

Development and Demonstration of Soil Moisture Determination and INSAR for Catchment Hydrological Monitoring

P.J. Saich, R.J. Miller, Space Division, GEC-Marconi Research Centre,
Chelmsford, Essex CM2 8HN, UK, paul.saich@gecm.com,
<http://www.gmrc.gecm.com>

A.J. Sephton, Space Systems Finland, Keilaranta 8, Fin-02150 Espoo,
Finland, sephton@ssf.fi

C. Collier, N.I. Fox, Telford Research Institute, University of Salford,
Salford M5 4WT, UK, N.I.Fox@civils.salford.ac.uk

Abstract

ERS SAR data acquired during the Tandem Mission have been used to determine catchment slopes and monitor soil moisture as inputs to a hydrological model for predicting the potential for floods in the catchment area of the river Irwell in the UK. A Digital Elevation Model (DEM) has been derived for the area using a pair of ERS SAR images acquired one day apart. This DEM is found to agree with maps of the area to a high degree of accuracy and provides estimates for the local terrain slopes. The soil moisture retrieval makes use of an algorithm that has been motivated by a theoretical scattering model. The algorithm has been developed and tested using ERS SAR data and in-situ measurements acquired over a five month period. The algorithm and radar measurements are found to give a good retrieval of the soil moisture and there are distinct differences between the results from descending and ascending orbits. We believe that this is due to the differing geometry that the radar sees over the hilly terrain when it crosses in opposite directions. We also believe that it ought to be possible to correct for this given information supplied by the DEM.

Keywords: SAR, Radar, Hydrology, Interferometry, Soil Moisture