Coordinated Energy and Water Cycle Observation Project (CEOP)
2nd Annual Meeting
September 15-17, 2008
Geneve, Switzerland

Current status and perspective of CEOP-HE Initiative

* Chair of CEOP-HE & President of Ev-K2-CNR Scientific Committee

Gianni **Tartari**[1,2,*]

with the collaboration of

Elisa Vuillermoz[2] , Beth Schommer[2], Emanuela Manfredi[2]

[1] *Water Research Institute - National Research Council (IRSA-CNR)*
[2] *Ev-K2-CNR Committee*

Why high mountains/high elevations

Agenda 21 - UNCED, 1992

"*Mountains are fundamental sources of water, biodiversity, minerals, forests, agricultural production and tourism*"

- Sensitive and fragile ecosystems
- Affected by different pressures driven by climate change (environmental degradation, alteration of hydrological cycles, retreat of glaciers,…)
- Early indicators of climate change
- The knowledge of the state and trend of high elevation climate conditions is still incomplete
- An integrated approach of observation, modeling and investigation of processes and mechanisms regulating the energy and water budget at high elevations is an important aspect for achieving GEWEX/CEOP's goals.

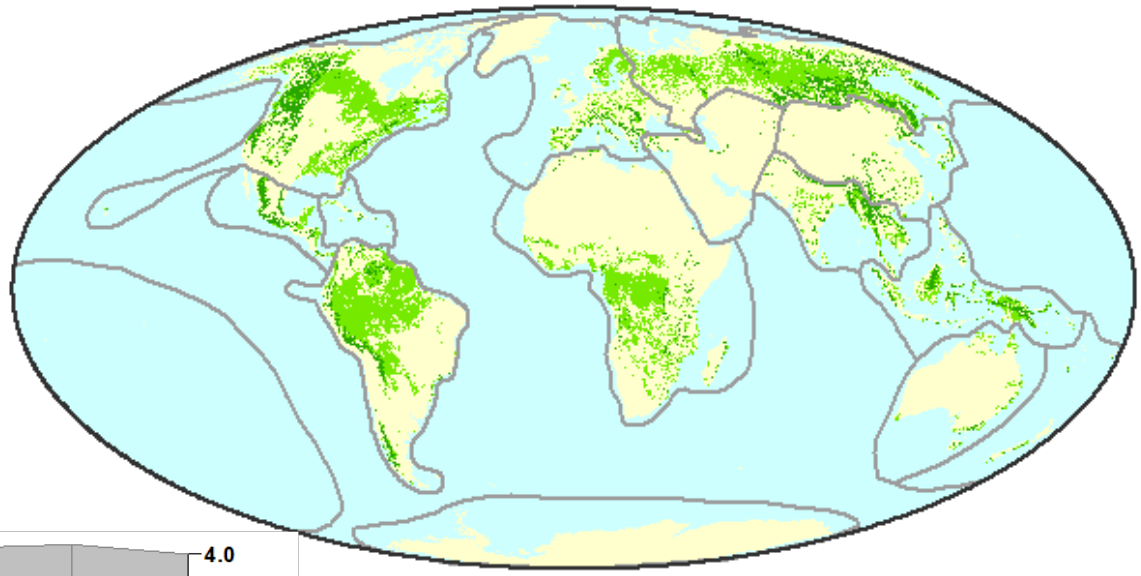
Few mesurement sites are located in high elevations (remote areas, complex topography, harsh climate conditions)

