UNIVERSITY OF TWENTE.

LESSON 4.
THE CALCULATION OF THE *LANDSAF ETA* PRODUCT

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Source: landsaf.meteo.pt

Satellite data

- Satellite: Meteosat Second Generation (MSG)
- Sensor: Spinning Enhanced Visible and Infrared Imager (SEVIRI)

- Repeat cycle: 15 minutes (but ET product has 30 minute resolution due to availability of irradiance product)
- Spatial resolution: 3 km at the equator

Data available for regions

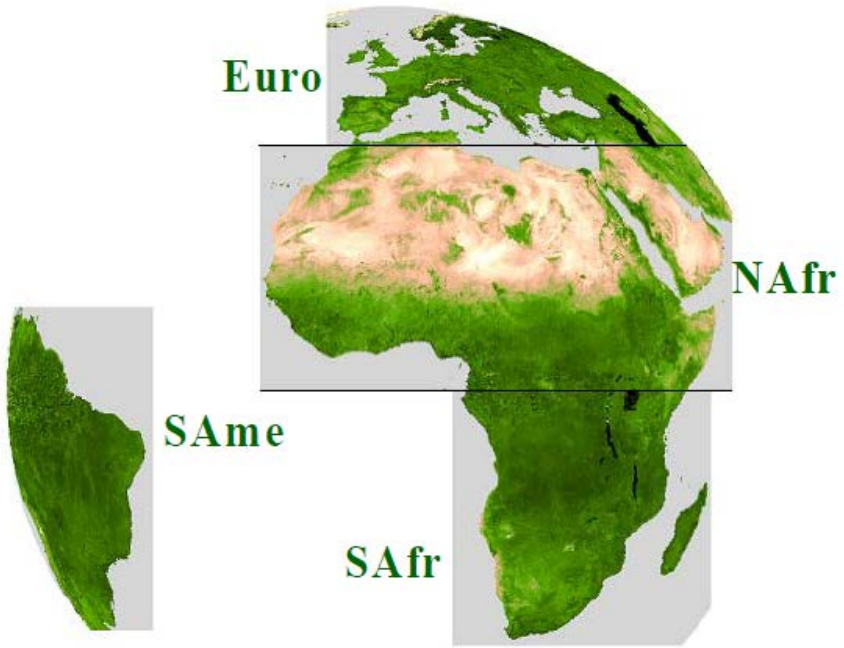


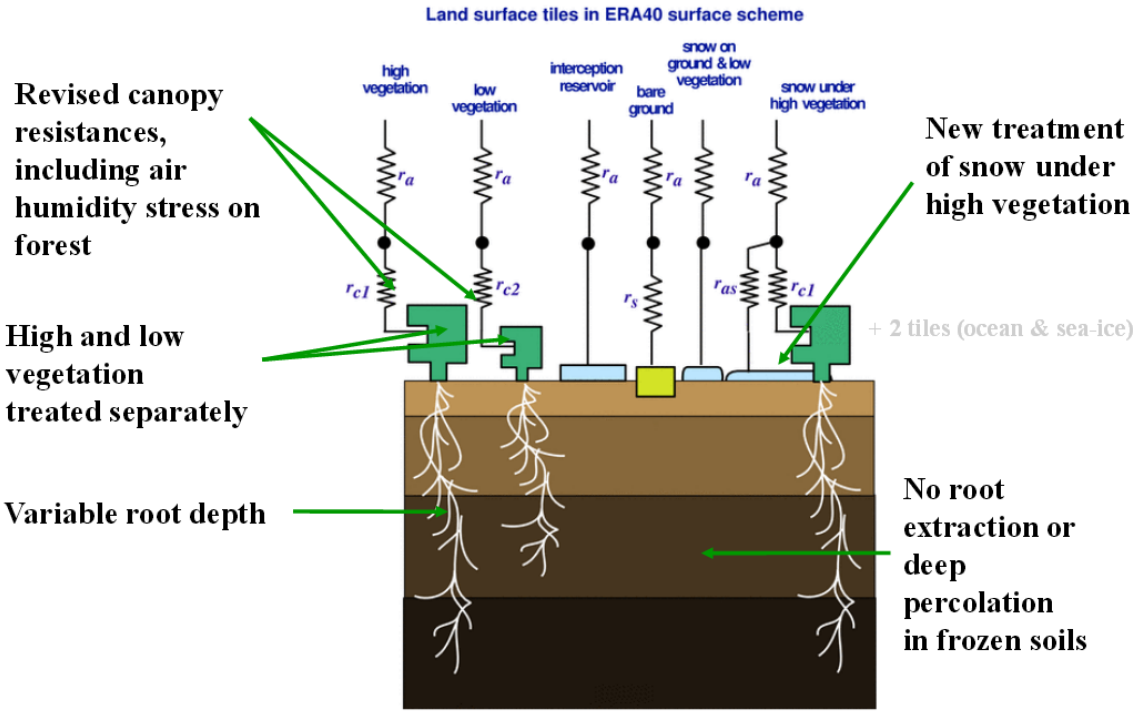
Figure 1 - The LSA SAF geographical areas for SEVIRI-based products.

