Climate Change in HKKH Cryosphere

Past, Present and Future perspectives

by

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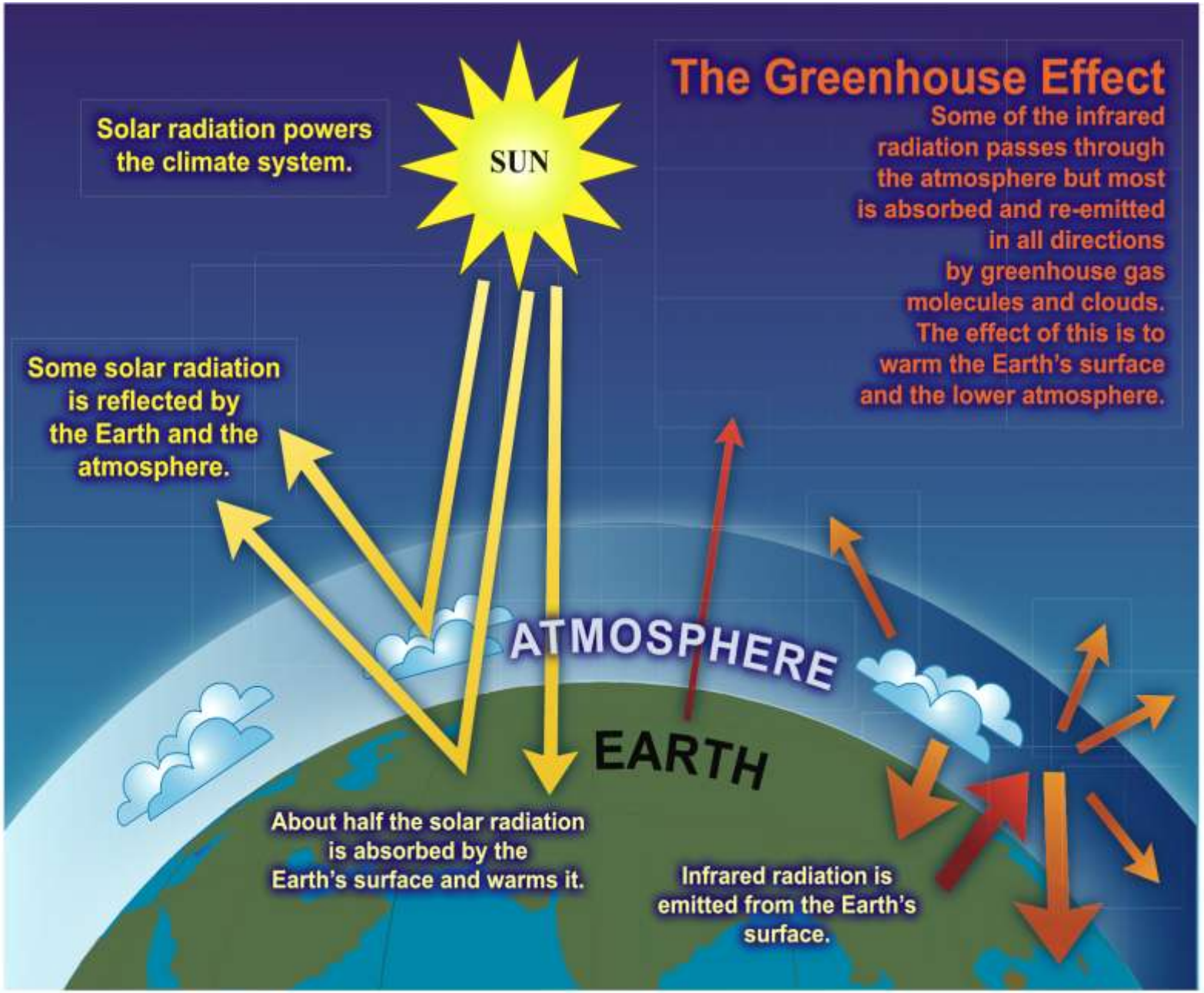

The Greenhouse Effect
Solar radiation powers the climate system.
SUN
Some of the infrared radiation passes through the atmosphere but most is absorbed and re-emitted in all directions by greenhouse gas molecules and clouds. The effect of this is to warm the Earth's surface and the lower atmosphere.
Some solar radiation is reflected by the Earth and the atmosphere.
ATMOSPHERE
EARTH
About half the solar radiation is absorbed by the Earth's surface and warms it.
Infrared radiation is emitted from the Earth's surface.

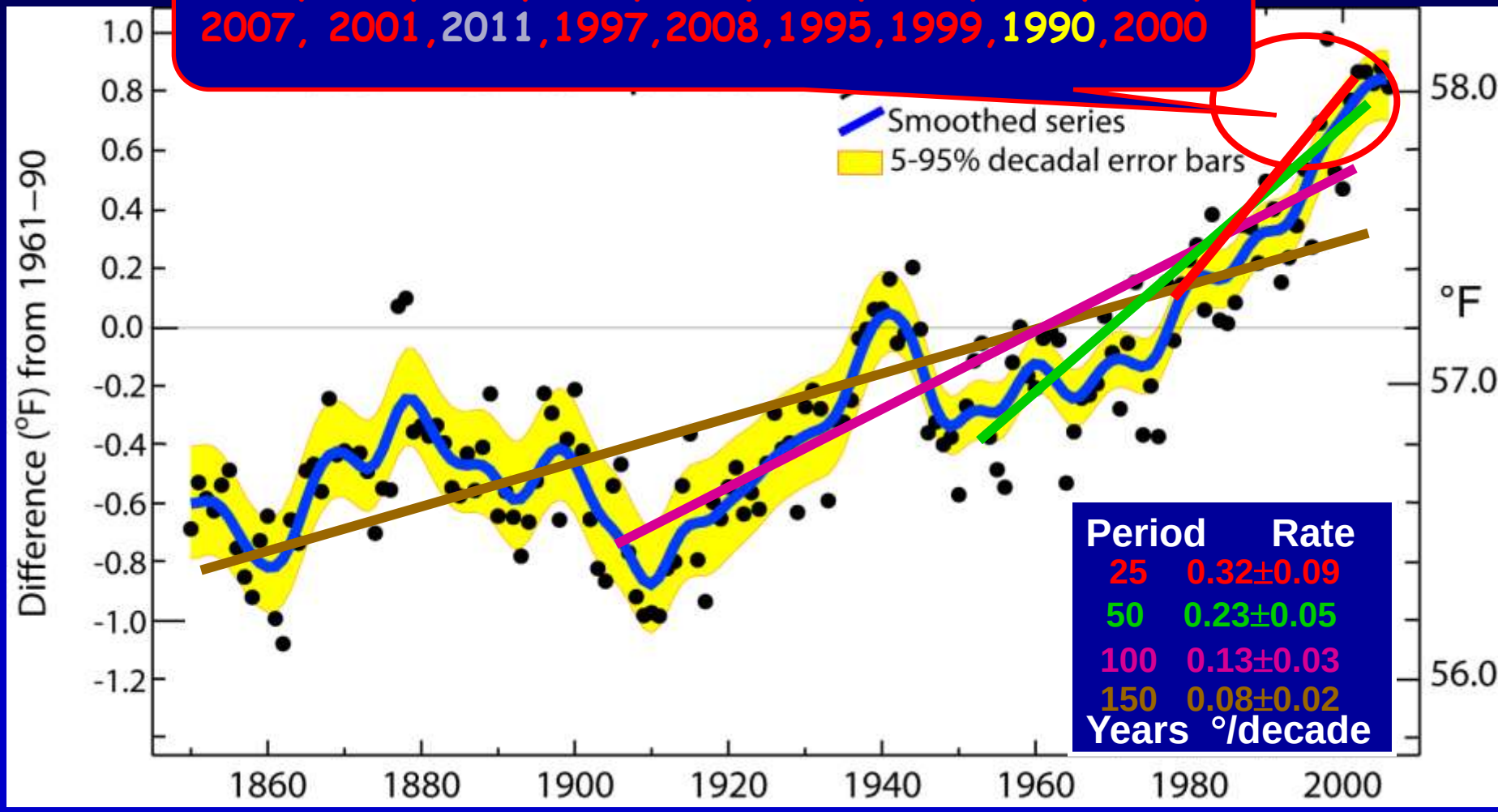
Climate System

- **Atmosphere:** Troposphere, Stratosphere, Mesosphere, Thermosphere and Ionosphere
- **Hydrosphere:** The oceans, rivers & inland water masses
- **Cryosphere:** The snow, ice & permafrost
- **Biosphere:** **V**egetation, animals and human beings
- **Lithosphere:** Soil, the deeper layer below soil, sea bed

Global mean temperatures are rising faster with time

Warmest 18 years:

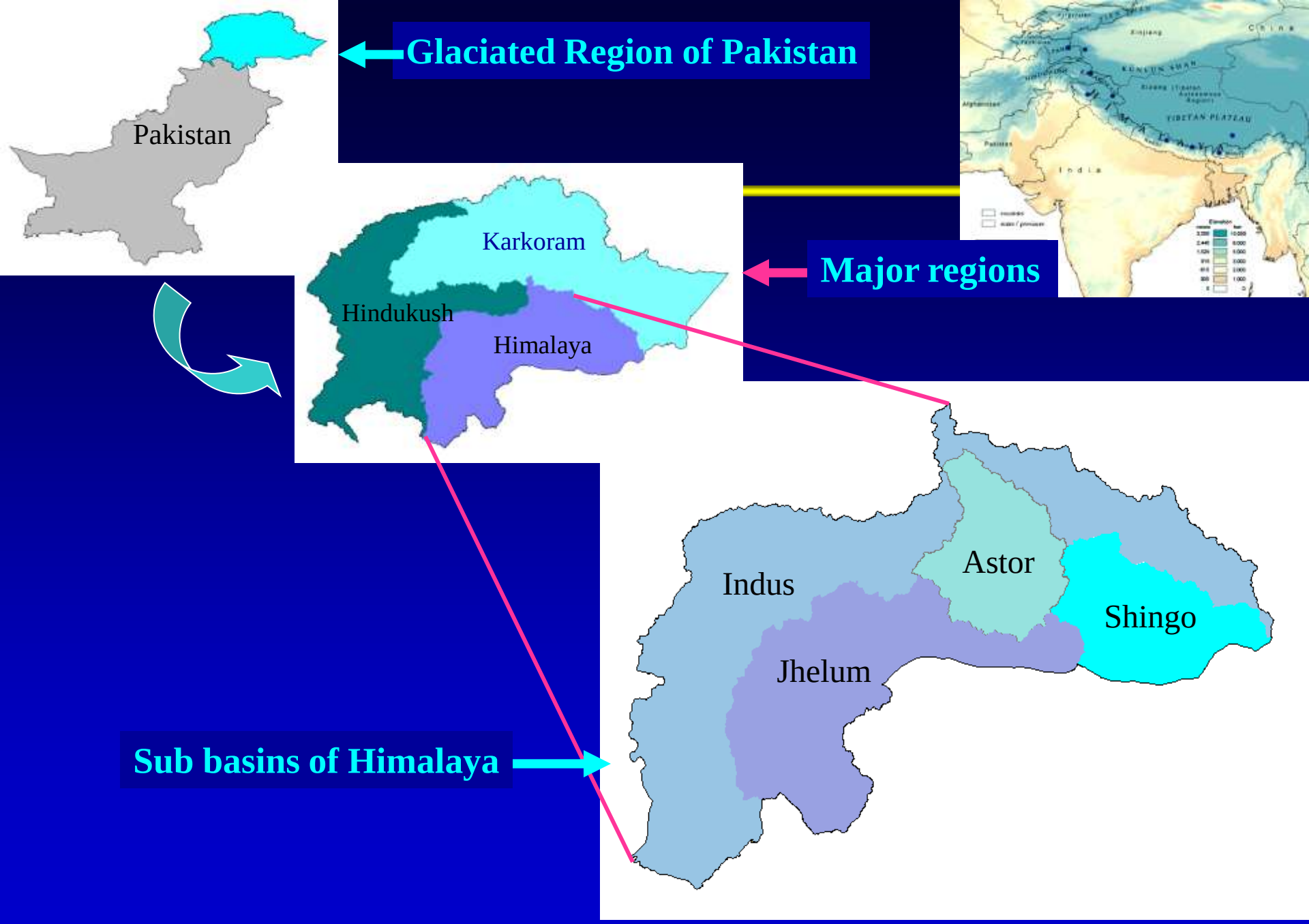
2010, 1998, 2005, 2003, 2002, 2009, 2004, 2006, 2012, 2007, 2001, 2011, 1997, 2008, 1995, 1999, 1990, 2000



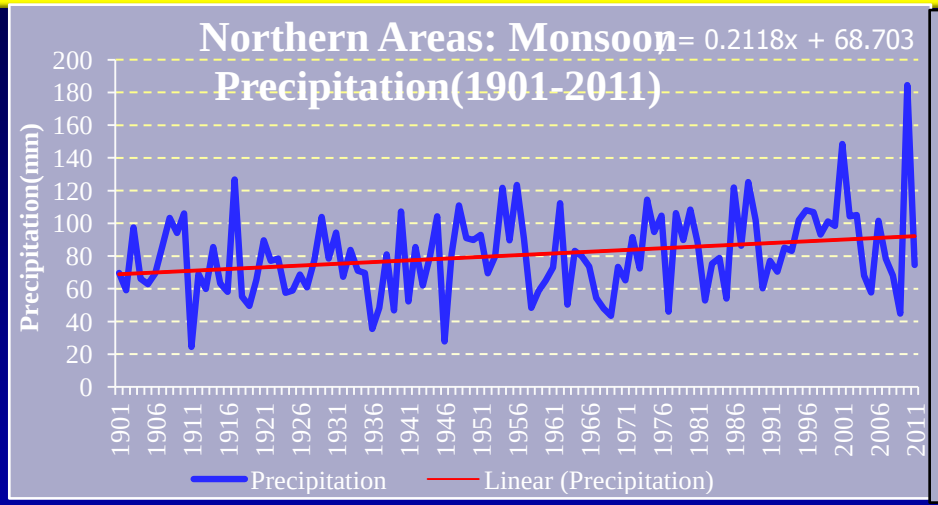
IPCC 4th assessment report

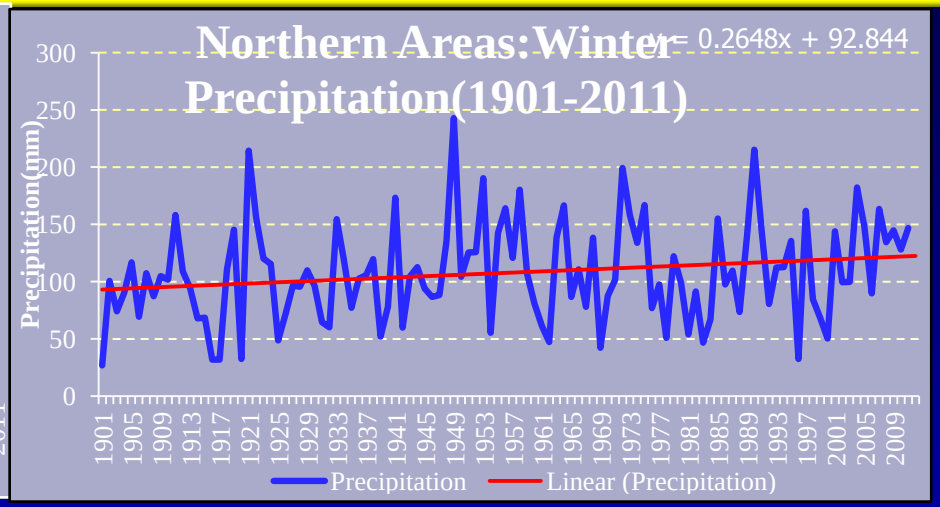
Summary of Climate Change over Pakistan (1931-1960) vs (1981-2010)

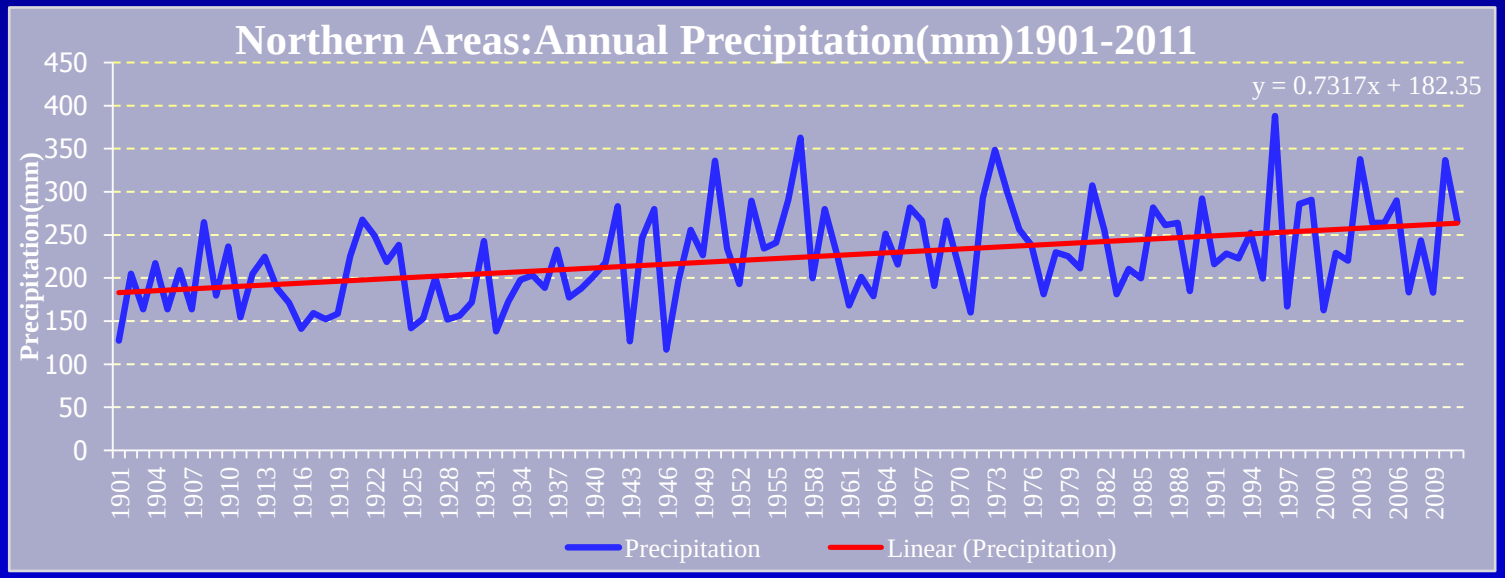
Province	Max Temperature	Min Temperature	Mean Temperature	Precipitation
G.B.	0.71	0.67	0.7	11.1
K.P.K	-0.34	0.88	0.3	19.5
Punjab	-0.21	1.02	0.45	78.1
Balochistan	0.46	0.58	0.51	8.1
Sindh	0.22	0.45	0.39	3.3