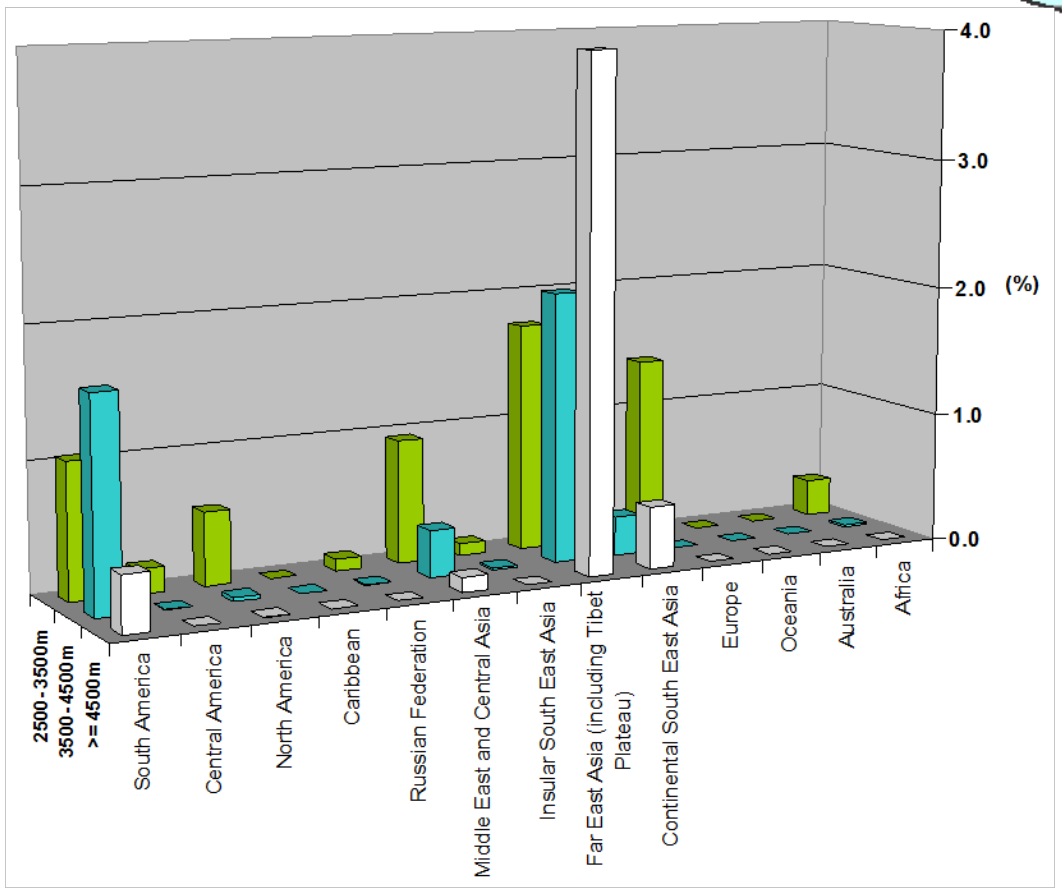
UNEP

WCMC

SWISS AGENCY FOR DEVELOPMEN AND COOPERATIO SDC

84% Mountainous Terrain
(Excluding Antartica)





