

AIRBORNE SOIL MOISTURE DETERMINATION: DATA FUSSION APPROACH AT REGIONAL LEVEL

Soil Moisture (SM) is considered a key factor in the study of climate change and its associated effects on society, as well as the overall water cycle.

Missions like SMOS or the future SMAP are focused on the recovery of SM, offering spatial resolutions of 40 km (SMOS), and 10 km (SMAP), which are not enough at local/regional level.

At this point, HUMID program is launched by the Supporting Centre of the Catalan Earth Observation Program (PCOT). HUMID program will benefit society by improving knowledge of SM distribution, optimizing crop production, helping on weather forecasters allowing detect risks of droughts, floods, or forest fires.

PROBLEM TO BE SOLVED

HUMID APPROACH

HUMID relies on:

1. ICC aircraft, with two photogrammetric windows, that allow the use of different sensors at the same time.
2. L-band radiometer, which measures the Tb emitted by the surface.
3. Two optical sensors,
 - 3.1. TASI (8-11.5 um) retrieves the Ts, which allows to improve the spatial resolution obtained with the radiometer.
 - 3.2. CASI (0.75-1.4 um), is useful to compute the NDVI parameters, which are employed to mitigate the effects of the vegetation.



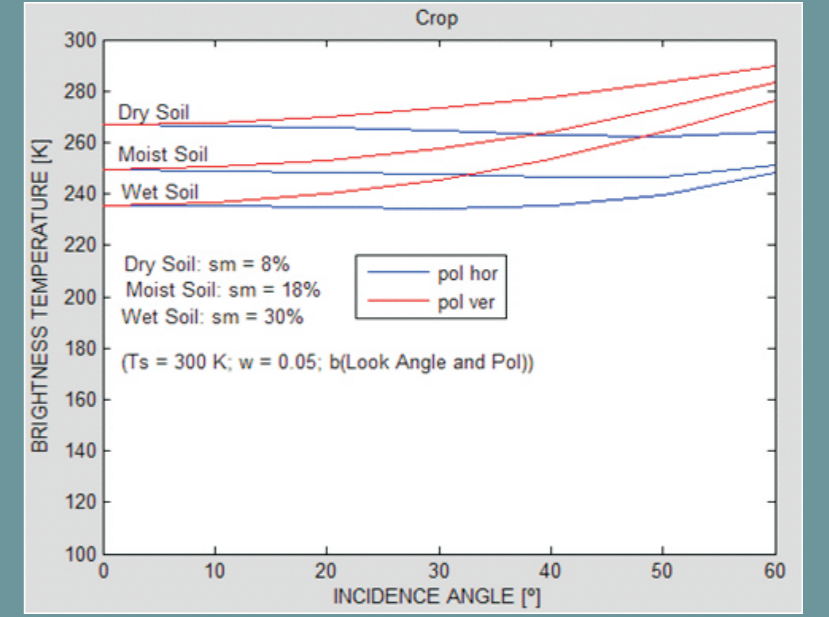
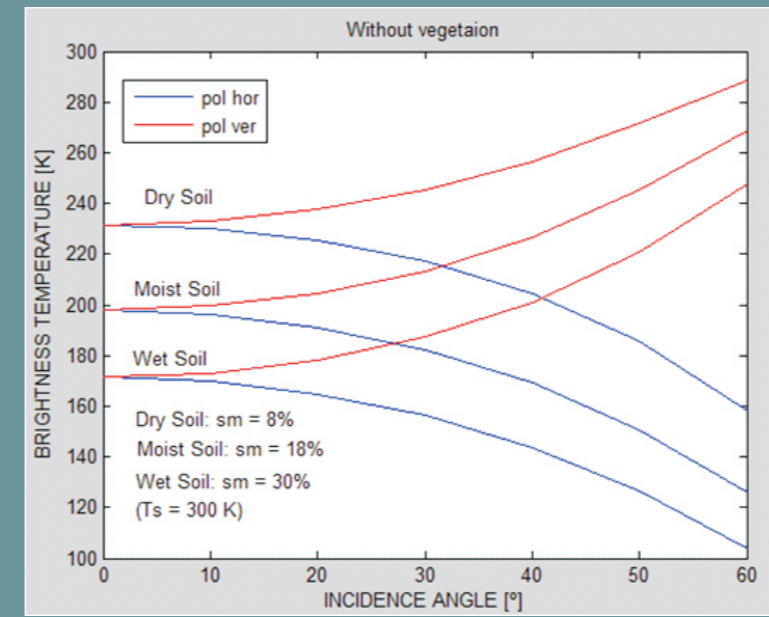
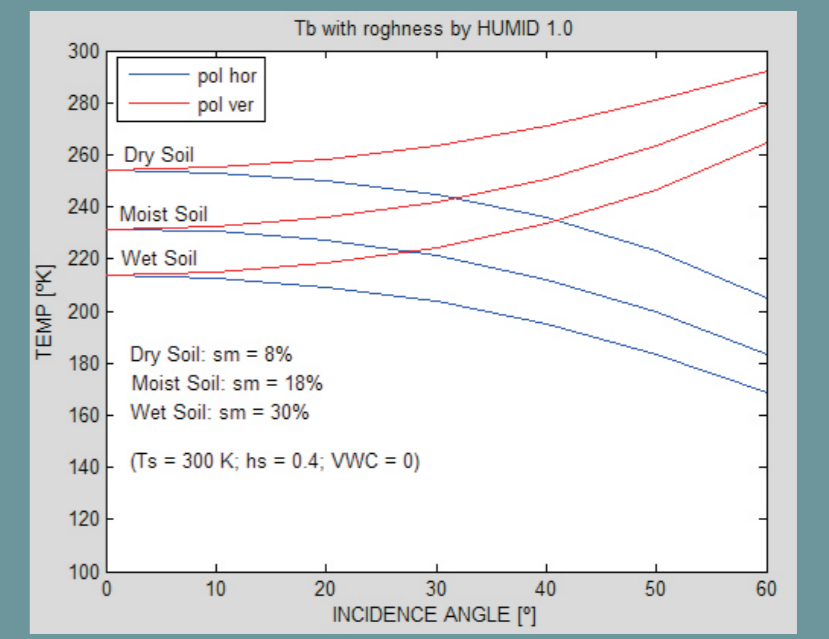
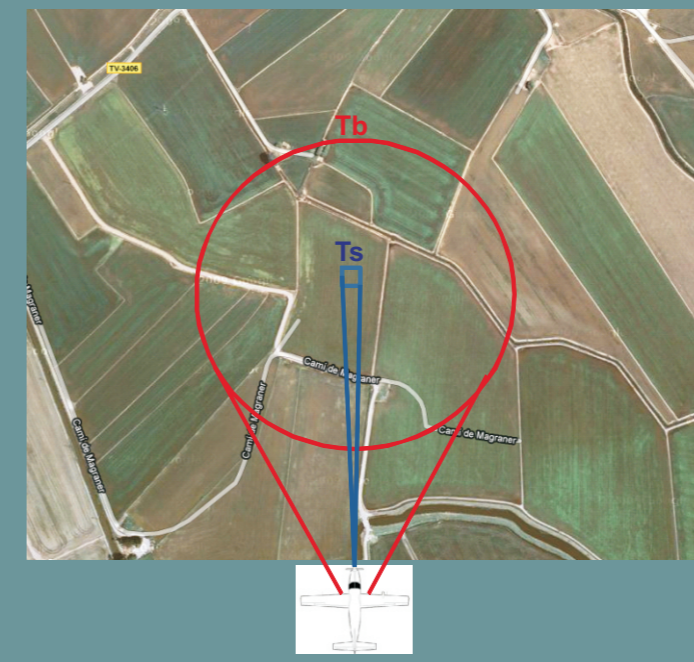
DATA FUSSION

The HUMID program is oriented to obtain soil moisture maps improving the spatial resolution offered by the radiometer, and accounting properly for roughness and vegetation.

The spatial resolution is improved here by means the combination of data from different sensors (L-band radiometer and thermal sensor).

