Geophysical Research Abstracts
Vol. 18, EGU2016-12972, 2016
EGU General Assembly 2016

Integration of multi-sensor data to measure soil surface changes

Anette Eltner and Danilo Schneider

Institute of Photogrammetry and Remote Sensing, Technische Universität Dresden, Dresden, Germany
(anette.eltner@tu-dresden.de)

Digital elevation models (DEM) of high resolution and accuracy covering a suitable sized area of interest can be a promising approach to help understanding the processes of soil erosion. Thereby, the plot under investigation should remain undisturbed. The fragile marl landscape in Andalusia (Spain) is especially prone to soil detachment and transport with unique sediment connectivity characteristics due to the soil properties and climatic conditions. A 600 m^2 field plot is established and monitored during three field campaigns (Sep. 2013, Nov. 2013 and Feb. 2014).
Unmanned aerial vehicle (UAV) photogrammetry and terrestrial laser scanning (TLS) are suitable tools to generate high resolution topography data that describe soil surface changes at large field plots. Thereby, the advantages of both methods are utilised in a synergetic manner. On the one hand, TLS data is assumed to comprise a higher reliability regarding consistent error behaviour than DEMs derived from overlapping UAV images. Therefore, global errors (e.g. dome effect) and local errors (e.g. DEM blunders due to erroneous image matching) within the UAV data are assessed with the DEMs produced by TLS. Furthermore, TLS point clouds allow for fast and reliable filtering of vegetation spots, which is not as straightforward within the UAV data due to known image matching problems in areas displaying plant cover. On the other hand, systematic DEM errors linked to TLS are detected and possibly corrected utilising the DEMs reconstructed from overlapping UAV images. Furthermore, TLS point clouds are filtered corresponding to the degree of point quality, which is estimated from parameters of the scan geometry (i.e. incidence angle and footprint size). This is especially relevant for this study because the area of interest is located at gentle hillslopes that are prone to soil erosion. Thus, the view of the scanning device onto the surface results in an adverse angle, which is solely slightly improved by the usage of a 4 m high tripod. Surface roughness is considered as a further parameter to evaluate the TLS point quality.
The filtering tool allows for choosing each data point either from the TLS or UAV data corresponding to the data acquisition geometry and surface properties. The filtered points are merged into one point cloud, which is finally processed to reduce remaining data noise. DEM analysis reveals a continuous decrease of soil surface roughness after tillage, the reappearance of former wheel tracks and local patterns of erosion as well as accumulation.