Mountains and Mountain Forests

MOUNTAINOUS TERRAIN

7.0 % of the **World** surface

24.0 % of **Continental** surface

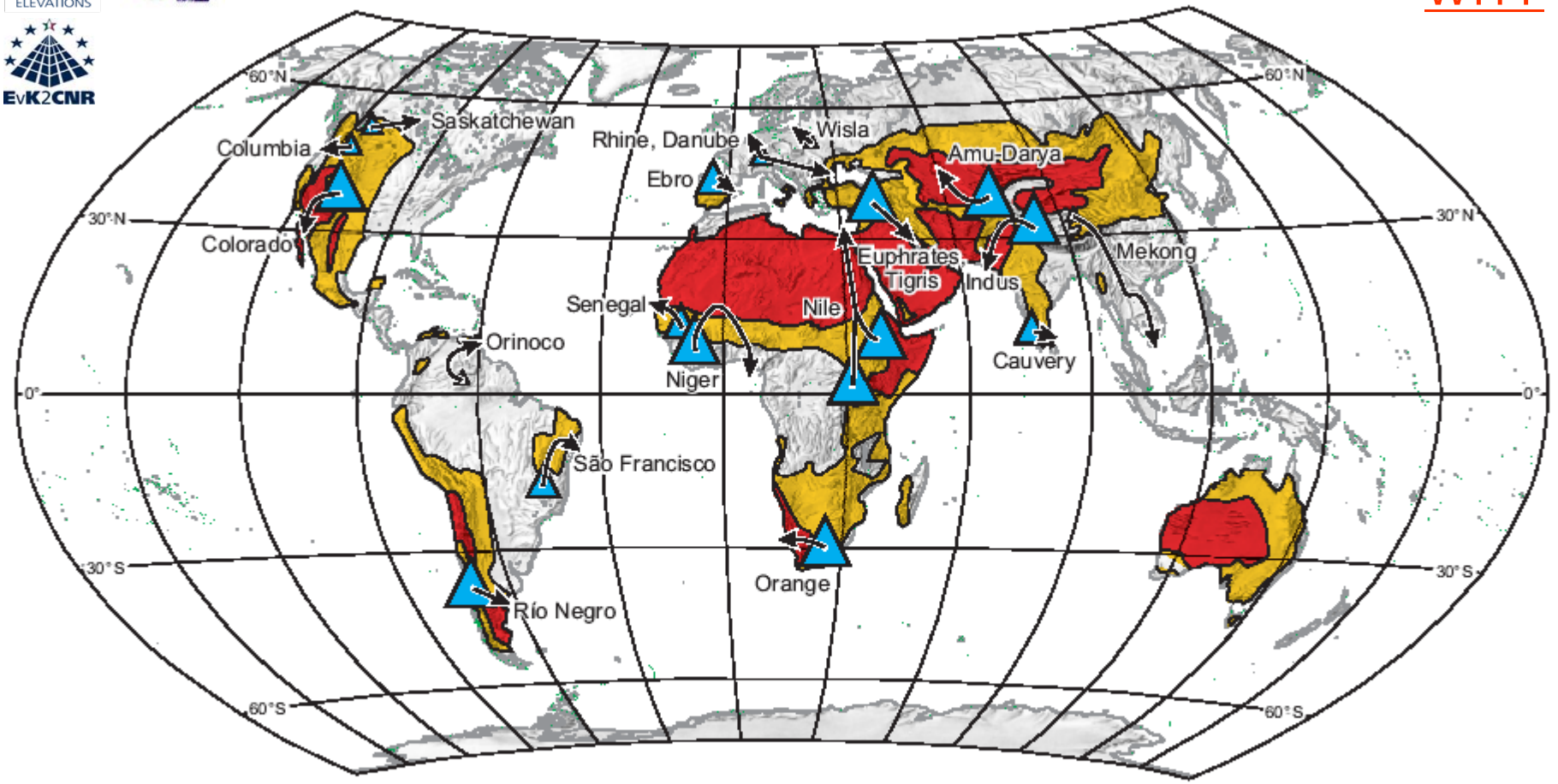
HIGH ELEVATIONS

EvK2CNR

WHY

Hydrological significance of mountain ranges for the river basins

WHY



Viviroli, D. & R. Weingartner. 2004. The hydrological significance of mountains: from regional to global scale. *Hydrology and* Earth System Science, 8: 1016-1029.

Definition of HE

"High Elevations" include areas such as:

- altitudes above the timberline,
- high plateaus,
- rough relief,
- low atmospheric pressure,
- low average temperature,
- … and any sites that directly create or influence regional climate patterns (e.g., high latitudes) etc.

Overall goal of CEOP:

To understand and predict continental to local-scale hydroclimates for hydrologic applications

GOAL of HE

To study multi-scale variability of water and energy cycles in high elevation areas, while improving observations, modeling and data management.

Specific OBJECTIVES:

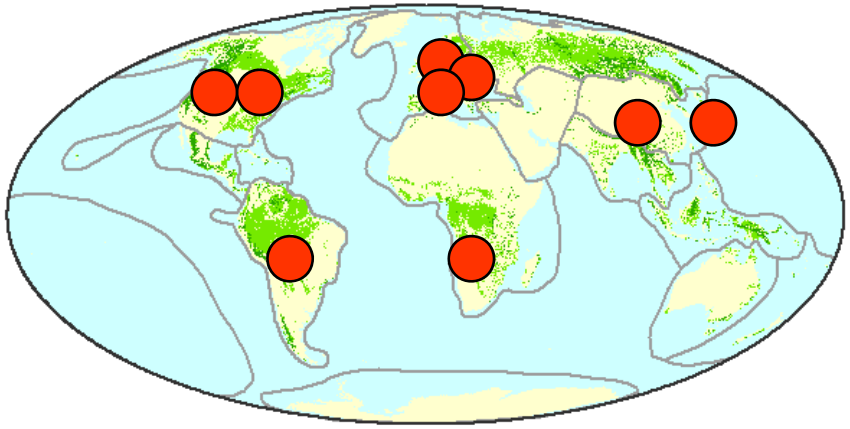
1. Provide a mechanism for sharing and harmonizing data from high elevation monitoring stations and for facilitating dialogue amongst researchers concerned with these stations.
2. Promote long-term (10-20 year) monitoring of meteo-climatic parameters in high elevation areas and analyze environmental responses to global changes.
3. Improve understanding of the influence of aerosols on the water cycle in high elevation areas.
4. Improve hydro-climate forecasting capabilities at high elevations to optimize benefits to society, particularly in water resources management.

