RSHS18-7
Remote Sensing and Hydrology Symposium (ICRS-IAHS)

Remote Sensing Based Changes Within Hydrological Storage Components on the Tibetan Plateau – Impact of Global Warming?

Volker Hochschild (1), Gebhard Warth (1), Jan Kropacek (2), and Niklas Neckel (3)

(1) University of Tuebingen, Department of Geography, Tuebingen, Germany (volker.hochschild@uni-tuebingen.de), (2) University of Life Sciences, Kamycka 129, Prague, Czech Republic, (3) Alfred-Wegener-Institut, Am Handelshafen 12, 27570 Bremerhaven, Germany

Climate change and its potential effects are of global interest. Especially on the Tibetan Plateau, the different hydrological storage components (lake levels, lake ice, glacier mass balances and snow coverage) act as effective indicators of climate change due to their sensitivity to climate elements, and can be observed on a large-scale with the help of remote sensing. The lakes on the Tibetan Plateau are important indicators for the development of the high mountain ecosystems facing the impacts of future climatic warming on runoff from snow and ice. Many of these Tibetan lakes are remote and hard to access, so multi-sensoral remote sensing is a valuable tool to generate hydrological relevant information as modeling input (land cover, soil moisture, trends in mountain lake ice cover, etc.) or validation base (lake level changes).

For the monitoring of the lake ice, the first and the last day of the partial ice cover and the period of total ice cover are defined on the basis of temporal high resolution MODIS data. The larger lakes were compared and put into regional groups in order to delineate and define different local trends. For obtaining a better spatial resolution for the calculation of the ice covered area, additional medium and high resolution optical and microwave data (ERS-1, ERS-2, ENVISAT A-SAR, LANDSAT, Kompsat-2, RapidEye) are being considered, which at the same time, have a smaller temporal resolution. By means of correlating the different data, the respective advantages of each data type are merged and then used for the exact iced surface area calculation.

The snow cover is an important intermediate storage of water and plays a crucial role in the water budget of the Tibetan endorheic lakes, since their contribution to runoff is mostly unknown as well as the loss through sublimation. It is observed by multi-temporal MODIS 8-day snow cover composites, which were split into three different seasons and displayed as RGB synthesis of snow distribution (RSD, Kropacek et al. 2010). Further multi-sensoral remote sensing analysis include the observation of lake level alterations by satellite altimetry as well as the investigation of the glacier volume or the glaciated area inside the basins with time series of ICESat data, TanDEM-X data and Structure-from-motion techniques through DEM differencing.

The study was financed by the German Research Association (DFG) within the priority program 1372 (TiP) “Tibetan Plateau: Formation – Climate – Ecosystems” as well as from the German Ministry of Research (BMBF) within the WET (Variability and Trends of water balance components in benchmark-catchments of the Tibetan Plateau) scientific cooperation and the TanDEM-Ice Project.