Characterisation of hydrological processes using active and passive RS systems: case-studies in the Qinghai – Tibet Plateau.

Menenti, Massimo[1]; Faivre, R.[2]; Colin, J.[2]; Lindenbergh, R.[1]; Van Den Bergh, L.[1]; Yu, H.[1]; Jia, L.[3]; Xin, L.[4]

[1]Delft University of Technology, NETHERLANDS; [2]Image Sciences, Computing Sciences and Remote Sensing Laboratory, University of Strasbourg, FRANCE; [3]Alterra, Wageningen University and Research center, NETHERLANDS; [4]Cold and Arid Regions Environmental and Engineering Research Institute, CAS, Lanzhou, CHINA

Glaciers surface and flow, lake level, vegetation structure and heat and water exchanges at the land – atmosphere interface have been observed using a variety of satellite sensors in different areas of the Qinghai – Tibet Plateau. Existing imaging spectro-radiometers, radars, microwave radiometers, backscatter LIDAR and SAR provide a very comprehensive suite of measurements over a wide range of wavelengths, time frequencies and spatial resolutions. It is however needed to devise new algorithms to convert these measurements into useful eco-hydrological quantitative parameters for hydrological modeling and water management. The DRAGON II project entitled Key Eco-Hydrological Parameters Retrieval and Land Data Assimilation System Developmentin a Typical Inland River Basin of Chinas Arid Region (ID 5322) aims at improving the monitoring, understanding and predictability of hydrological and ecological processes at catchment scale, and promote the applicabilityof quantitative remote sensing in watershed science. Existing Earth Observation platforms provided by and through the European Space Agency as well as prototype airborne systems developed in China - ENVISAT/AATSR, ALOS/PRISM and PALSAR, Airborne LIDAR - are used and combined to retrieve advanced land surface physical properties over high elevation arid regions of China. The results presented have been obtained building upon the synergy of this 5322 project, the CEOP-AEGIS project (FP7) and the WATER project (CAS). ICESAT/GLAS data over the entire lifetime of the system (2003 – 2009) have been analyzed to evaluate relationships between observed waveforms and glacier morphology. ALOS/PRISM have been used to construct a high resolution DTM of a glacier in preparation of further analyses of changes in glaciers volume and mass.The ICESAT/GLAS data have been used to determine trends in lake level for about 200 lakes in the Plateau. Different zones have been identified with different trends. ALOS/PALSAR interferometry has been used to determine Line Of Sight displacements for a first glacier. The estimation of glacier flow velocity using feature tracking instead of interferometry has been evaluated. Airborne LIDAR data have been used to map the aerodynamic roughness in an agricultural landscape using a novel method based on Computational Fluid Dynamics (CFD). AATSR data have been used to parameterize heat fluxes with a single- and a dual-source parameterization of sensible heat flux. The parameterization of aerodynamic resistance in the single-source model will be based on upscaling the results of the high resolution mapping with airborne LIDAR and multi-angular imaging radiometers (WIDAS). Keywords: Optical remote sensing, LIDAR, Digital surface model, Roughness length, Surface Energy balance, Evaporation