GLOBAL MONITORING OF HYDROLOGICAL PARAMETERS IN AFRICA BY USING BOTH ACTIVE AND PASSIVE MICROWAVE SENSORS

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Global monitoring of hydrological parameters with microwave remote sensing requests some knowledge on land cover in order to separate different surface types and apply the most suitable algorithms for estimating the parameters. This is particularly important in areas where the availability of local information, such as thematic maps or cartography, is limited. The use of microwave sensors with appropriate combinations of frequencies and polarizations can significantly improve the potential of single frequency/polarization in separating bare soil from vegetation and snow.

The Advanced Microwave Scanning Radiometer (AMSR-E) is a multi-frequency dual polarized radiometer that can be successfully exploited for global and regional investigations on the Earth's surface parameters and their temporal changes. Indeed, theoretical studies and field experiments, conducted to study microwave emission from land, have revealed a significant sensitivity of brightness temperature to hydrological parameters, such as soil moisture content, vegetation biomass and snow cover and depth, which are of great interest in hydrology, meteorology, climatology and agriculture. On the other hand, the use of SAR sensors (i.e. ENVISAT/ASAR and ALOS/PALSAR), with their well-known sensitivity to geophysical parameters combined with a very high ground resolution, can significantly improve the generation of detailed maps of the surface.

The objective of this work was to characterize different types of land surfaces and estimate hydrological parameters on a global scale by using combined multi-frequency multi-temporal observations from AMSR-E, ENVISAT and ALOS microwave sensors**.**

An extensive research was conducted in the past on some selected test sites, located in different climatic regions of the world, and characterized by a wide range of cover types by using multi-temporal SSM/I, AMSR-E and ERS/WindScatt data. This research allowed the identification of the major characteristics of the observed land surfaces and the estimate of vegetation biomass, soil moisture and snow depth.

In this present study, some areas in Africa, where detailed information was available, have been considered. These areas are located in Morocco, Tunisia, Ethiopia and Senegal. For them cartography and other data have been obtainable through the "Istituto Agronomico per l'Oltremare" (IAO), which is a branch of the Italian Ministry for Foreign Affairs and is a technical-scientific institute for studying, training, consulting and providing technical assistance in the field of tropical and subtropical agriculture and environmental protection.

The available images of ALOS/PALSAR and ENVISAT/ASAR have been collected on these areas and processed along with AMSR-E data. The brightness temperature and the backscattering coefficient values, along with their combinations of polarizations and frequency indexes, have been related to land features, obtained from ground data and cartographic and meteorological information, and their temporal evolution. The seasonal development of vegetation cover and soil moisture has been particularly analysed. The retrieved parameters

have afterwards been used in an algorithm based on Artificial Neural Networks to estimate global soil moisture maps in different climatic regions of the world.