteorological stresses and the insulation system. On return from the "O. Vittori" station, controls and modifications were performed, in the laboratories of the institutes ISAC (Bologna) and LGGE (Grenoble), together with the implementation and development of the system following the instructions received from the tests performed at Monte Cimone.



Trend of atmospheric parameters measured by NANO-SHARE at Monte Cimone during the period February, 18 March, 10, 2011 and comparison with reference measurements at GAW station.

3) During summer 2011, the NANO-SHARE system was installed on the Forni glacier moraine in High Valtellina, in the framework of SHARE-Stelvio project. NANO-SHARE included scientific instruments for measuring climatic and weather conditions, the thermoregulatory system, the data acquisition and transmission system, the energy storage and distribution system and the energy supply system, including solar panels and wind generator.

Such tests allowed the adjustment of the NANO-SHARE system, which is now able to perform measurements concerning the atmospheric composition, by producing high-quality observational data functional for purposes of scientific research, civil protection and territory services. NANO-SHARE, being modular, may contain equipment of interest for specific types of monitoring.



NANO-SHARE tests: on the ISAC-CNR roof (a), at the "O.Vittori" station (b), on the Forni glacier (c)

Objectives foreseen in 2012

Improvement and implementation of the NANO-SHARE system in order to:

- improve access to the equipment;
- optimise the sampling system and the system management program;
- implement distribution circuits;
- create a system of self-levelling;
- create a system for indoor measurements.

WP 3: Information system

Reference Person:

Maria Teresa Melis

Remote Sensing & GIS – University of Cagliari

Objectives foreseen in 2011

- 1) On-line publication of the SHARE GeoNetwork system with the first phase of data base compiling and testing through the transfer from the local machine at the lab in Cagliari to the dedicated server at the Committee in Bergamo.
- 2) Connection to My SQL.
- 3) Configuration of the interface.
- 4) Definition of categories and hierarchical metadata models of SHARE research stations.
- 5) Development of mapping services
- 6) Ordering of the metadata of SHARE stations into the identified hierarchical categories.

Results obtained in 2011

- 1) The system SHARE GeoNetwork was configured in a dedicated server at the offices of the Committee and is now accessible on the web at <http://www.geonetwork.evkc2cnr.org>. compared to the basic version, the software was modified in its management and graphic interface, in order to create a customized system. With regard to the DBMS, the most powerful system MySQL was chosen rather than the integrated McKoi.



Web interface of Geonetwork

- 2) On consultation with researchers, the categories to be used in SHARE metadata were selected: Anthropological Sciences Atmosphere & Climate, Biodiversity, Datasets, Earth Science, Cryosphere &

Glacier, Health, Interactive resources, Maps & Graphics, Publications, Satellite Images, Stations at High Altitude, Technological Research, Water Resources.

3) The credentials for access to the SHARE were provided to researchers in order to submit metadata for their fields of work. A hierarchical structure for the metadata of high-altitude stations was arranged, allowing besides the logical organization of metadata, the web navigation by users between the different elements of the network: stations, instruments and measurements. The compilation of the database also included publications.

4) The harvesting of the GeoNetwork nodes ICIMOD and the HKKH Partnership was performed, inheriting over 4000 metadata records. The integration of GeoServer and the configuration with PostGIS allowed the development of WEBGIS services for the management of map data, in particular a WMS (Web Map Service) for the publication of maps and for publishing the same data on Google Earth.

Objectives foreseen in 2012

- 1) Official WEB publication of the GN SHARE site.
- 2) Further compilation of the database metadata.
- 3) Alignment of sw to future versions and fixing of bugs.
- 4) Amendments to the query system for direct visualization of hierarchies.
- 5) Harvesting of other catalogues in the thematic field of interest to SHARE.
- 6) Consolidation of the GN SHARE node as an access point and for the support to the dissemination of metadata for publishing services of existing data (GAW, WMO, etc ...).
- 7) Publication of map data products from the SEED project.
- 8) Development of mapping service dedicated to publication via Google Earth.

WP 4:

Capacity Building

Objectives foreseen in 2011

- 1) Continuation of training courses for Nepalese, Pakistani and Ugandan technical-scientific staff that is involved in the project in order to finalize the transfer of technical knowledge necessary to guarantee ordinary and extraordinary maintenance activities of installed instrumentation.
- 2) Training-workshop organization in the framework of pilot project SHARE - Himalayan Seed Bank.
- 3) Involvement of Nepalese doctors in research activities carried out in the framework of the pilot project SHARE – Gard Khumbu and transfer of correct medical-scientific knowledge.

Results obtained in 2011

- 1) Training of local technical staff involved in the maintenance of stations installed in Nepal, Pakistan and Uganda continued. Training programmes related to joint field activities, in the period in which Italian personnel were on mission, as well as activities of daily distance coordination in order to guarantee the remote checking of instrumentation.
- 2) In the framework of the SHARE – Himalayan Seed Bank project, Dr. Deepa Dhital, NAST scientist, won a competition promoted by the Centro Internazionale Cooperazione per lo Sviluppo, thanks to which she could spend a period of training at Lombardy Seed Bank of University of Pavia, starting in January 2012.
- 3) In June 2011, NAST and Ev-K2-CNR organized a “Training-Workshop on Seed Biology”. On this occasion the SHARE- Himalayan Seed Bank project was presented, along with the main methodologies and techniques useful for seed collection and conservation. The event was attended by more than 30 researcher from several Nepalese researcher centres.
- 4) In the framework of SHARE- Gard Khumbu, during two mission carried out in Nepal in April and October 2011, two Nepalese doctors took part in activities directly, under the supervision of Prof. Cogo, acquiring increasing autonomy in the performance of respiratory and cardiology tests.
- 5) The Ev-K2-CNR Committee started a collaboration with Dr. Bhupesh Adhikary, Nepalese researcher of Kathmandu University, in the framework of WP 1.1 – Atmosphere. The Dr. Adhikary spent two months in Italy, at ISAC-CNR, Bologna, in order to deepen his knowledge on the processing of meteo-climatic data from the stations installed in the Khumbu Valley and, in particular, from NCO-P.

Objectives foreseen in 2012

- 1) Continuation of training courses for technicians and researchers involved in the Project.
- 2) Encouragement of participation of local technicians in basic courses of computer and as industrial electricians.
- 3) Organization of a training course for Dr. Dhital, in January-March 2012, at Lombardy Seed Bank - University of Pavia.



- 4) Organization of World Spirometry Day, on 27 June, 2012, at Kathmandu, in Nepal, with the direct involvement of Nepalese doctors.
- 5) Continuation of collaboration with Dr. Adhikary in the framework of SHARE activities related to meteorological studies in Nepal.

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Meetings and Events

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14 May, Rimini: "Salute del viaggiatore: problematiche in alta quota"

16-17 September, Terni: "Polmone ed Esercizio"

30 September-1 October, Varallo Sesia: "Monitoraggio dell'ossigeno e predizione di AMS"

10-11 November, Rovereto: "Respiratory risk in mountain environment"

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