PROgRESSIon: PRotOtyping the Retrievals of Energy fluxes and Soil Surface moIsture

Missions
ENVISAT
SMOS
MSG

Sensors
AATSR
MERIS
MIRAS
SEVIRI

Understanding Earth's system natural processes, as well as the interactions of Earth system components with anthropogenic activities - particularly so in the context of global climate change - has been recognised by the global scientific community as a very urgent and important research direction requiring attention for further investigation. In this framework, being able to accurately and systematically estimate parameters such as the fluxes of heat (H) and moisture (LE) as well as the soil surface water content (Mo) is of great importance, given their relevance to many physical processes of different Earth system components. Yet, at present global operational mapping of those parameters from remote sensing instruments is lacking or is underdeveloped, whereas in general their estimation by remote sensing is done in quite diverse, unconnected methods. Specifically methods combining the biophysical properties encapsulated in a satellite-derived scatter-plot developed between the surface temperature (Ts) and vegetation index (VI) maps often combined with simulations from a land biosphere model have shown a considerable prospect for potential operational implementation scenario.

Based on such a Ts/VI scatterplot based-method concept, the specific objectives of PROgRESSIon are to: 1). Develop a series of prototype products for the operational retrieval of LE/H fluxes and of Mo from the Advanced along Track Scanning Radiometer (AATSR), 2). Develop a prototype algorithm for the improved Mo operational product estimates from the Microwave Imagine Radiometer using Aperture Synthesis (MIRAS) sensor of SMOS mission, based on its synergy with the Spinning Enhanced Visible and Infrared Imager (SEVIRI) radiometer of Meteosat Second Generation (MSG-2) platform and 3). Appraise the added-value of Medium Resolution Imaging Spectrometer (MERIS) and of the Mo prototype product of objective 2, to the retrievals of the prototype products from AATSR obtained from objective 1. Deliverables from PROgRESSIon, among other, will complement other analogous activities currently undertaken by the Agency and worldwide. The same time, the knowledge that will be gained will also have the potential to be used in extending the methods developed herein to future missions planned by the Agency.

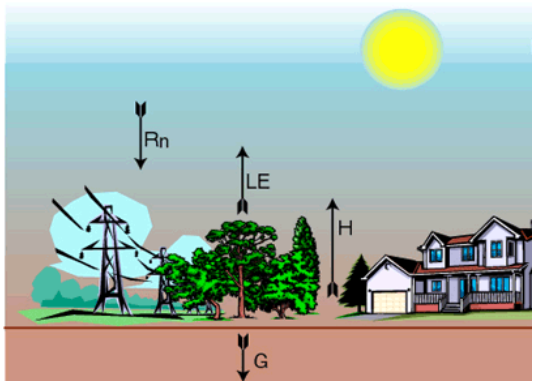

Fig 1.

Fig.1: A schematic representation of surface energy fluxes over land (adopted from https://courseware.e-education.psu.edu/simsphere)

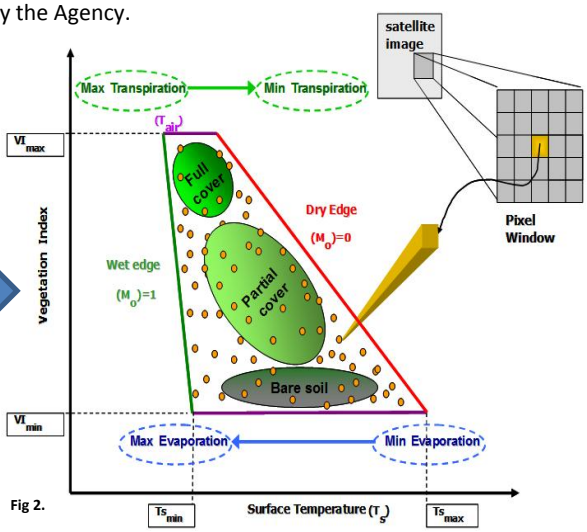

Fig 2.

Fig.2: Summary of the key descriptors and physical interpretations of the satellite-derived Ts/VI feature space (adopted from Petropoulos et al., 2009)

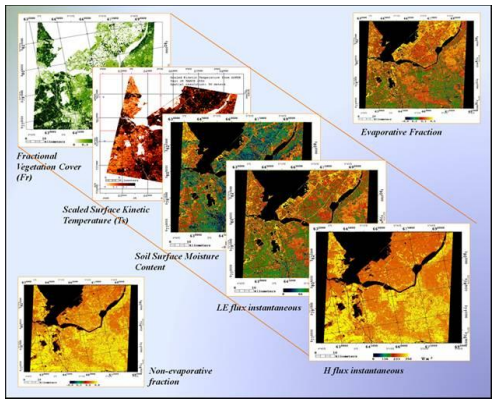

Fig 3.

Fig.3: Example of inverted energy fluxes and Mo maps derived from the implementation of a Ts/VI method using here ASTER imagery and a SVAT model for a region in The Netherlands.

George P. Petropoulos completed his graduate studies (MSc, PhD) at the University of London in the UK in 2008, specialising in the coupling of remote sensing observations with land surface process models for deriving spatially distributed maps of parameters characterising the surface energy balance. He then worked for 1,5 years in the UK, and since May 2009 he has been professionally active in Greece, where he has collaborated with various research and education establishments in his country of residence. He has an interest in the study of land surface interactions and of land use/cover as well as of their changes occurred from either natural hazards or anthropogenic activities, by exploiting Earth Observation data or deterministic simulation process models alone or synergistically.

Dr. George P. Petropoulos, Institute of Applied and Computational Mathematics, Foundation for Research and Technology Hellas (FORTH), Greece