Source: landsaf.meteo.pt

Soil-Vegetation-Atmosphere Transfer model

‘Tiled ECMWF Scheme for Surface Exchanges over Land’ (TESSEL)

- Tiled ECMWF Scheme for Surface Exchanges over Land



http://www.ecmwf.int/sites/default/files/Subseasonal-WS-Balsamo.pdf

Sub-pixel heterogeneity: each pixel a mosaic of land covers

$$\lambda E = \sum \zeta_i \lambda E_i$$

ζ: fractional cover of a land cover type
i: land cover type

Land cover from ECOCLIMAP (Masson et al., 2003) land cover classification

Figure 2 Schematic representation of pixel composition

Calculation of net radiation

Downward Surface Short-wave Flux (DSSF) from three SEVERI short-wave channels (VIS 0.6µm, NIR 0.8µm, SWIR 1.6µm);

$$R_{s,n} = R_s^{\downarrow} - R_s^{\uparrow} = R_s^{\downarrow} - \alpha R_s^{\downarrow} = (1-\alpha)R_s^{\downarrow}$$

albedo (AL) product

Downward Surface Long-wave Flux (DSLF): an hybrid method based on two different bulk parameterisation schemes for clear and cloudy sky conditions using as input ECMWF forecasts of 2m temperature, 2m dew point temperature and total column water

$$R_{n,l} = (1 - \varepsilon_s)R_{li} - R_{lo}$$

0.99

$$R_{lu} = \varepsilon_s \sigma T_s^4$$

Modelled skin temperature (not from LST product)

Calculation of ground heat flux

$$G = \beta R_n$$

A factor calculated from a vegetation index:
MSAVI (Chehbouni et al., 1996)

