Multi-annual data products on turbulent heat fluxes at the local and continental scale using AATSR and FY-2 data.

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Monitoring of the Surface Energy Balance using multi-spectral radiometric data has been investigated in several ways during the entire duration of the project. Two objectives have been pursued: the parameterization of turbulent heat fluxes and the integration of land surface observations with model-generated atmospheric boundary layer data. The parameterization of sensible and latent heat fluxes has been improved by using LIDAR data acquired over the Yingke area for the characterization of surface roughness length for momentum. The extraction of a digital surface model from LIDAR cloud points, associated with ground wind measurements in a CFD model, had provided 3-dimensional wind fields. Maps of aerodynamic roughness length were generated by inversion of wind profiles. Also other geometrical approaches for roughness length retrieval were evaluated. Land surface evaporation was calculated by the combination of airborne VNIR & TIR, ground meteorological observations and roughness length calculations. SEB algorithms rely on a good characterization of atmospheric state, generally provided by measurements. For regional studies, concurrent atmospheric soundings are rarely available. The use of meso-scale atmospheric models, fed by meteorological reanalysis, improves the spatial and temporal resolution of the atmospheric data, such as wind profile from surface to planetary boundary layer, and better match with the AATSR acquisition time. Early results show that such computations are consistent with radiosoundings acquired over the Heihe River basin by the WATER project team. Next, the up-scaling of parameterization developed at the local scale to larger spatial scales was investigated using the bi-angular AATSR radiometric data to capture the effect of land surface heterogeneity on heat exchange in combination with atmospheric data generated with the GRAPES modeling and data assimilation system. This approach was applied to the entire HeiHe river basin and evaluated with flux data collected on the Qinghai- Tibet Plateau. Finally the Multi Scale Surface Energy balance System has been implemented for a 2.4 106 km2 area including the Plateau and the headwaters of the major rivers of East and South Asia. Hourly data collected by the FY-2 geostationary satellite have been used to generate gap-filled observations of land surface temperature. The results have been evaluated against measurements of sensible heat flux by Eddy Covariance and Large Aperture Scintillometer systems at locations in the Qinghai Tibet Plateau. Our investigation did benefit from the availability of simultaneous airborne, space-borne remote sensing data and ground-based observations over the HeiHe River basin. ''Watershed Allied Telemetry Experimental Research'' (WATER) Keywords: Surface Energy Balance, Land surface evaporation, Optical remote sensing, AATSR, LIDAR, Meso-scale atmospheric model.