Glaciated Region of Pakistan
Pakistan
Karkoram
Hindukush
Himalaya
Major regions
Indus
Astor
Shingo
Jhelum
Sub basins of Himalaya

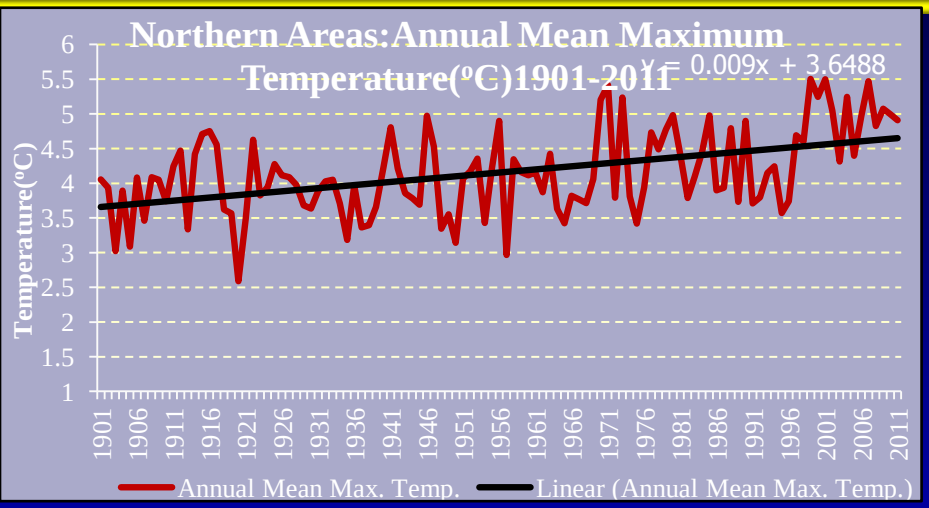
Gilgit Baltistan Mean Precipitation(mm) (1901-2011)

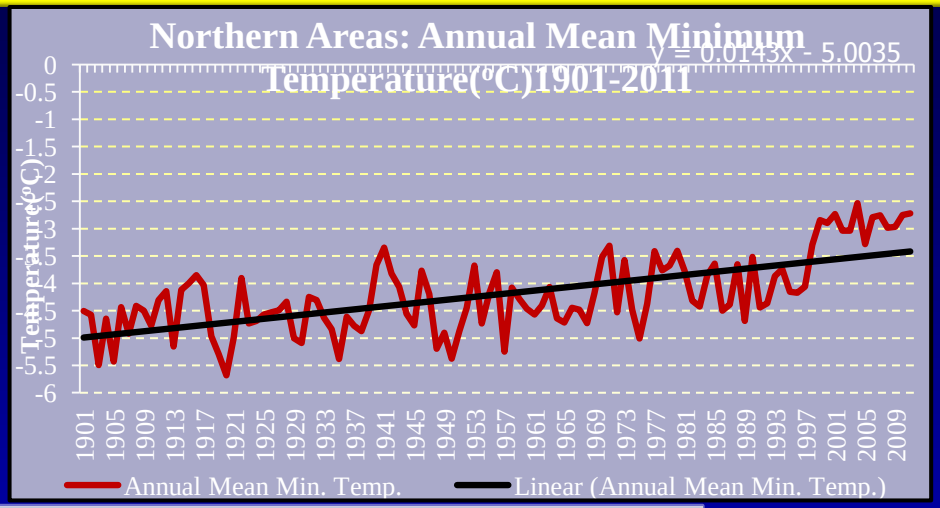


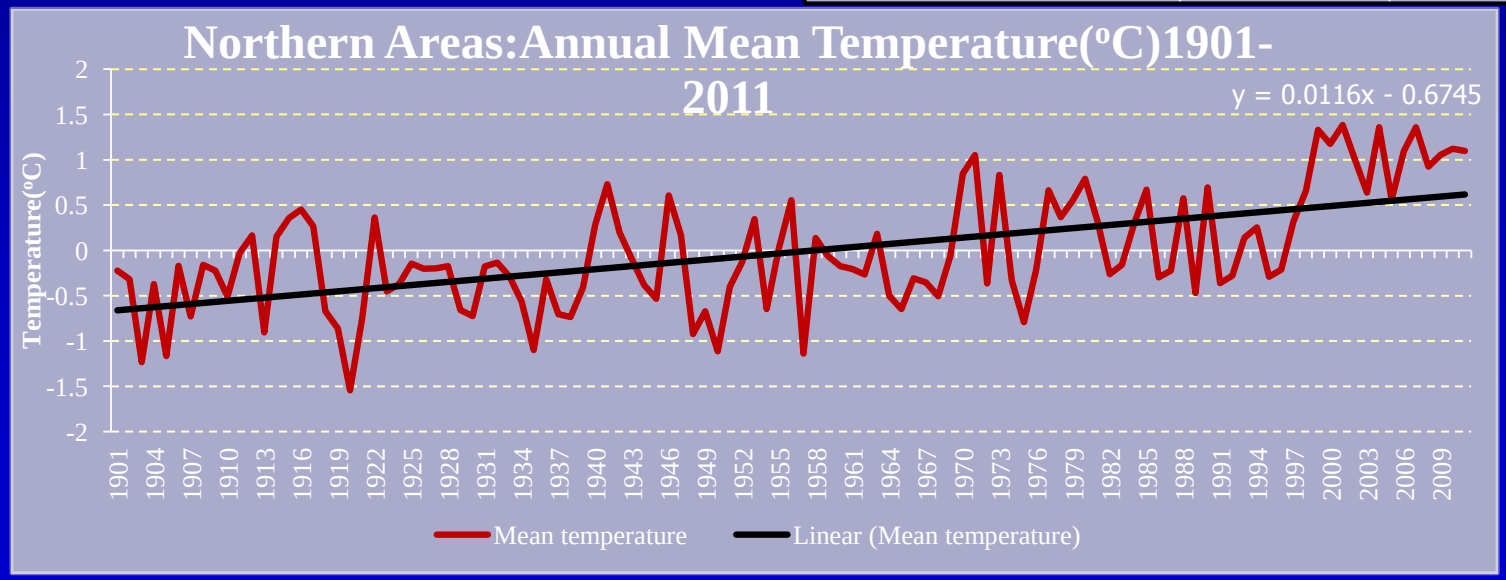




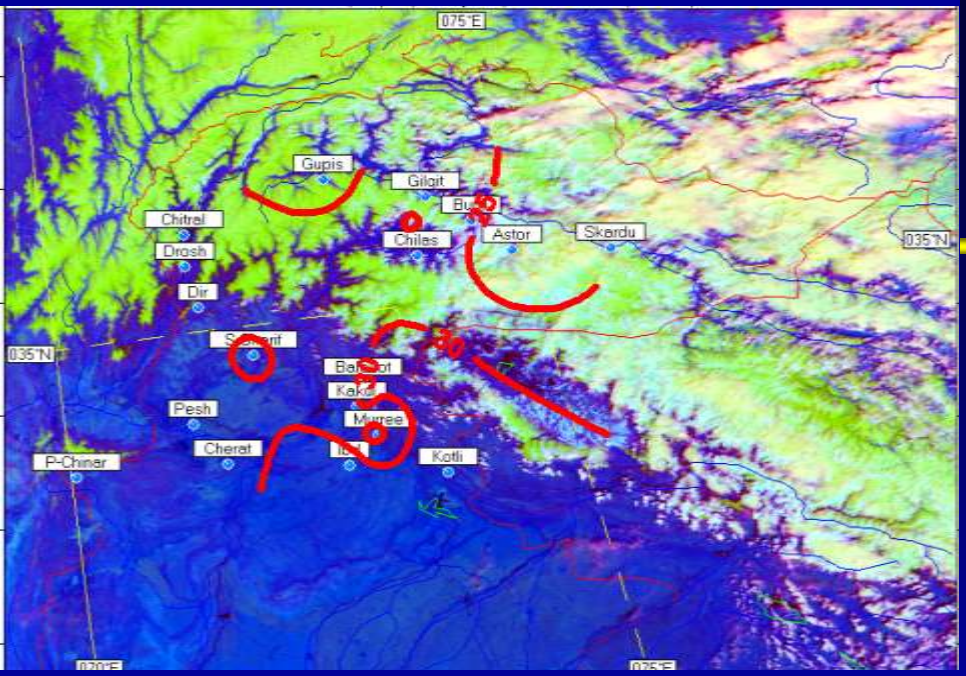
Gilgit Baltistan Mean Temperature(° C) (1901-2011)