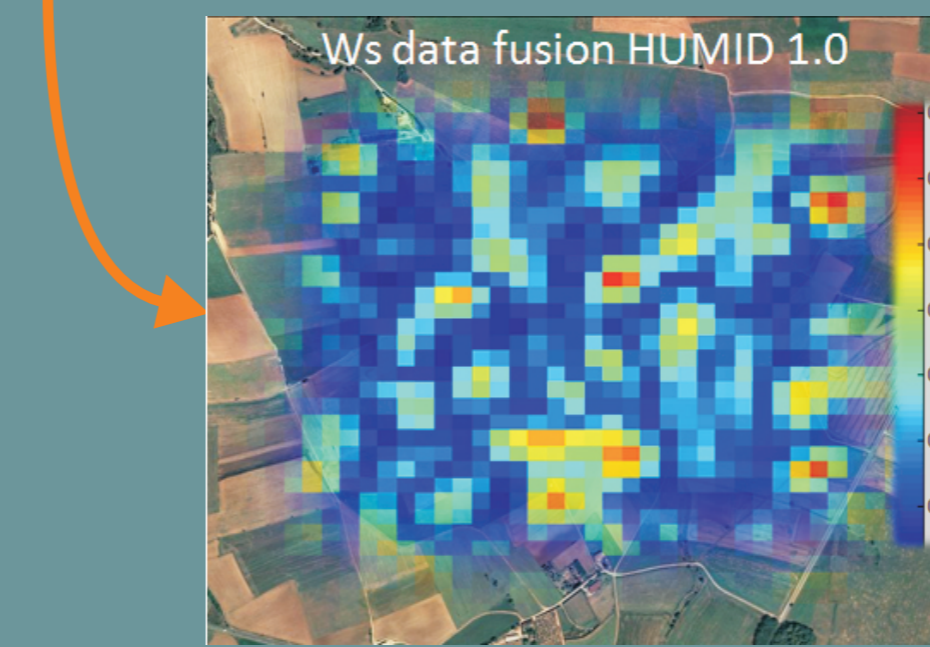
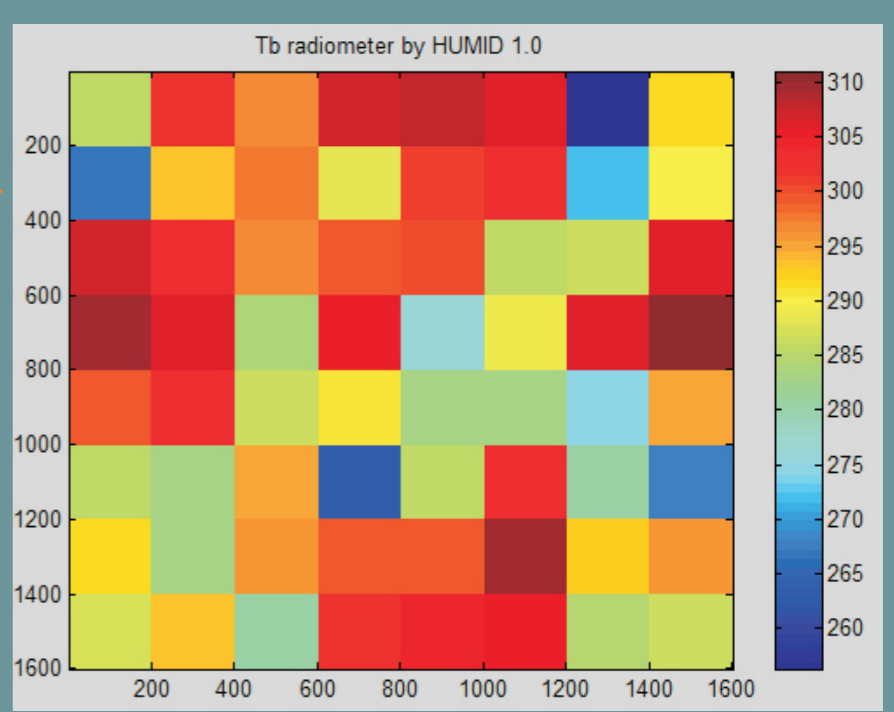
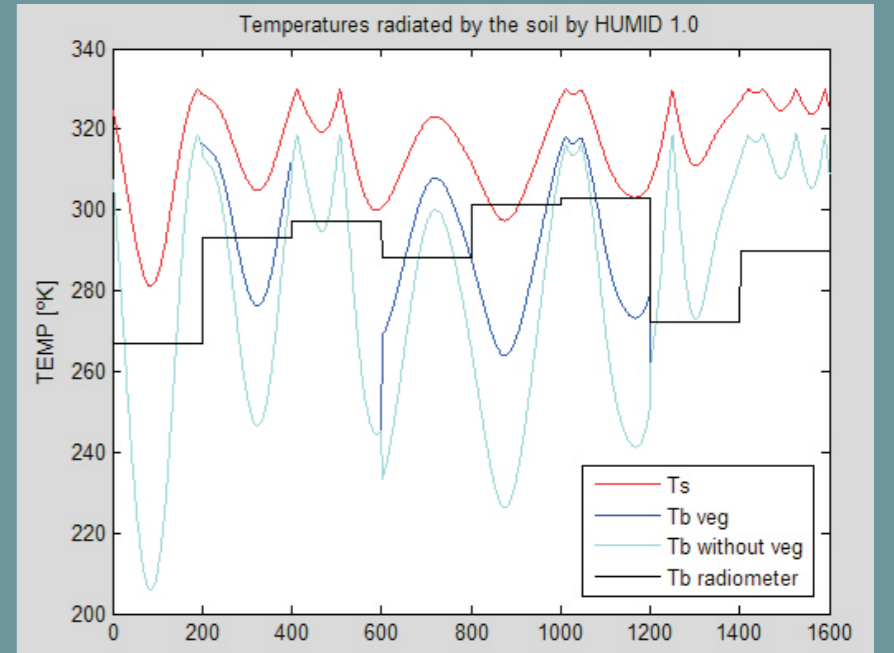
