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Use of multi-temporal series of COSMO-SkyMed and PALSAR SAR data for landcover classification and soil moisture retrieval over agricultural sites

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The availability of high-frequency temporal series of SAR acquisitions from space platforms makes possible the use of change detection techniques to monitor near-surface soil moisture content globally. The rational of this method is that temporal changes of surface roughness, canopy structure, and vegetation biomass occur over longer temporal scales than soil moisture changes, excluding periods of cultivation. Therefore, variations in surface backscatter observed with a short repeat cycle are expected to mainly reflect changes in soil moisture, since other parameters affecting radar backscatter can be considered fairly constant. Moreover, because the temporal series of SAR acquisitions included L-band (PALSAR) and X-band (COSMO-SkyMed) frequencies, accurate classification of crops is also possible, which is usually an important prerequisite for the application of SAR retrieval algorithms.

In this context, the objectives of this study were to investigate the applicability of a soil moisture retrieval algorithm, based on the use of temporal changes of SAR backscatter response [1], to multi-temporal PalSAR and COSMO-SkyMed SAR data acquired over the Yanco study area in South-Eastern Australia. The Yanco area is a flat semi-arid agricultural and grazing area of approximately 60 km x 60 km, located in the broad western plains of the Murrumbidgee catchment. The principal summer crops are rice, maize and soybeans, while winter crops include wheat, barley, oats and canola. The area has been hydrologically monitored by the OzNet soil moisture monitoring network (http://www.oznet.org.au/) since 2001. The Yanco study area consists of 13 long-term soil moisture monitoring sites installed in a grid-based pattern to continuously monitor precipitation, soil moisture and soil temperature at various depth.

This study illustrates the methodology used and provides a preliminary assessment of the algorithm results in terms of crop classification and soil moisture mapping.

References

[1] A. Balenzano, F. Mattia, G. Satalino, M.W.J. Davidson, “Dense temporal series of C- and L-band SAR data for soil moisture retrieval over agricultural crops”, IEEE J-STARS Special Issue on Temporal Change Observation for Bio-Geophysical Parameter Retrieval in Agricultural from SAR and Optical data, DOI: 10.1109/JSTARS.2010.2052916, 2010.