Geophysical Research Abstracts,
Vol. 10, EGU2008-A-03063, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-03063
EGU General Assembly 2008

Soil moisture retrieval from L-band SAR data and hydrologic modelling

F. Mattia (1), G. Satalino (1), V.R.N. Pauwels (2), A. Loew (3) and W. Timmermans (4)

(1) Consiglio Nazionale delle Ricerche (CNR), Ist. Studi sui Sistemi Intelligenti Per l'Automazione (ISSIA), Bari, Italy (F.Mattia@ba.issia.cnr.it)

(2) Ghent University, Lab. of Hydrology and Water Management (LHWM), Ghent, Belgium

(3) University of Munich (LMU), Dep. of Geography and Remote Sensing, Munich, Germany

(4) Int. Inst. for Geo-Information Science and Earth Observation (ITT), Enschede, The Netherlands

Soil moisture content is a parameter of major importance for land applications at both watershed and regional scale such as hydrology and agriculture. In the past, a vast number of experimental and theoretical studies relating radar measurements to soil and vegetation parameters have been conducted. Such studies have widely demonstrated the sensitivity of Synthetic Aperture Radar (SAR) measurements to soil moisture content. The inverse problem of retrieving soil parameters from the observed radar response of the surface has also been widely investigated, although, no retrieval algorithm is yet operational. An important part of the limitations to monitor superficial soil moisture is due to the disturbing effect of surface roughness and vegetation layer modulating the radar sensitivity to the soil moisture content thus rendering intricate the retrieval problem. A promising approach consists of using multi-temporal SAR data and a priori information on surface parameters to improve the robustness and the accuracy of retrieval algorithms [e.g. Mattia et al., *TGARS*, vol. 44, n. 4, April 2006]. To gather a priori information on soil moisture content different approaches, ranging from networks of ground stations to estimates derived from spaceborne microwave radiometer or from hydrologic modelling, can be exploited.

This paper presents an algorithm retrieving soil moisture content of wheat fields by using multi-temporal L-band SAR data and hydrologic modelling.

The work is based on SAR and ground data acquired over the Demmin (Germany) agricultural site during the AGRISAR 2006 campaign, funded by the European Space Agency. From April to July 2006, approximately every week, multi-frequency, multi-polarization radar data were acquired by the airborne E-SAR system operated by the Deutsches Zentrum für Luft- und Raumfahrt (DLR). In addition, ground data in terms of soil roughness, soil moisture, leaf area index, evapotranspiration, etc. were collected during the entire campaign and particularly during three periods of intensive in situ measurements, i.e. end of April, mid-June and beginning of July.

In a previous study [Pauwels et al., *J. Hydrol*, vol. in press, 2007], two hydrologic models, namely PROMET and TOPLATS, were applied and assessed on the AGRISAR data set. In particular, daily estimates of soil moisture profiles of a wheat field on the study area were predicted and compared with continuous in situ measurements acquired by TDR soil moisture probes. In this study, these estimates are used as a priori information for the soil moisture retrieval algorithm, which transforms temporal series of L-band SAR data, acquired at HH polarization and low-medium incidence angles, into soil moisture values.

The paper illustrates the algorithm and its performances. In particular, soil moisture maps concerning the Demmin site are derived and compared with ground measurements gathered during the AGRISAR campaign. Finally, the paper provides recommendations for future work.