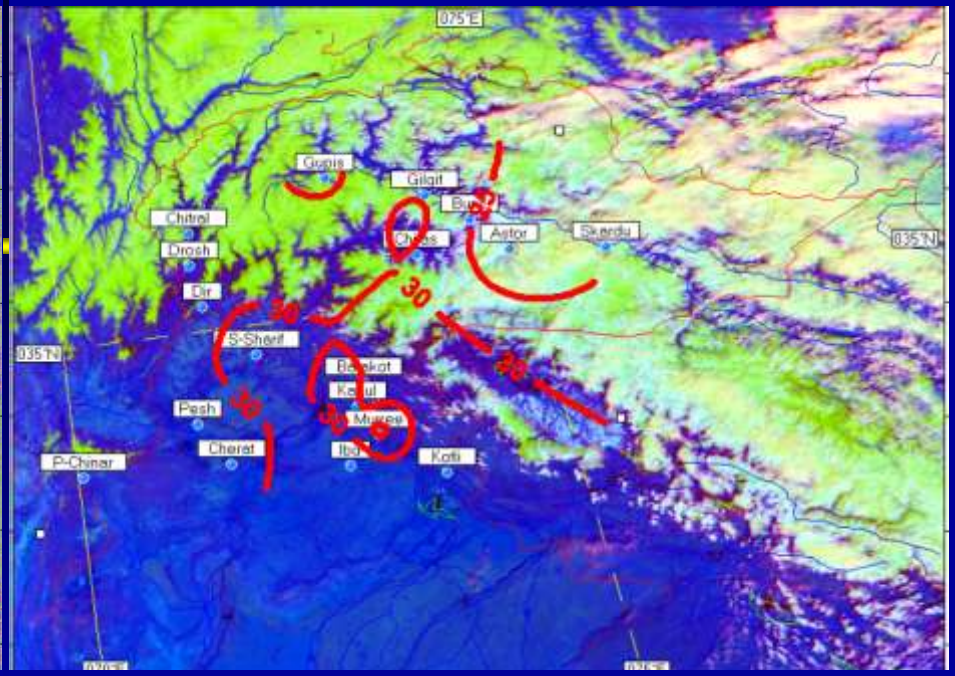




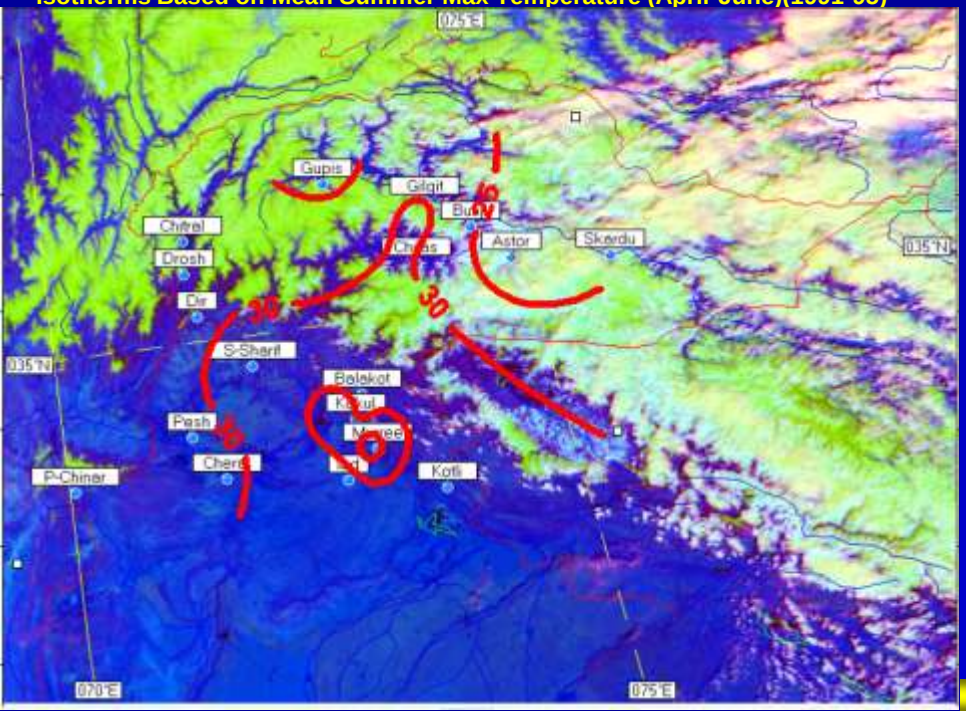
Isotherms Based on Mean Summer Max Temperature (April-June)(1981-85)



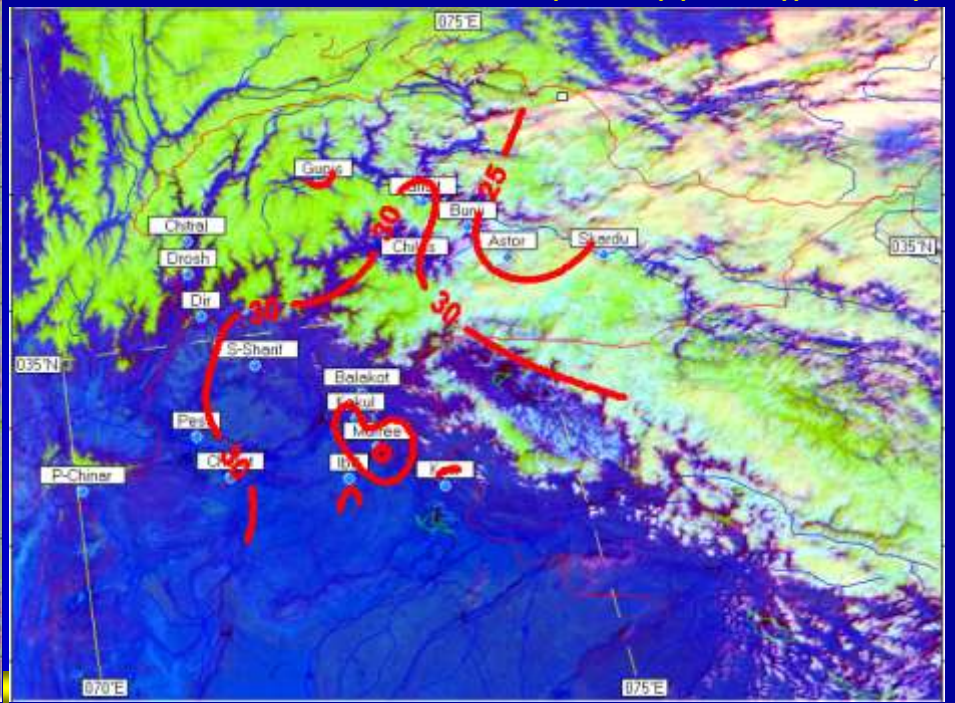
Isotherms Based on Mean Summer Max Temperature (April-June)(1985-90)



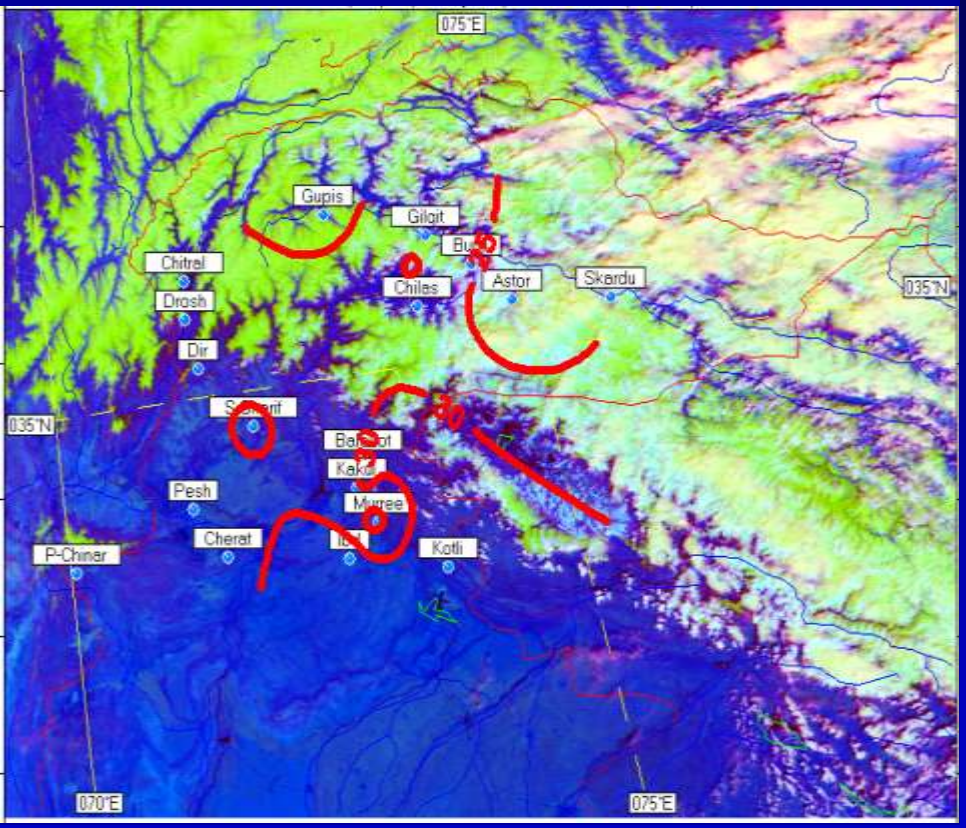
Isotherms Based on Mean Summer Max Temperature (April-June)(1991-95)