Status – Past activities

- March 2007, Washington GEWEX/CEOP Joint Planning Meeting: birth of HE
- September 2007, Bali meeting:
  - ✓ definition of actions for creation of HE Working Group (WG)
  - ✓ identification of Scientific Coordinator (Prof. K. Ueno)
  - ✓ identification of possible members of WG
- February 2008:
  - ✓ activation CEOP-HE Secretariat (Ev-K2-CNR Committee, Bergamo, Italy)
  - ✓ establisment of a Steering Committee of experts in high elevation studies
- April 2008: *1st HE Steering Committee meeting* , Padua, Italy:
  - ✓ confirmation of goal and objectives
  - ✓ discussion on elaboration of HE Science Plan
- May/August 2008: collection of contributions for elaboration of Science Plan
- September 2008: HE at the 2nd CEOP Annual Meeting

CEOP High Elevations Steering Committee

Gianni Tartari	I	Ev-K2-CNR & IRSA-CNR
Kenichi Ueno	J	University of Tsukuba
Yaoming Ma	CN	ITP & CAS
Annarita Mariotti	USA	NOAA
Stefan Grab	ZA	University of Witwatersrand
Axel Thomas	D	University of Mainz
Paolo Bonasoni	I	ISAC-CNR
Vladimir Aizen	USA	University of Idaho
Rene Garreaud	CL	University of Chile



Directions

OBJECTIVE	RESULTS
Sharing and harmonization of data collected at high elevation monitoring stations and facilitating dialogue amongst the researchers	Network of global high elevation monitoring stations including CEOP Reference Sites
	Archive of harmonized and quality data of HE stations made available to the scientific community.
Promote long-term hydroclimatic monitoring in HE areas to analyze the local environmental responses to global changes	Climatic processes in high elevation areas analyzed
	Local responses to global change understood
	Cultural consensus regarding the long-term monitoring
Improve understanding of the influence of aerosols and other atmospheric components on the water cycle in high elevation areas	Processes and mechanisms regulating the water budget, including the influence of aerosols and dust, studied.
Improve capabilities for hydro-climate forecasting at high elevations to benefit the society.	Integrated hydrologic and meteo-climatic datasets
	Synergies between meteorological-climate and hydrological studies explored
	Contributions to the development of climatic models specific to high elevation areas made.

Recommendations to CEOP

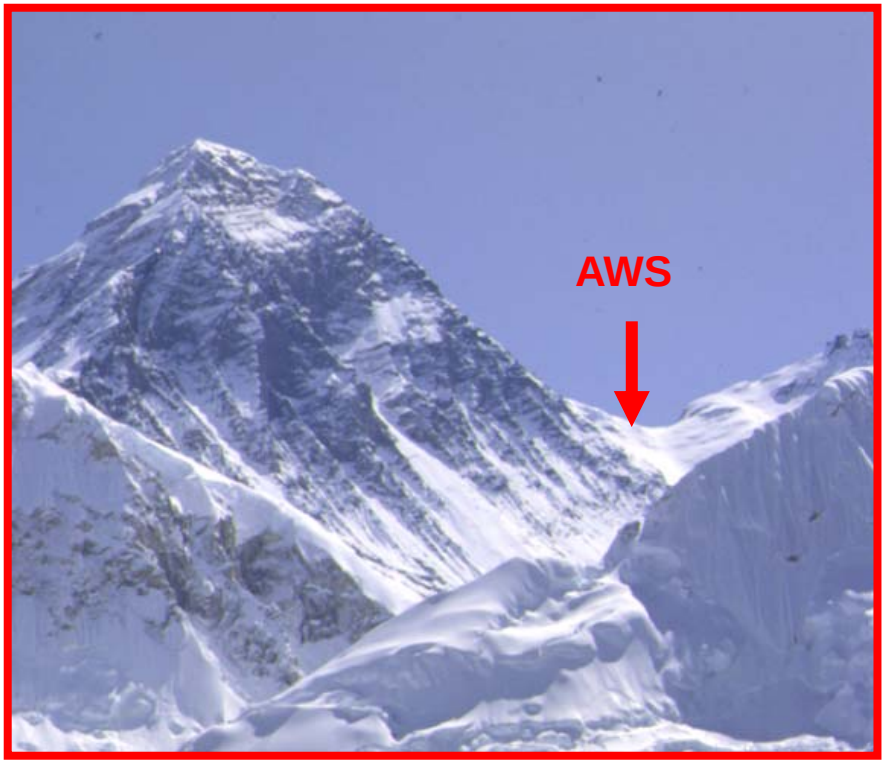
- Promote the installation of HE sites in poorly represented areas
- Contribute to the development of guidelines regarding installation procedures, long-term maintenance of CEOP-HE sites and data acquisition
- Support efforts of HE working group to garner sufficient funds for the activities proposed