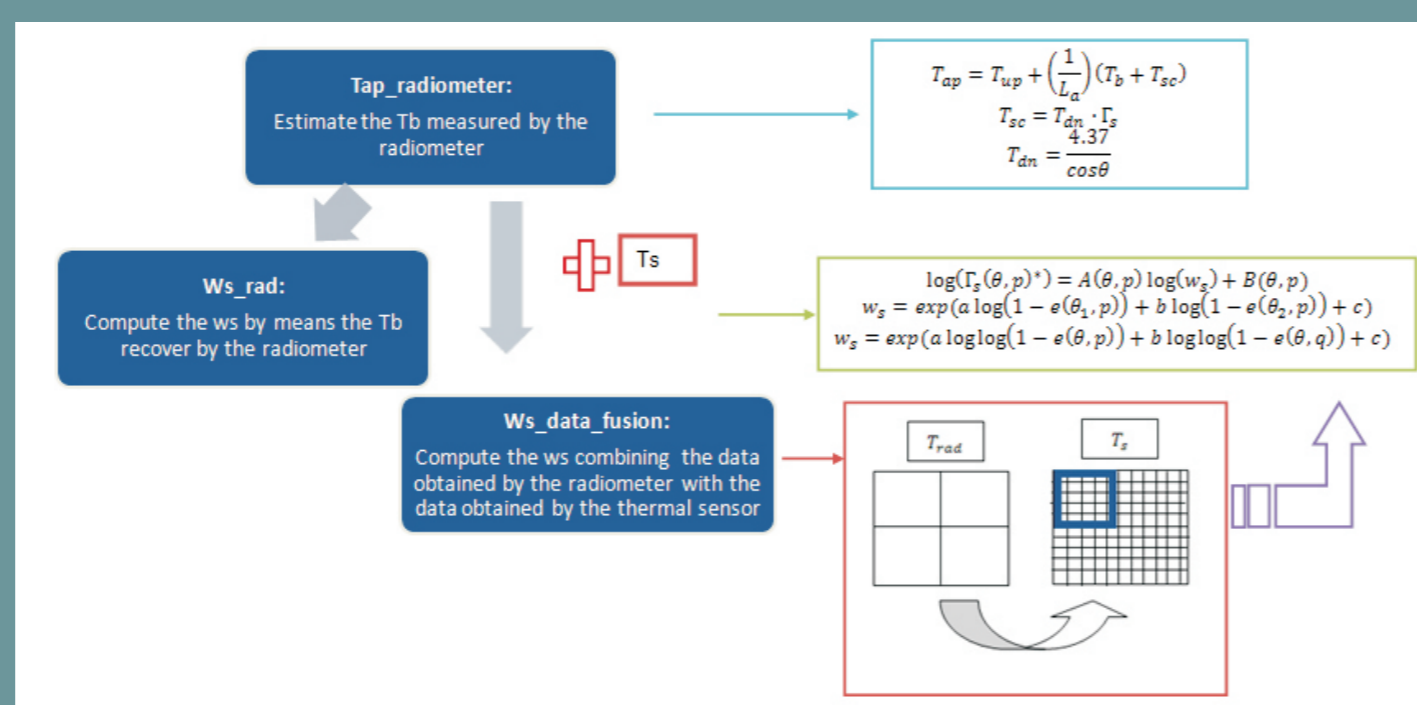
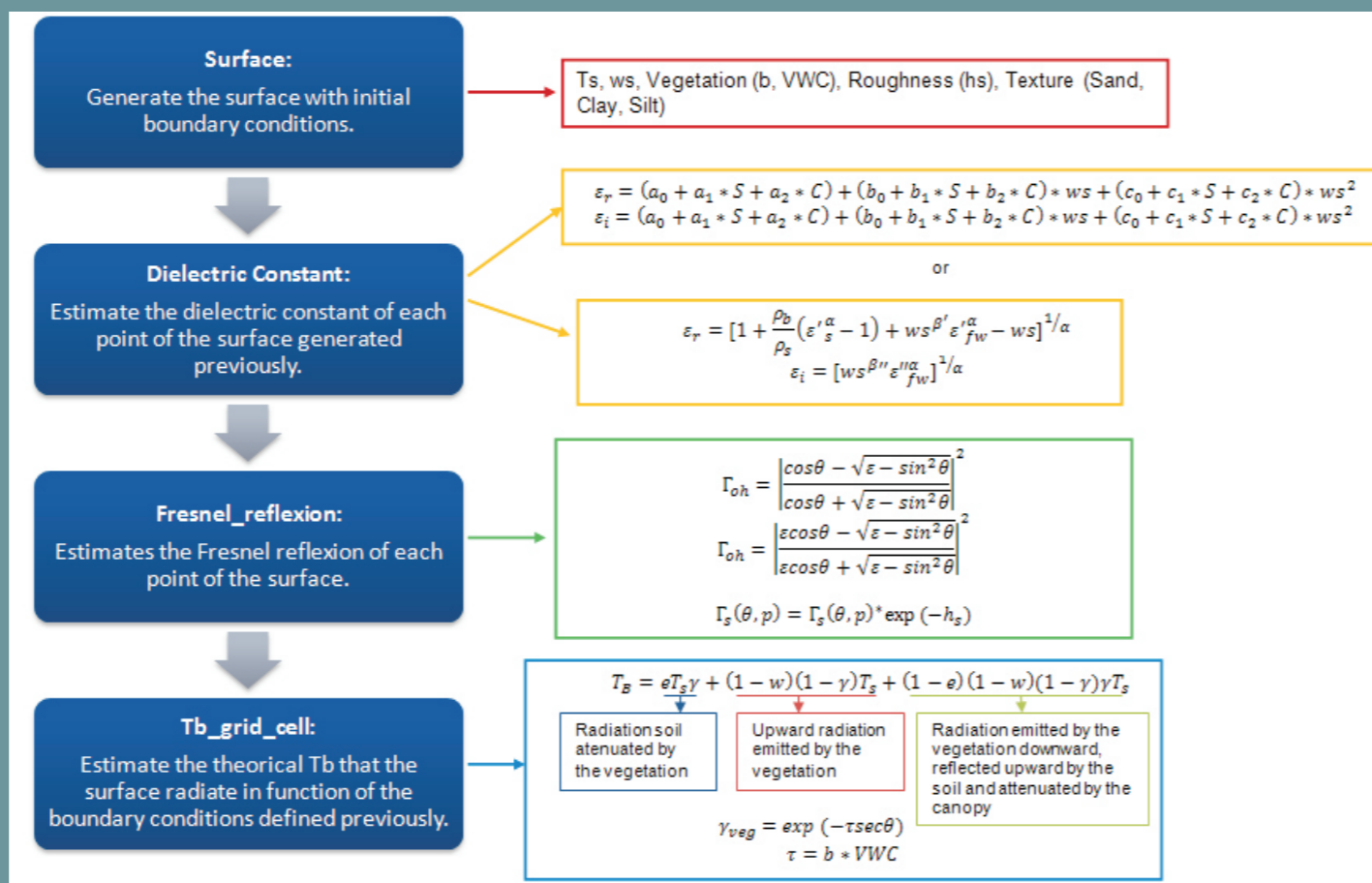
The effect of the roughness is modeled here modifying slightly the Fresnel reflectivity, adding the semiempirical constant 'hs'.

