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A multi-sensor approach to assess erosion risk in low mountain range landscapes - a comparative case study in western Germany

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In this presentation we summarize our experience in the derivation of variables for identification of erosion and areas endagered of erosion from different remote sensing sensors. The field study is situated at the "Zemmer-Plateau" (north-east from Trier) and was undertaken to compare the ability of different, passive and active, remote sensing sensors to derive several process parameters of soil erosion in agricultural landscapes. Additionally the added value of sensor combinations was investigated.

Backscatter of C-Band microwave instruments is known to be sensitive to soil roughness and surface soil moisture. If landuse and roughness is approximately constant, backscatter is mostly affected by temporal changes in soil moisture. For the test site multitemporal imagery from the ASAR and ERS2 sensors was available. For the identification of areas prone to waterlogging an approach based on principal component analysis was used.

Multitemporal imagery from optical sensors like Landsat and SPOT HRV allow the assessment of slow changes within the landscape and annual changes of vegetation cover. We used Landsat imagery from 1975, 1984 and 2000 to map the changes in landuse and associated soil development, multi temporal imagery from SPOT 4 and 5 satellites was used to identify different crop types. Additionally we investigated which areas that are prone to erosion by their topography position, have, due to maladjusted land management, not been protected by vegetation cover during the main annual rainfall season in 2003.

Airborne Laser Scanning (ALS) data is well suited for discovering areas susceptible of erosion. Even under forest canopies ALS can provide high-resolution terrain models that can be used for identifying trenches, linear features, steep hills and other terrain features, which trigger erosion or are even results of erosion. ALS-derived DTMs usually have a spatial resolution of about 1 m, while DTMs from other data sources are much coarser. A key problem when working with ALS is finding the echoes that have really been reflected by the ground and not by buildings or vegetation. This is achieved by filtering the last and only return laser points. The investigations were aided be the analyses of two Quickbird datasets.

The information layers derived from different sensors were merged into a preliminary erosion information system. This data base allows the identification of areas prone to erosion risk. Furthermore the results allow setting the focus on the most effective methods for further investigations.