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Observation and modeling of land surface state and convective activity over the Qinghai - Tibet Plateau

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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. This provides spatial patterns in the land surface drivers of atmospheric instability: radiative forcing, land surface temperature and soil moisture contribute to trigger convective events. Heat and vapour fluxes at the land surface have been mapped at high spatial resolution and over periods of time representative of seasonal variability using MODIS and AATSR multispectral radiometric data. The response of surface temperature to vegetation phenology has been studied by using 25 years of AVHRR observations. Snow cover has been monitored by improving and re-calibrating the MODIS snow cover product. The snow water equivalent has been monitored over a period of 28 years using SMMR and SSM/I 18 and 37 GHz data and an improved algorithm. Linkages between land surface conditions, convective events and the onset of the Asian Monsoon have been investigated using two Numerical Weather Prediction Models: GRAPES in China and WRF in Japan to analyze a set of case-studies. These first experiments were aimed at evaluating the linkages of land surface conditions with intense rainfall events in the region. Using the modeling and data assimilation system GRAPES a series of experiments was performed to assess the sensitivity to different types of Land Surface Models. Combined use of medium resolution thermal infrared sensors like AATSR or MODIS with GRAPES in a Multi-Scale Surface Energy Balance System has provided turbulent flux maps at a kilometric resolution on the entire Tibetan Plateau. Both meso and local scale approaches are compared and discussed to analyse the effect of sub-grid heterogeneity on land surface and turbulent flux parameterisation.