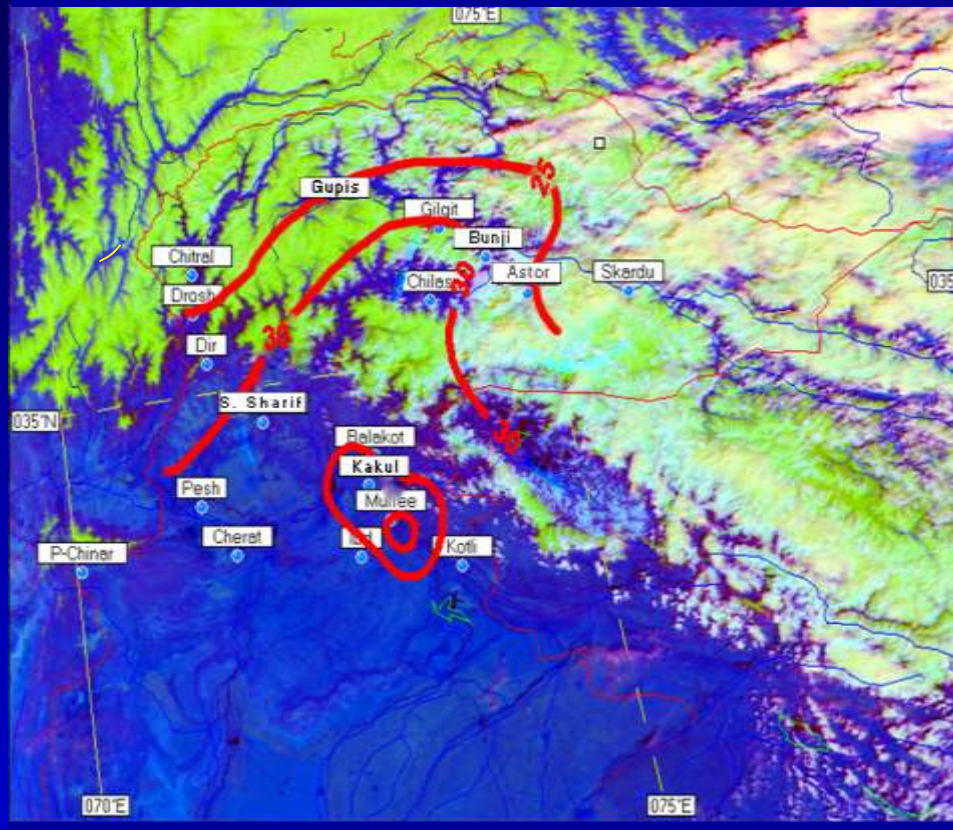
Isotherms Based on Mean Summer Max Temperature (April-June)(1995-2000)



Isotherms Based on Mean Summer Max Temperature (April-June)(1981-1985)



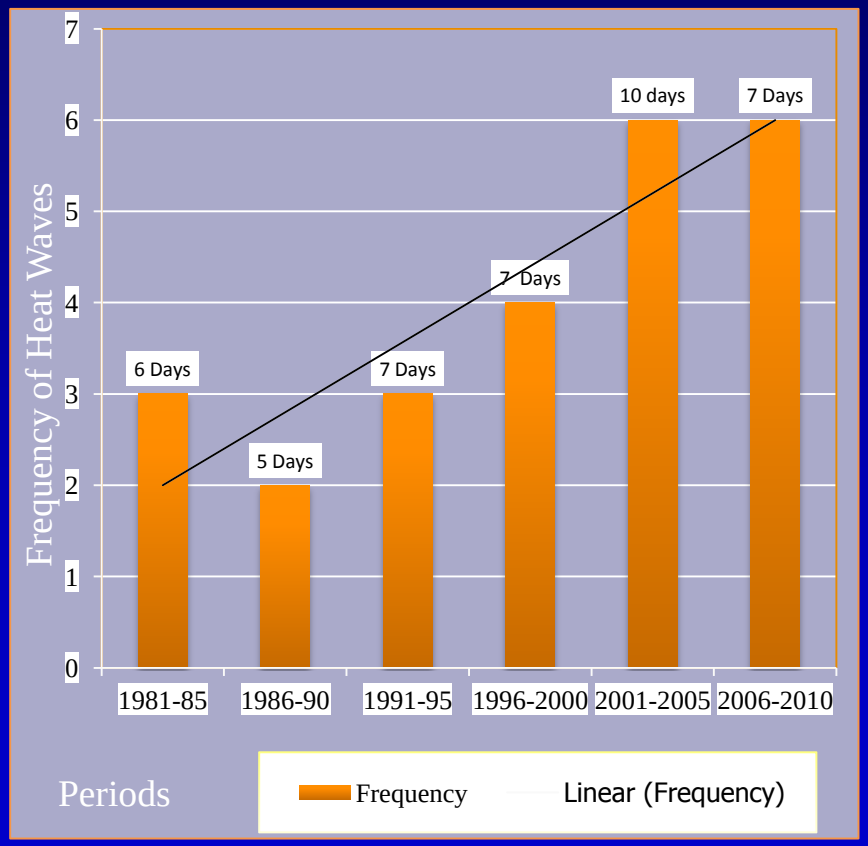
Isotherms Based on Mean Summer Max Temperature (April-June) (2006-2010)



Heat Wave Frequency Over Northern Areas of Pakistan

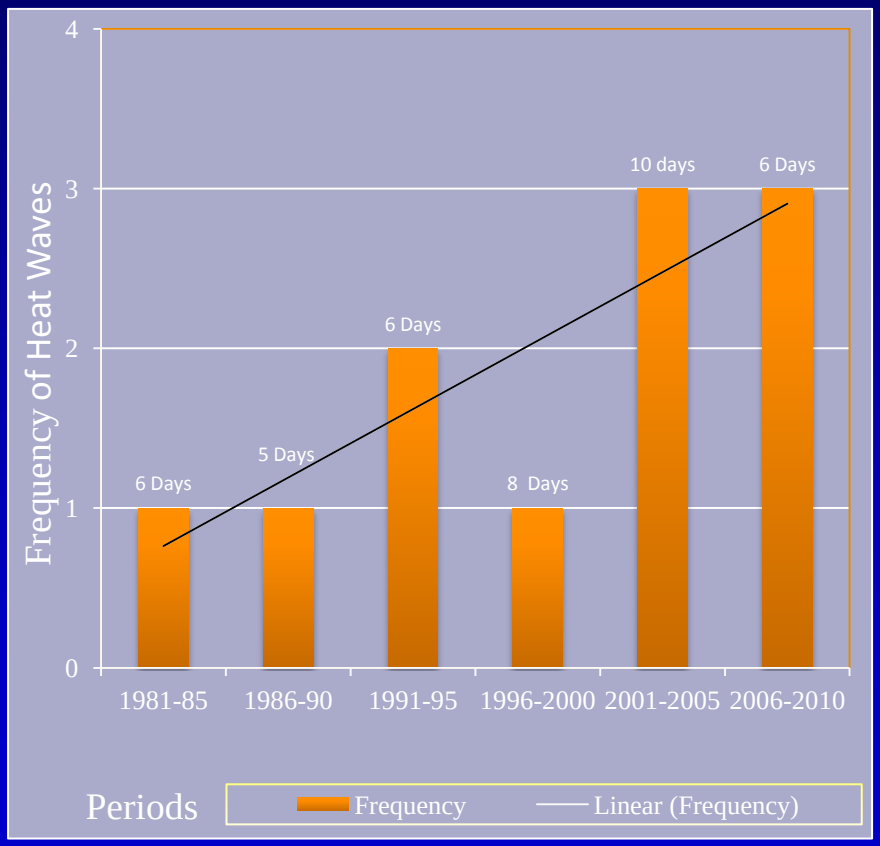
Heat Waves Frequency over Northern Areas

(when Max Temp > 35 Degrees) (consecutive 05 Days or above)

