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Soil Moisture Content Retrieval based on Apparent Thermal Inertia for the Xinjiang province in China

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In Xinjiang, the most north-western province of China, soil moisture is the main hydrological driver for vegetation growth. With the launch of MODIS, local MODIS reception capacity and the strong pressure on water resources, the detection and mapping of soil moisture content has become a major issue for the regional water management authorities of the province.
In our poster we present an approach based on apparent thermal inertia to quantify soil moisture content. We report as well on soil moisture content mapping for the entire province for the year 2005. In the estimation approach, diurnal LST difference and broadband albedo are applied to determine the space-time variability of soil moisture content. The retrieval of soil moisture content is based on the rationale that high apparent thermal inertia (ATI) values correspond with high soil moisture contents (SMC) and low ATI values correspondingly with minimal SMC. To enable the application of the technique, a new classification of soil texture was established based on an existing Chinese soil type classification.
For validation purposes, data from eight sites of the automatic weather station and Time Domain Reflectometry (TDR) network of the province were used for the year 2005. The datasets have been acquired by the Xinjiang Meteorological Bureau (XMB), the Tarim Water Management Bureau (TMB) and the Xinjiang Institute for Ecology and GIS (XIEG).
When time series of SMC determined by using ATI are compared with measured SMC at the different validation sites, regression curve slopes of the validation relationships vary between 0.499 and 0.922 depending on soil texture. The same is true for the R^2 values, which vary between 0.25 and 0.83. Our results suggest that ATI is quite suitable for the retrieval of a 1 m soil moisture profile in an arid to semi-arid region, but quantitative accuracy is dependent on soil texture class.