

CEOP- High Elevations: present status and future scenarios

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The High Elevations (HE) initiative is a recent element of “regional focus” within the Coordinated Energy and Water cycle Observation Project (CEOP) of the Global Energy and Water Cycle Experiment (GEWEX), under the WCRP of WMO.

The goal of this initiative, launched and coordinated by Ev-K2-CNR Committee in the framework of SHARE project is to study multi-scale variability in energy and water cycles in high elevation areas, while improving observation, modelling and data management. In particular, HE aims at improving overall long-term monitoring of meteo-climate parameters in high elevation areas to further knowledge on climate change impacts, to understand aerosols impacts on water cycle, and to improve hydro-climate forecasting capabilities at high elevations.

The interaction between atmosphere, mountains and plains provides the mechanism for moisture exchange over the continental land-mass. The mountains therefore play a significant role in water supply and hydroelectric use. Thank to seasonal snow and glacier, mountains and, in particular, high elevation regions are the main water reservoirs. In fact climate changes recorded in the last decades are altering the whole hydro-meteorological system with negative consequences on global ecosystem.

The research of CEOP-HE will be focused on the analysis of meteo-climate and hydrological conditions over time in high elevation areas to better understand the processes and mechanisms regulating the water and energy budget. Local environmental responses to global climate change will also be evaluated, as will the impacts of natural and anthropogenic aerosols on the climate and hydrological cycle.

The currently CEOP network comprises 52 selected globally distributed Reference Sites (RS), where various measurements are performed and provide enhanced observation datasets of sub-surface (soil temperature and moisture), surface (standard surface meteorological and radiation), near surface (heat and CO₂ fluxes from flux towers), atmospheric profiles (rawinsonde and profiler), and ancillary data sets (radar, special observations) in a common format.

Among these sites only CAMP/Tibet on the Tibetan Plateau, CAMP/Himalayas on the Himalayan mountain range and Pakistani Karakorum Network on the Karakorum mountain range are located at high elevation (altitude >2500 m a.s.l.). Furthermore the AWS of Forni Glacier (Italian Alps) together with the observatory of Mount Cimone (Apennines) have been recently included as new CEOP Reference Sites.

Possible stations that could be considered part of the HE network should ensure: availability of long term instrumentation, homogeneity and completeness of data, regional coverage, sampling the free troposphere and should be equipped with high precision sensors and real-time data transmission systems.

According to these characteristics, stations could be classified: HE Weather Stations (AWS or synoptic stations); HE Observatories (full-scale scientific observatories), and HE Research Stations (AWSs operational for a limited period of time), HE reference stations should generally belong to “HE Observatories” category.

CEOP Reference Sites would represent the first step for the implementation of a global HE network that would be enhanced with the inclusion of additional existing non-CEOP stations and the installation of new observatories in significant but unrepresented areas. HE will develop QA/QC protocols for installation and maintenance of HE sites to guarantee harmonization of data in accordance with CEOP data policy.

All data will be stored in an electronic archive and datasets will be analyzed and integrated with satellite data. Data will also be used to improve the implementation of hydro-climatic models.

HE would strictly collaborate with other CEOP elements, including Regional Hydroclimate Projects (MAHASRI, CPPA), other Regional Studies (Cold Region Studies, Monsoons, SARS) and Cross-Cutting working groups (WEBS, Extremes, Aerosol). Such collaboration would especially concern aspects that directly influence (monsoon circulation, aerosols) or characterize HE areas (arid conditions, cold temperatures, etc.).

CEOP-HE would benefit of the experience of Ev-K2-CNR/SHARE project and would establish a coordinated activity between the high altitude climatic stations with aims at building a network within CEOP reference stations.

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