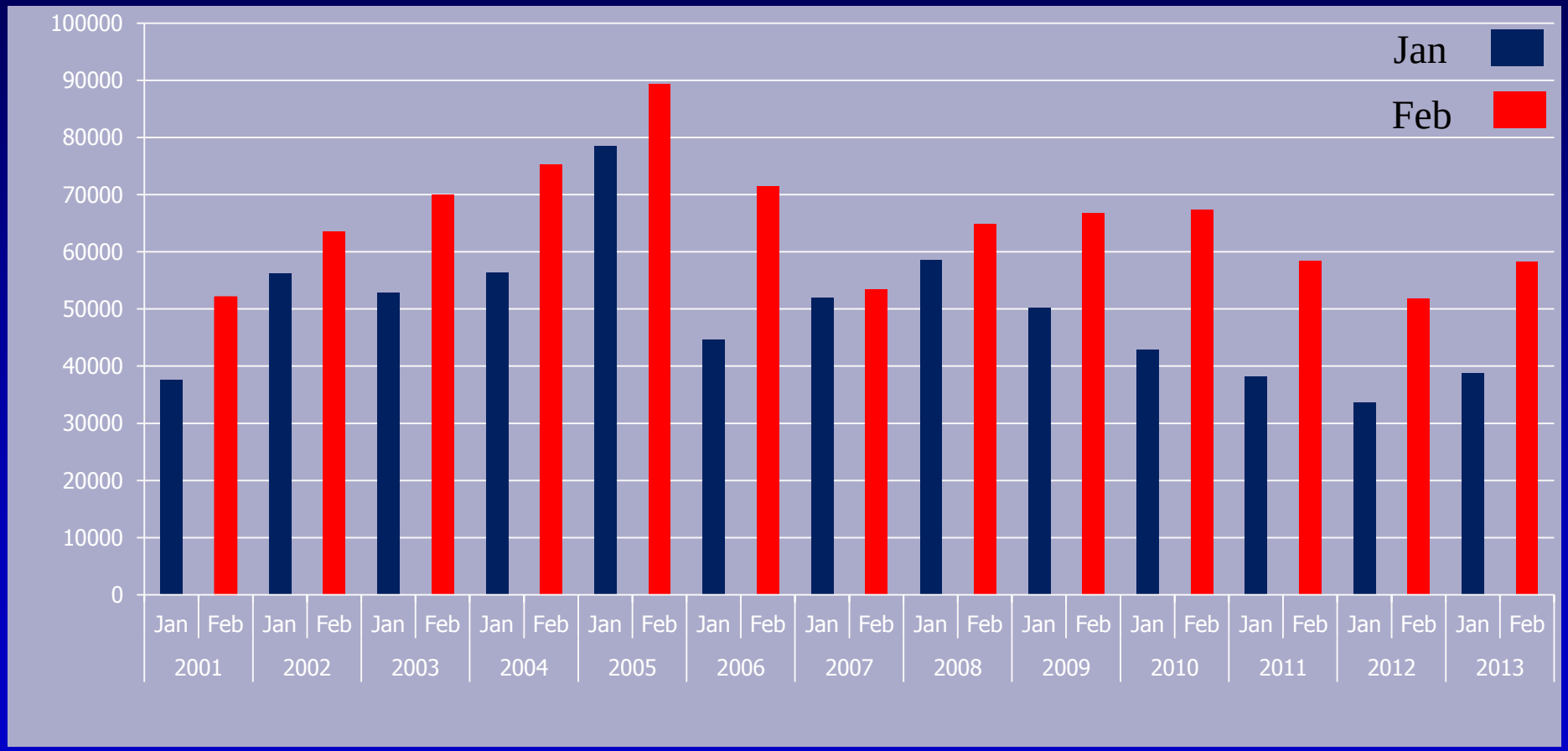


Heat Waves Frequency over Northern Areas

(when Max Temp > 40 Degrees) (consecutive 05 Days or above)