The vegetation effect is overcome by means the employment of the 'NDVI' parameters. In conditions of very dense vegetation, it can be employed a bi-angular or bi-polarization approach.



MODELLING

The model followed is divided in two blocks, one that simulates the radiation emitted by a determined zone or area, and other that simulates the behavior of the radiometer and the soil moisture retrieved.

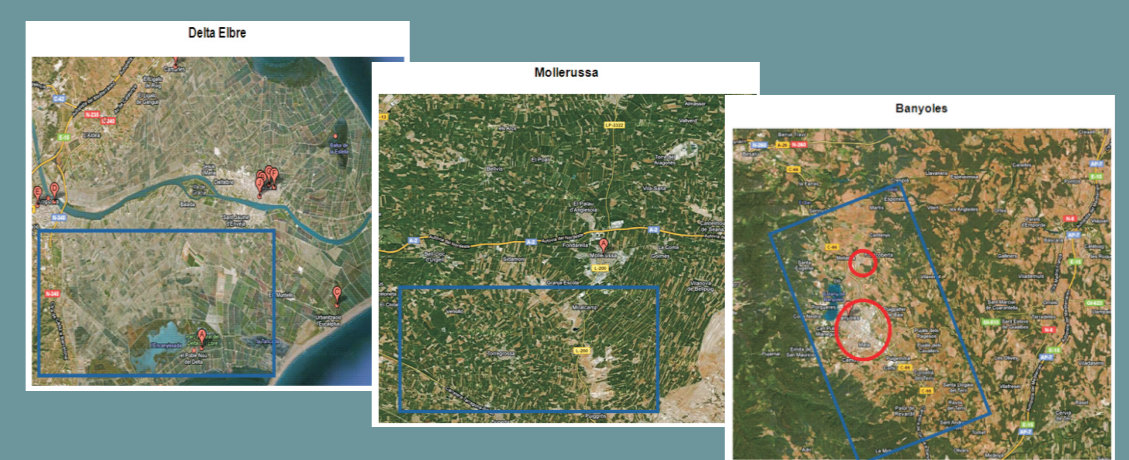


The model is employed to one of the candidates test site (Banyoles).

Applying the data fusion approach the spatial resolution is improved by a factor of 5.

Banyoles is a good candidate since ICC has already undertaken flight campaigns with CASI and TASI sensors, as well as satellite imagery, so that additional information can be used to perform the SM retrieval. Mollerusa and Delta de l'Ebre are interesting because both run experimental ground measurements.

HUMID program is going to run next winter flight campaigns of the test site candidates. Additional analysis of Radio Frequency Interference will be carried out to check potential L band problems.



FUTURE WORKS