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Pattern recognition in soil moisture distribution on agriculture land derived from remote sensing SAR- and thermal-data

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On the one hand information on soil moisture pattern plays a crucial rule for optimising harvest yield, the assessment of resistance against water logging and soil compaction or for hydrological modelling. On the other hand we have to recognise that sensitiveness against precipitation may be coupled with several different geographical factors like soil patterns, geology or aspect and slope. On a higher level there might be rules of landscape predeterminations and self organisation. To enable investigation in soil moisture pattern on meso scale it seams to be obligate to employ remote sensing methods.

The presented studies take place in a region northwest of Trier (Bitburger Gutland, Rhineland-Palatinate), dominated by agriculture. Only these cultivated areas with slopes not steeper than 7 % were investigated. All other parts, with settlement, meadows or the steep and forested valley were excluded. We employed a multi temporal and multi sensor data set that consists out of active radar data from ERS2 (13 scenes, C-Band, VV polarisation) and ASAR (12 scenes, C-Band, VV (HH) polarisation) sensors and Landsat thermal data. Imagery covers the year 2004 (ERS2 and Landsat) and 2005 (ERS2, ASAR). Radar data was taken under different geometric conditions what results in inhomogeneous data sets. All scenes are commercial products, taken under standard conditions.

The SAR-datasets were calibrated by soil moisture and discharge measurements accomplished in several test catchments. By using temporal comparison and principal component transformation techniques the influence of different view angels and

topography should be reduced. Partial results show a god fit between discharge, backscatter and gravimetric soil moisture. A preliminary validation based on topographical index and field investigations prove the coincidence between the remote sensed and the analysed data. Using comprehensive field data for calibration, it seems to be feasible to extract soil moisture information (dynamic, rapid saturation areas) even from heterogeneous data sets.

Further investigation had been focused on the recognition of patterns in radar and optical data for soil moisture spreading. Simulations spatial correlations between data sets from different sensors and years had been under investigation. Although thru the concentration on agriculture fields a preselection take place, we had been interested in linkages between observed soil moisture patterns and geomorphic processes, soils and ecology.