EVASPA, a tool for mapping evapotranspiration from space

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EVASPA, a tool for mapping evapotranspiration from space

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Context and objectives:

Evapotranspiration **(ET)** is a fundamental variable of the hydrological cycle. There is a strong need of methods to monitor ET in space and time, e.g. for evaluating crop water use, improving knowledge in surface processes in hydrological or climate modelling, as well as for weather forecast.

We have developed the EVASPA tool to provide continuous mapping of daily ET from remote sensing (RS) data at spatial and temporal scales relevant to hydrological or agronomical studies (Gallego-Elvira et al. 2013).

Further, EVASPA has been designed for providing ET estimations together with estimation uncertainties.

In this poster, we provide examples of EVASPA results over the Crau-Camargue test site (Lower Rhône valley) from MODIS TERRA and AQUA (1km resolution) and LANDSAT-7 ETM+ data (60 m resolution).

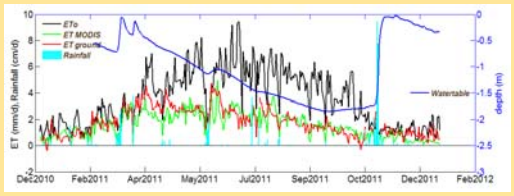
Methods

EVASPA was developed with specific characteristics:

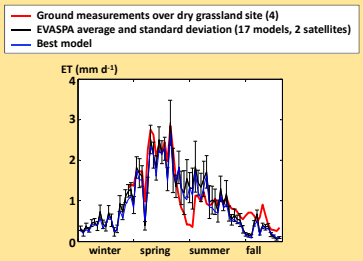
- ET is estimated using several algorithms derived from S-SEBI (Roerink et al. 2000), the 'triangle' method (Tang et al. 2010) and SEBS (Su 2002)
- various equations and data sources are used for estimating input information (net radiation, ground heat flux, evaporative fraction, climate variables…)
- it integrates various RS sensors (and can be easily adapted to new sensors)
- time integration/interpolation procedures are used for calculating daily ET and for providing ET on days without RS images

=> all together this provides a continuous estimation of ET associated to a day-to-day evaluation of the uncertainties in ET derivation (ensemble evaluation)

Comparison of EVASPA estimates to ground data

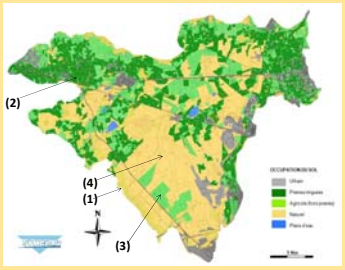


Sansouire = saltmarsh scrubs (in Camargue)

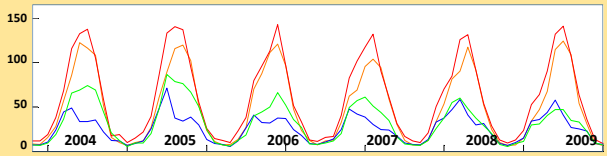


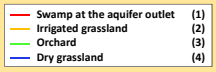
RMSE ranged between 0.6 mm.d^{-1} and 1 mm.d^{-1} depending on the ecosystem and the year.

Land use (~2000)

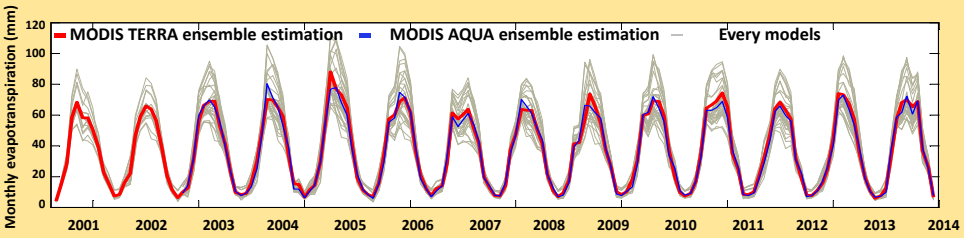


Monthly evapotranspiration (mm) for the main land use types





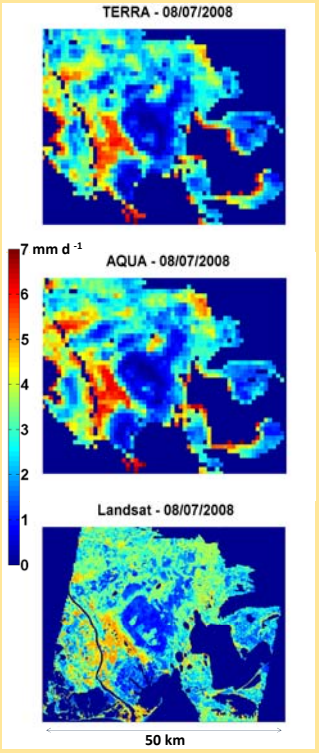
ET monitoring over the Crau aquifer area



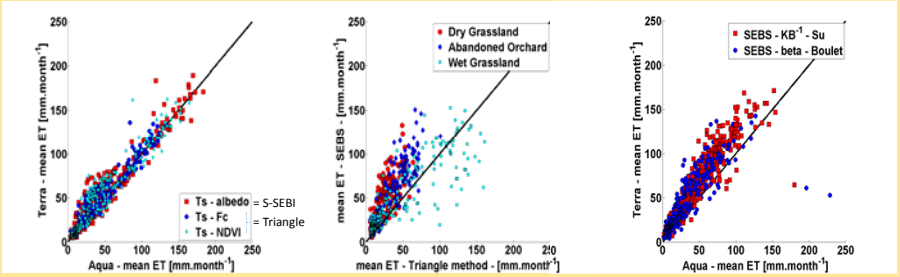
When aggregated over the aquifer area (550 km^2) the ensemble annual mean ET was 239 hm^3.
The range of ET estimated with the various models was 224 hm^3 to 261 hm^3
(while rain ranged between 260 hm^3 (S) to 299 hm^3 (N) and irrigation was estimated around 250-300 hm^3).

Example of ET maps

Averaged (ensemble) estimation of ET



Comparison of ET estimations for different models and sensors



MODIS TERRA and AQUA provided close ET, in particular for the S-SEBI – Triangle approaches.
SEBS and S-SEBI – Triangle approaches provided different ET depending on the ecosystem
Main differences were related to the high sensitivity of SEBS to aerodynamic + thermal roughness estimates and air temperature, while these inputs were not required in the S-SEBI – Triangle approaches

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