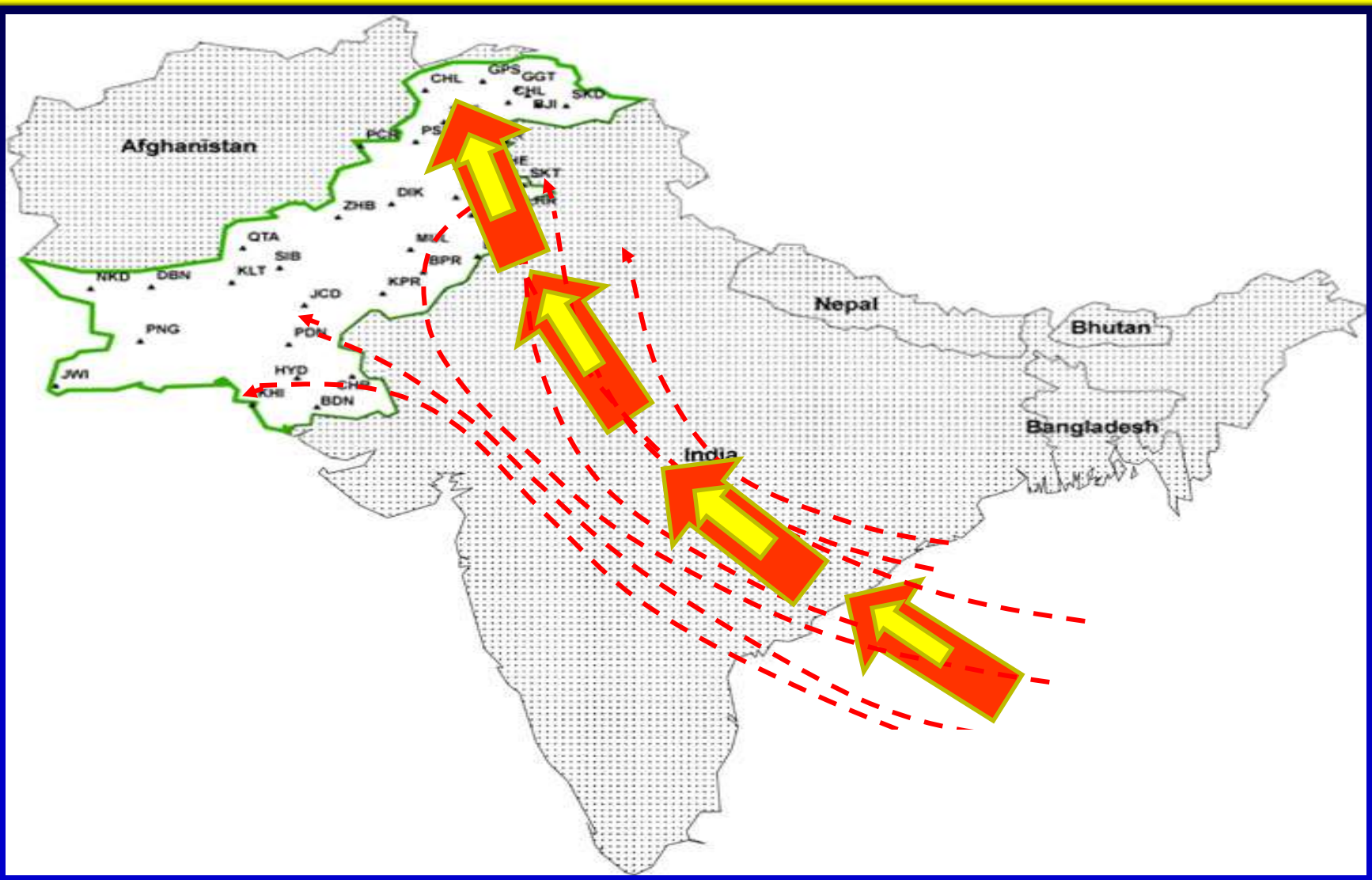
Snow Residency



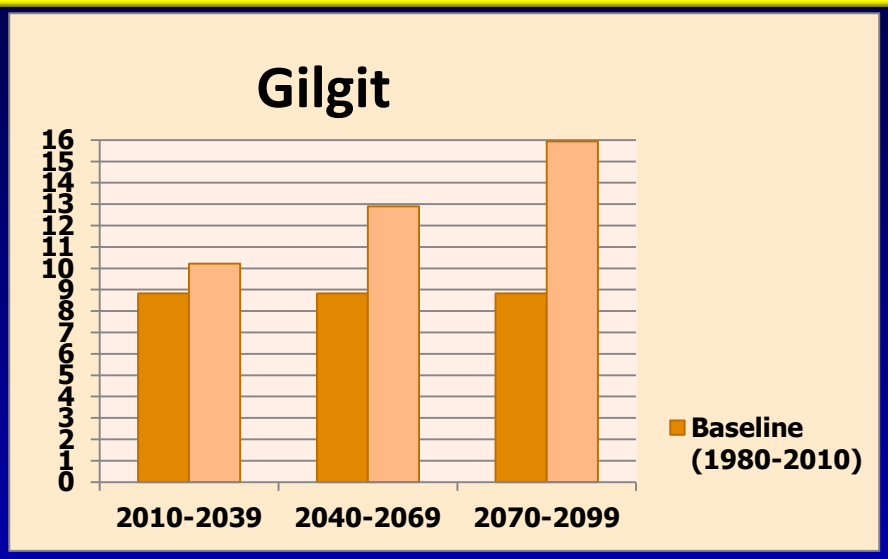
Black Carbon

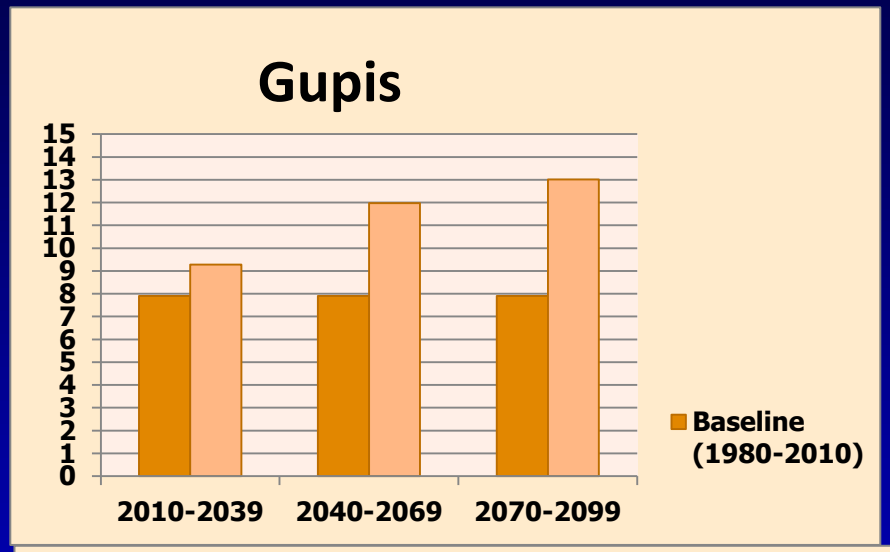
Name of Glacier	Length (km)	Aspect	Carbon (ng/m2)	Diameter (micron)
Hinarchi	17	S	224	131
Hisper	53	NW	161	212
Minapin	16	N	192	401
Gutumi	14	W	105	203
Bualtar	20	NW	63	116

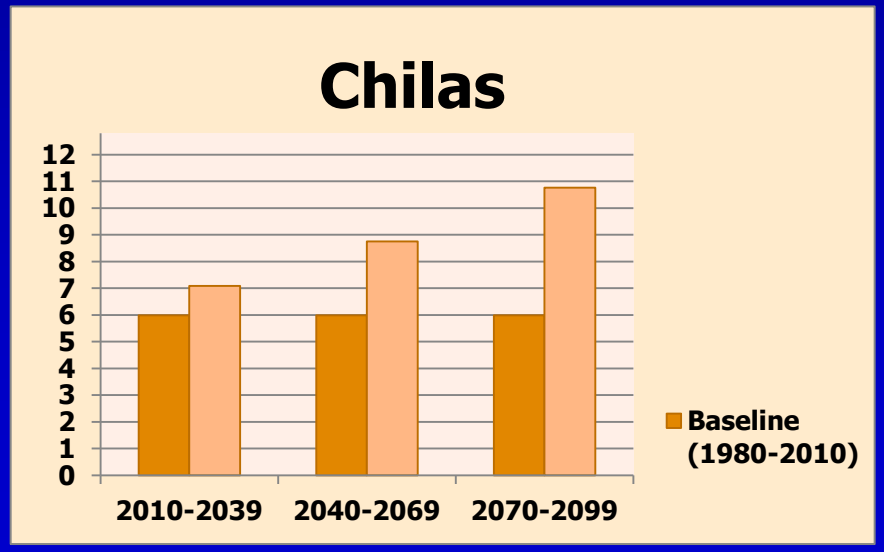
Extent of Monsoon Currents

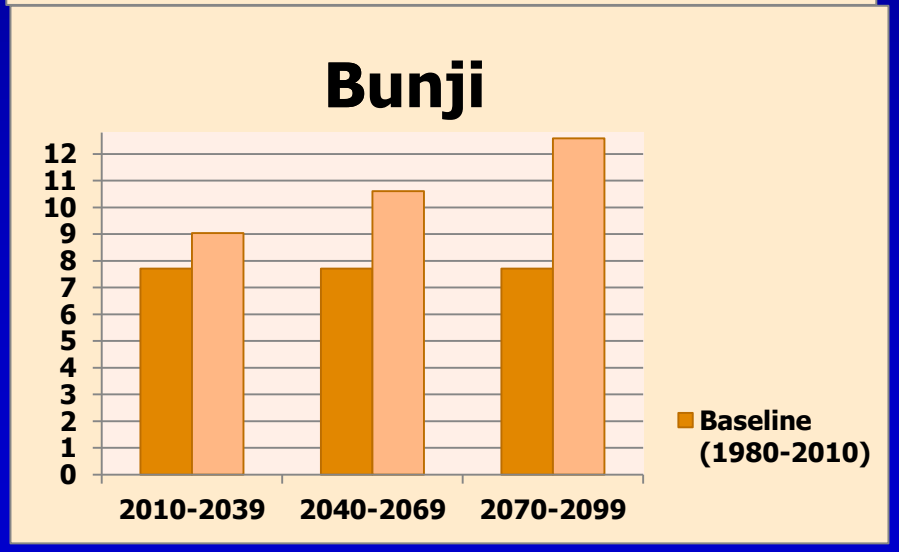


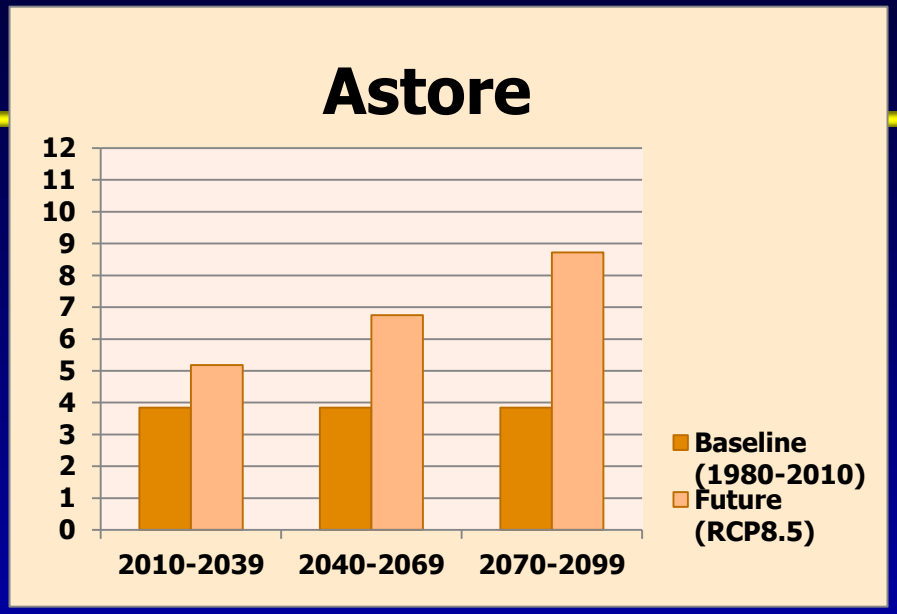
Future Mean Temperature (◦C) Trends under RCP 8.5 Scenario







