A PROTOTYPE OBSERVATION SYSTEM FOR WATER RESOURCES IN SOUTH-EAST ASIA

Menenti, M., Jia, L., Colin, J., Wang, J., Shen, X., Ueno, K., Immerzeel, W.

ABSTRACT:

The synergy of ground and space observations to monitor water resources in the Qinghai-Tibet Plateau and to further current understanding of the Asian Monsoon System is being evaluated by the CEOP - AEGIS project funded by the European Commission under the FP7 Theme Environment.

The goal is two-fold: a) to construct out of existing ground measurements and current / future satellites an observing system to determine and monitor the water yield of the Plateau; b) to monitor the evolution of snow, vegetation cover, surface wetness and surface fluxes and analyze the linkage with convective activity, (extreme) precipitation events and the Asian Monsoon. Three main elements are foreseen: A) Observations of the terms of the water balance: precipitation, meltwater from snow and glaciers, changes in soil water content and evaporation for a period of three years will be generated by integrating ground and satellite measurements on weekly and monthly basis. Radiative transfer models and algorithms are being developed for different regions of the electro-magnetic spectrum. B) The water balance of the Plateau will be calculated with a distributed hydrological model. Interactions of land surface hydrology with convective activity and the Asian Monsoon will be investigated by using a meso-scale atmospheric model. C) Time-series of image data are being used to demonstrate a Drought and a Flood Early Warning Systems.

The system relies on an existing and expanding network of observatories and on spaceborne observing systems for which data continuity is guaranteed. A Database Management System has been put in place in Lhasa. Highlights of results achieved so far will be presented: a) analyses of the land surface energy balance for the entire Plateau; b) observations of snow cover, snow water equivalent and estimates of snow melt water; c) daily streamflow at selected locations on the seven major rivers of SE Asia obtained with a distributed water balance model.

Land Surface Energy Balance. A new data analysis system has been developed to include several alternate parameterizations and to deal with different sensor configurations, taking into account that different data may be available over time. The parameterizations implemented in the system address the upper and lower bound of Land Surface Temperature (LST) over the full range of evaporative fraction, i.e. from 1 (lower LST bound) to 0 (upper

LST bound), and the Planetary Boundary Layer heat exchange with the land surface. Data generated with a new high resolution modeling and data assimilation system developed by the China Meteorological Administration have been used in the case-studies completed so far. Snow cover and Snow Water Equivalent. Time series archived in the Chinese Glacier Information System and at the CAREERI - CAS archive have been analyzed to assess trends in snow cover and snow water equivalent over the last 40 years. Preliminary results obtained with a new algorithm based on the combination of optical and microwave observations will be presented. Plateau Water Balance. A distributed, raster-based water balance model of the entire Plateau has been developed to ingest the hydrological observations listed above. Daily streamflow is calculated and routed using a DTM at a 5 km x 5 km spatial resolution. The results obtained for a first case study have been evaluated against observations at selected locations along the seven major rivers of SE Asia.