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Hydro-meteorological processes on the Qinghai – Tibet Plateau observed from space

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The Qinghai – Tibet Plateau is characterized by a significant intra-annual variability and spatial heterogeneity of surface conditions. Snow and vegetation cover, albedo, surface temperature and wetness change very significantly during the year and from place to place. The influence of temporal changes on convective events and the onset of the monsoon has been documented by ground based measurements of land – atmosphere exchanges of heat and water. The state of the land surface over the entire Plateau can be determined by space observation of surface albedo, temperature, snow and vegetation cover and soil moisture.

Fully integrated use of satellite and ground observations is necessary to support water resources management in SE Asia and to clarify the roles of the interactions between the land surface and the atmosphere over the Tibetan Plateau in the Asian monsoon system.

New or significantly improved algorithms have been developed and evaluated against ground measurements. Variables retrieved include land surface properties, rain rate, aerosol optical depth, water vapour, snow cover and water equivalent, soil moisture and lake level. The three years time series of gap-free daily and hourly evaporation derived from geostationary data collected by the FY-2D satellite was a major achievement.

The hydrologic modeling system has been implemented and applied to the Qinghai Tibet Plateau and the headwaters of the major rivers in South and East Asia. Case studies on response of atmospheric circulation and specifically of convective activity to land surface conditions have been completed and the controlling land surface conditions and processes have been documented.

Two new drought indicators have been developed: Normalized Temperature Anomaly Index (NTAI) and Normalized Vegetation Anomaly Index (NVAI). Case study in China and India showed that these indicators capture effectively drought severity and evolution. A new method has been developed for monitoring and early warning of flooded areas at the regional scale.