Calculation of sensible and latent heat flux

Modelled skin temperature

$$H = \rho c_p \frac{T_s - T_a^*}{r_a}$$

ECMWF data

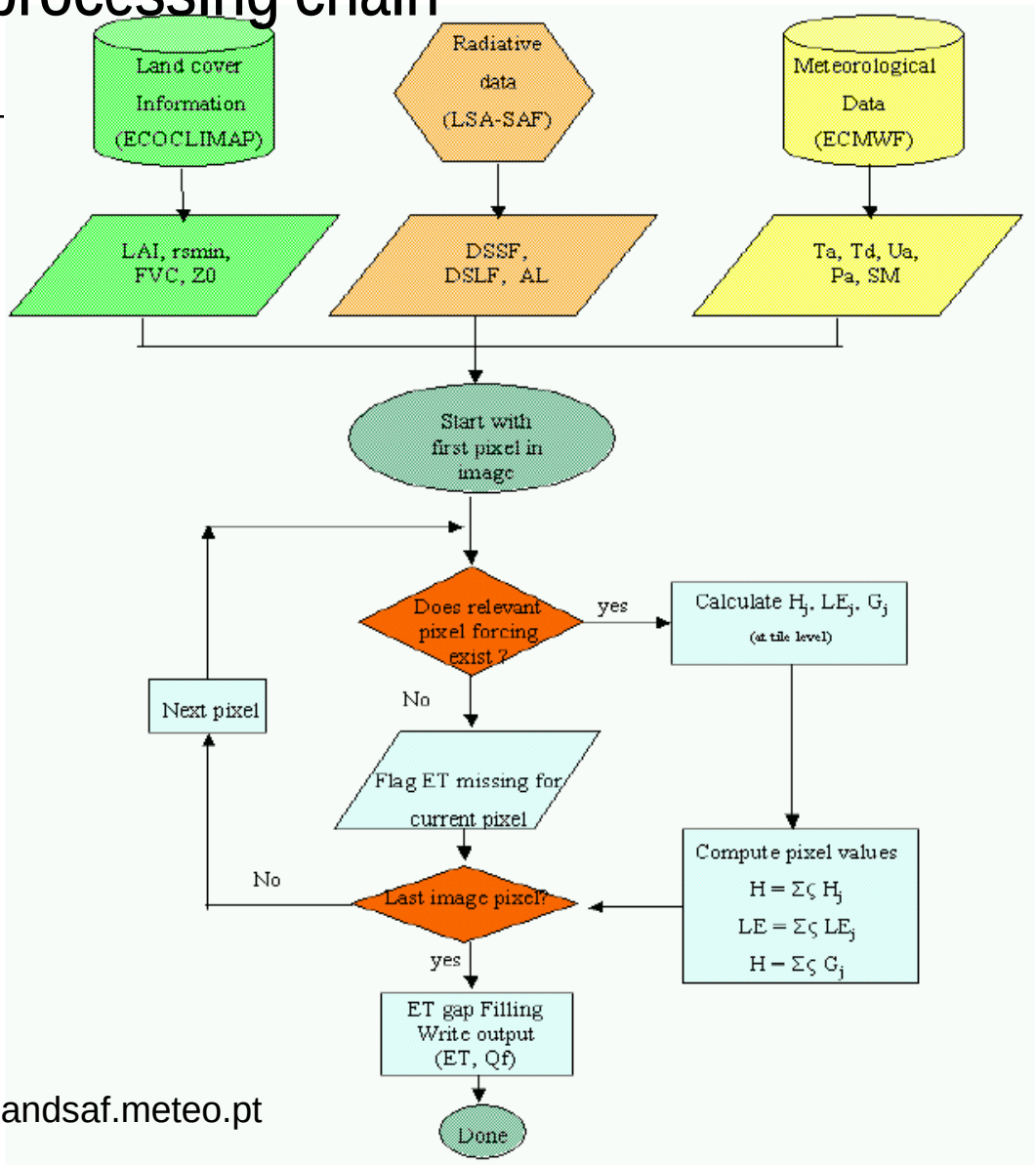
From ECMWF wind data and vegetation type parameters

$$\lambda E = \frac{\lambda \rho}{\gamma} \cdot \frac{e_s - e_a}{r_a + r_c}$$

ECMWF data

* Strictly, these are potential temperatures (corrected for elevation difference)

Overall processing chain



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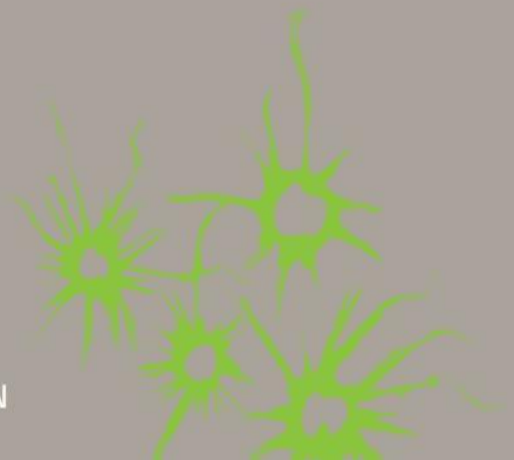
THE END

THANK YOU



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