Contribution to CEOP-HE objectives by Ev-K2-CNR Committee

- The CEOP-HE is strongly supported by National Research Council as a strategic component of the SHARE Project
- Future needs: new monitoring activities in remote areas and extreme elevations. The Ev-K2-CNR Committee will continue to provide technical and scientific expertise towards this goal.

SHARE EVEREST 08

http://www.share-everest.com/cms/

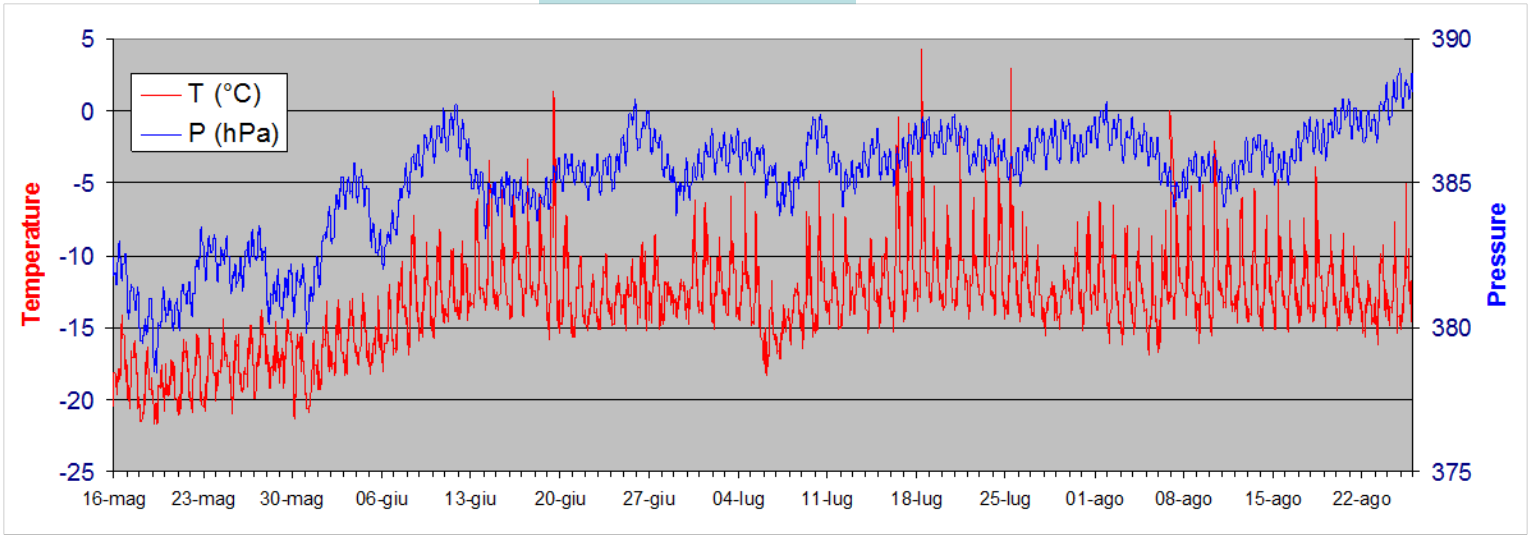


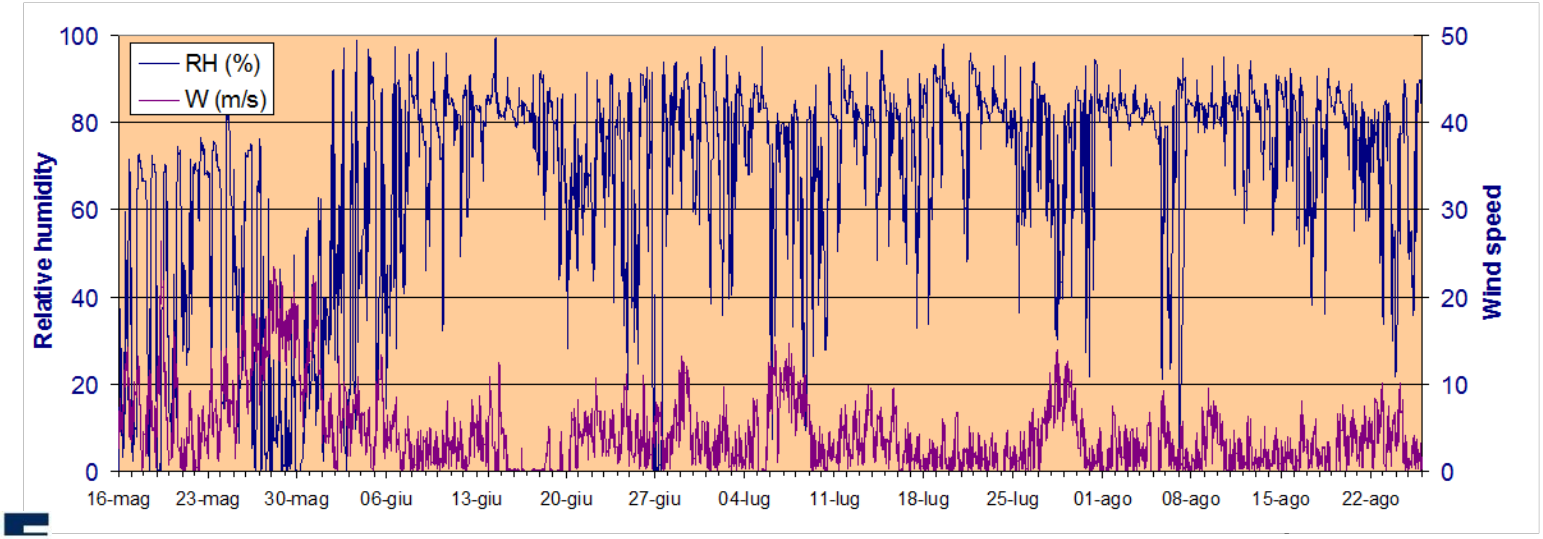
Mt. Everest top 8848 m
South Col 7925 m

The highest AWS in the world

First data record 16/05-26/08/2008
Preliminary Elaboration

South Col 7925 m





CONCLUSIONS

- High elevation regions are ideal sites for monitoring hydroclimatic conditions near or over the boundary layers and for the study of natural and anthropogenic aerosols
- In the future CEOP-HE WG can play an important role in coordination of those initiatives aimed at understanding hydroclimate in high elevation areas, including:
  - development of QA/QC protocols for monitoring of meteorological parameters
  - address the results of baseline observations from local to global scale
  - comparison of observations of trace gases and aerosols in the free troposphere from various sites around the world
  - ….

At this stage, we invite suggestions and observations from the CEOP Scientific Community to optimize our Science Plan and Implementation Strategy.

Thanks in advance.

Kala Patthar AWS 5600 m a.s.l.

Data logger	Elog (ELO305)
Combined air temperature and humidity sensor	(DMA572.1)
Combined wind speed and direction sensor	(DNA022)
Global radiation sensor	(DPA153)
Rain gauge sensor	(DQA030)
To be implement in autumn 2008	
Atmospheric pressure sensor	(DQA250)
	(DPA007)

South Col AWS 8000 m asl

Data logger	Elog (ELO305)
Combined air temperature and humidity sensor	(DMA572.1)
Combined wind speed and direction sensor	(DNA022)
Global radiation sensor	(DPA153)
High altitude atmospheric pressure sensor	(PTU300)
UV-A radiation sensor	(DPA007)