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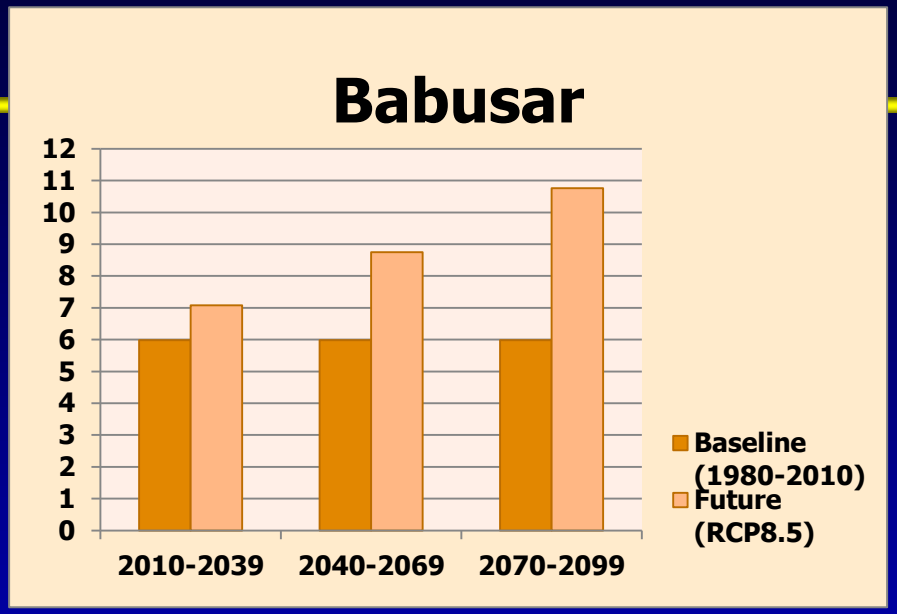
2070-2099
Baseline (1980-2010)
Future (RCP8.5)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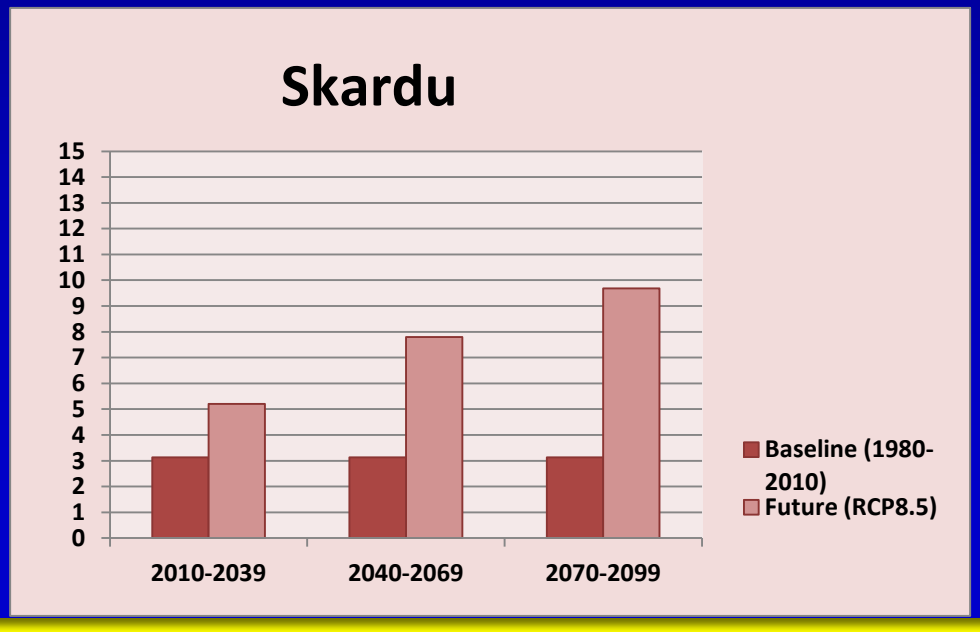
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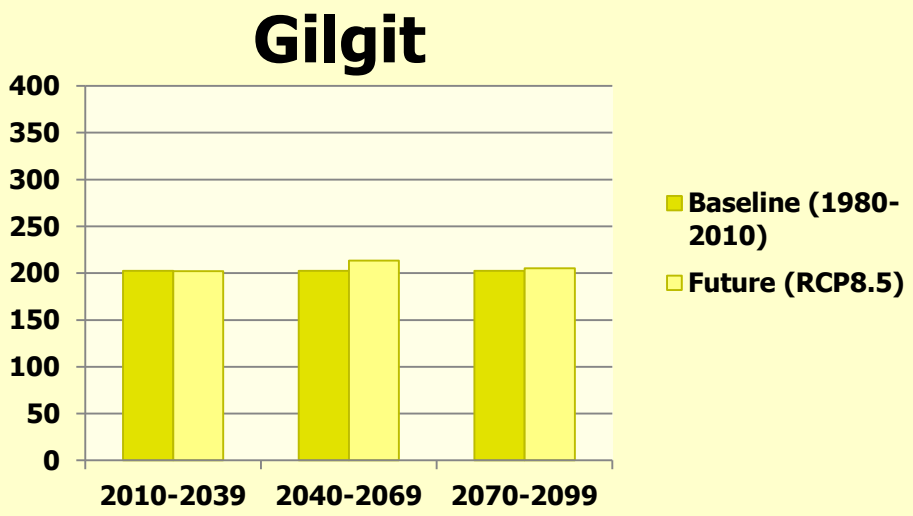
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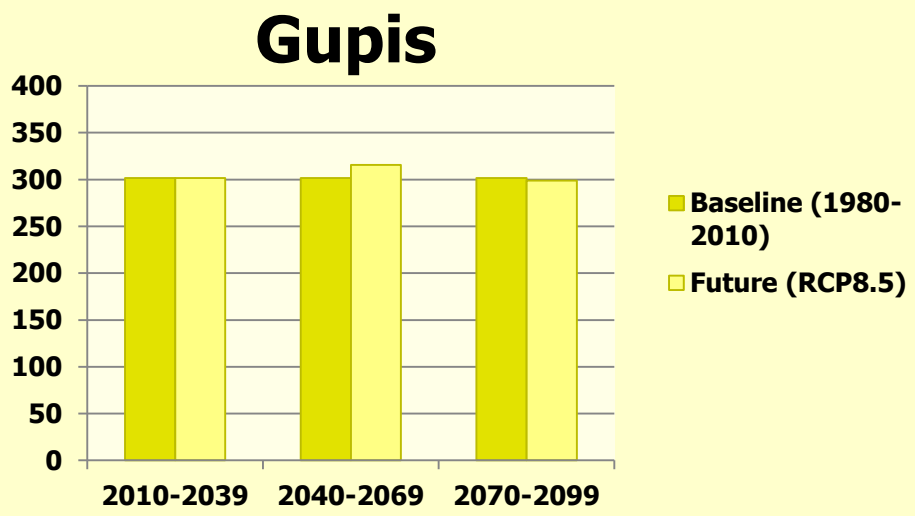
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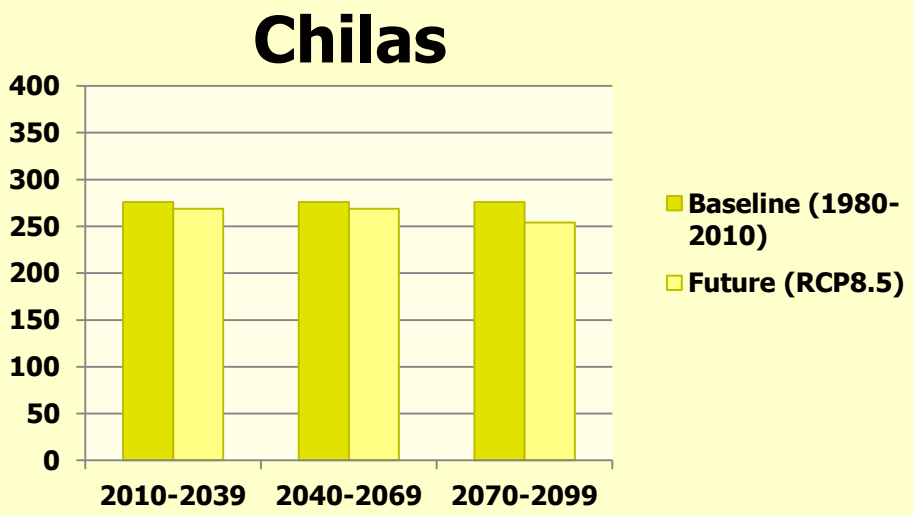
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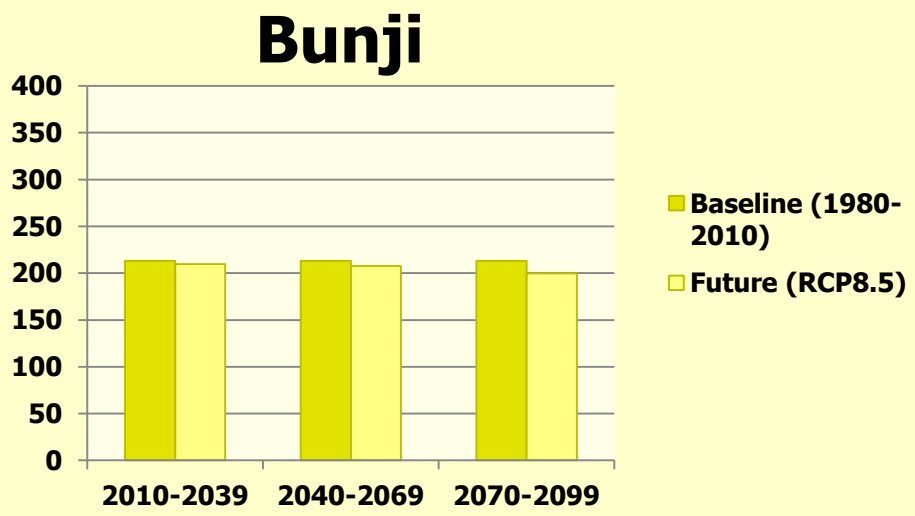
Future (RCP8.5)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2070-2099
Baseline (1980-2010)
Future (RCP8.5)

HKKH is Global Asset

- Together with Tibbet Plateau HKKH is a powerful driver of the General Circulation of the Atmosphere

- The amount of seasonal snow cover not only affects the dynamics of Asian Monsoon but also the frontal systems producing rain/snow over the higher latitudes

- Teleconnections of the Arctic Oscillations and Tibbetan Warm Pool are two-way exchanges of heat and momentum

- Removal of ice from HKKH will bring drastic changes in Regional Climates which in turn will change the weather patterns

Let us save it together for our future generations

Thank You