THE MEDIUM RESOLUTION SOIL MOISTURE DATASET: OVERVIEW OF THE SHARE ESA DUE TIGER PROJECT

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1. INTRODUCTION

Soil moisture is a key element in the global cycles of water, energy and carbon and belongs to the Essential Climate Variables defined by the Global Climate Observing System (GCOS). Soil moisture represents a switch that controls the proportion of rainfall that percolates, runs off, or evaporates from land. Its quantitative representation can bring further improvement in hydrological monitoring and modelling.

Since 1970's the microwave technology dominated the soil moisture retrieval. A variety of coarse resolution datasets became available from active and passive microwave systems (ERS-1/2, METOP ASCAT or AMSR-E) and the potential of these datasets for improvement in hydrological, climatological, and vegetation studies has been amply demonstrated. The importance of the soil moisture as an essential climate variable has been recently manifested by the implementation of the first near real time soil moisture dataset [1]. The dataset is provided from the ASCAT scatterometer onboard Metop and is available via EUMETCAST.

Despite the existing broad research on the soil moisture retrieval, the low spatial resolution (25-50 km) reminds the main constrain and often discourage the hydrological community operating at local (meters or few km) scales from implying remotely sensed soil moisture datasets into hydrological models and products.

2. METHODOLOGY

To address the needs of hydrological community, the medium (1 km) resolution soil moisture dataset has been recently developed (Figure 1) at the Vienna University of Technology in a cooperation with the University of Kwazulu Natal (South Africa). The dataset is acquired using the side-looking Synthetic Aperture Radars (SARs) taking advantage of the Doppler discrimination concept designed to acquire high resolution images. The algorithm has been transferred from the change detection algorithm from the ERS-1/2 scatterometer [5] to the ASAR data.

The 1 km soil moisture dataset has been provided as part of the SHARE European Space Agency DUE TIGER project and aims to provide operational soil moisture monitoring service for the SADC region. The SHARE supplies soil moisture information for the African continent, at a resolution of 1 km, posts on the web, freely accessible to all. Currently, monthly updates of soil moisture maps over Africa (south of 12 N) are available with approximately 2-month lag.

The validation studies of the ASAR Global Mode (GM) 1 km soil moisture dataset with the in-situ data and with the ERS-1/2 and ASCAT scatterometer soil moisture datasets have been performed. The temporal trends in in-situ soil moisture were captured well by the ASAR GM 1 km dataset when compared over the MESONET soil moisture network in Oklahoma, USA [3]. Despite the large differences in spatial and radiometric resolution of the ASAR GM and ERS/ASCAT soil moisture datasets and the low radiometric accuracy of the ASAR Global Mode, the spatial agreement for the ASCAT, ERS and ASAR GM soil moisture products have been demonstrated over Oklahoma as well as in southeastern Australia [4]. A wet bias was demonstrated by the ASAR GM soil moisture when compared to other remotely-sensed dataset as well as in-situ data .

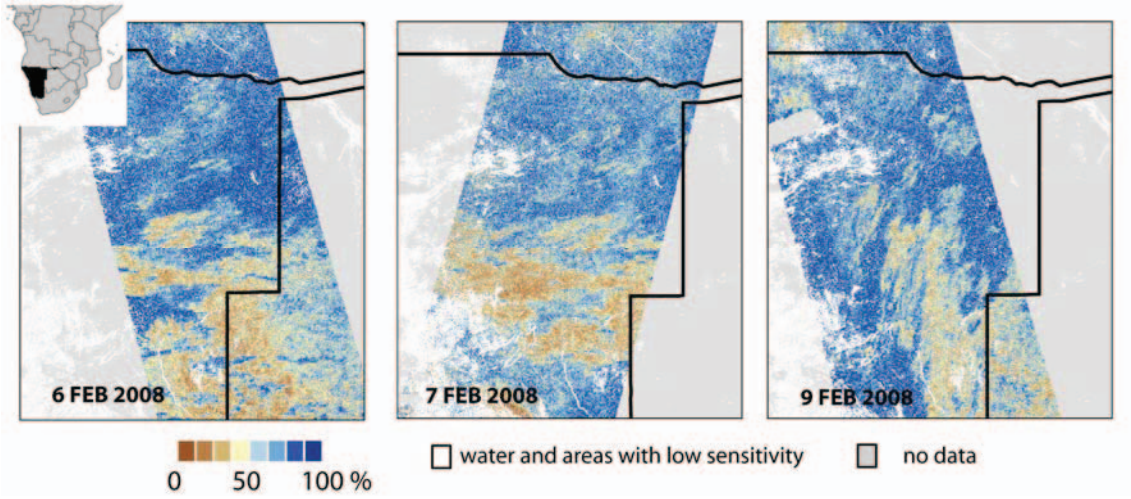

Figure 1. An example of the ASAR GM 1 km soil moisture dataset over the northeastern Namibia in February, 2008.

4. RESULTS AND DISCUSSION

First results obtained over the southern African continent indicate that the method is transferable to large regions and different climatic zones. Further, it was demonstrated that he ASAR GM soil moisture can be clearly related to river discharge measurements [2]. Currently, 37 data requests have been answered since the start of the project in 2006. The application ranges from general modeling, drought and flood assessment up to crop yield forecasting.

Further research is required to understand the errors caused by neglecting seasonal vegetation effects in the retrieval and to understand the source of the demonstrated wet bias. In addition, data assimilation techniques for the effective use of these data in hydrological and meteorological applications are to be developed. The ASAR GM soil moisture data can be obtained from the SHARE project website: http://www.ipf.tuwien.ac.at/radar/share/.

11. REFERENCES

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