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High altitude environmental monitoring: the SHARE project and CEOP-HE

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Mountain areas above 2,500 m a.s.l. constitute about 25% of the Earth's surface and play a fundamental role in the global water balance, while influencing global climate and atmospheric circulation systems. Several millions, including lowlanders, are directly affected by the impacts of climate change on glaciers and water resource distribution. Mountains and high altitude plateaus are subject to the highest rate of temperature increase (e.g., Tibetan Plateau) and are recognized as particularly vulnerable to the effects of climate change. In spite of this, the number of permanent monitoring sites in the major environmental networks decreases with altitude. On a sample of two hundred high altitude automatic weather stations located above 2,500 m a.s.l., less than 20% are over 4,000 m, while there are only 24 stations in the world that could be considered "complete" high altitude observatories. Furthermore, entire mountain areas are left uncovered, creating significant data gaps which make reliable modelling and forecasting nearly impossible.

In response to these problems, Ev-K2-CNR has developed the project SHARE (Stations at High Altitude for Research on the Environment) with the support of the Italian government and in collaboration with UNEP. This integrated environmental monitoring and research project aims to improve knowledge on the local, regional and global consequences of climate change in mountain regions and on the influence of high elevations on climate, atmospheric circulation and hydrology. SHARE today boasts a network of 13 permanent monitoring stations between 2,165 m and 8,000 m. Affiliated researchers have produced over 150 scientific publications in atmospheric sciences, meteorology and climate, glaciology, limnology and paleolimnology and geophysics. SHARE network data is also contributed to international programs (UNEP-ABC, WMO-GAW, WCRP-GEWEX-CEOP, NASA-AERONET, ILTER, EU-EUSAAR, EU-ACCENT). Within this context, the CEOP-High Elevations (CEOP-HE) element of regional focus was developed under the GEWEX CEOP programme to study multi-scale variability in water and energy cycles in high elevation areas, and to help improve observations, modelling and data management.

Future plans include expansion of the SHARE network, addition of other key research areas including hydrology, and creation of mechanisms to favour exchange of data amongst high altitude networks. In coordination with other global research and monitoring projects (CliC, etc.), SHARE and CEOP-HE could provide a more organic and well-distributed interdisciplinary network, thus allowing governments and international agencies to better face impacts of climate change effects on energy and water budgets and elaborate appropriate adaptation strategies.