



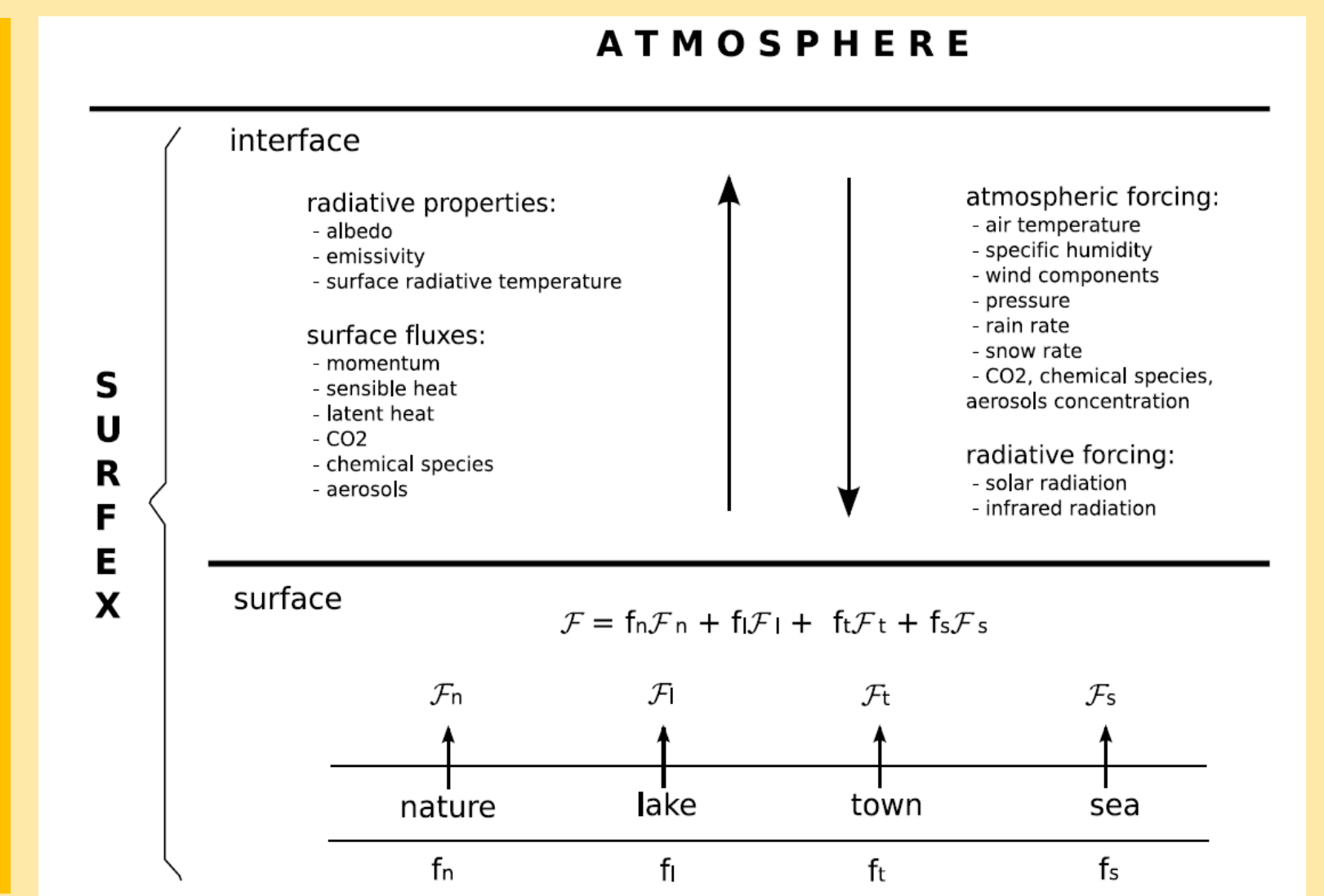
SURFEX Earth Surface Modelling Platform

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www.umr-cnrm.fr/surfex/

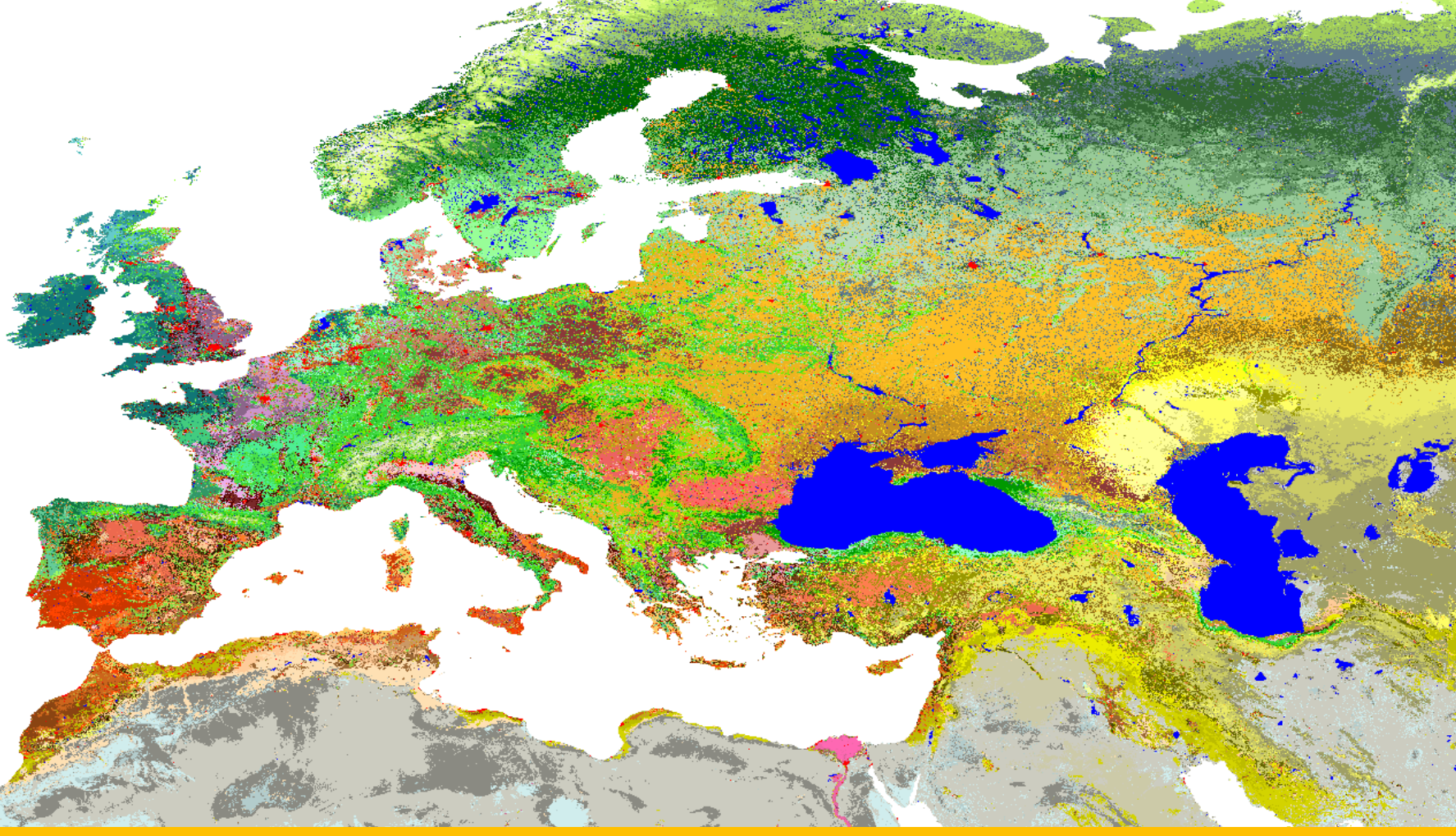


Principle of SURFEX

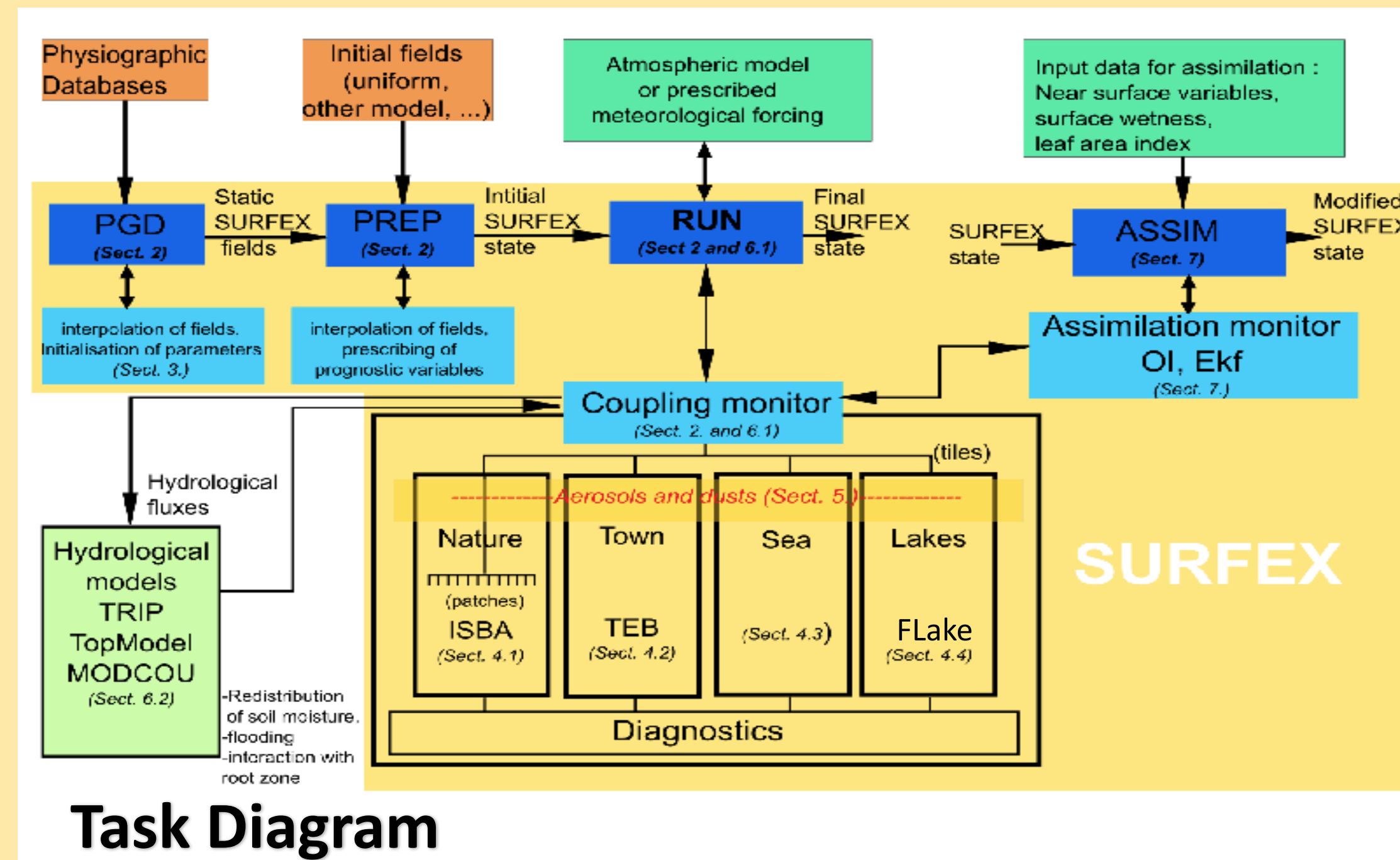
- SURFEX is a surface modelling platform developed by Météo-France.
- SURFEX is composed of various physical models for natural land surface (including photosynthesis, biomass, soil carbon and wood), urbanized areas, lakes and oceans. It also simulates chemistry and aerosols surface processes and can be used for assimilation of surface and near surface variables.
- SURFEX has its own initialisation procedure and can be used in stand alone mode and coupled to atmospheric model.



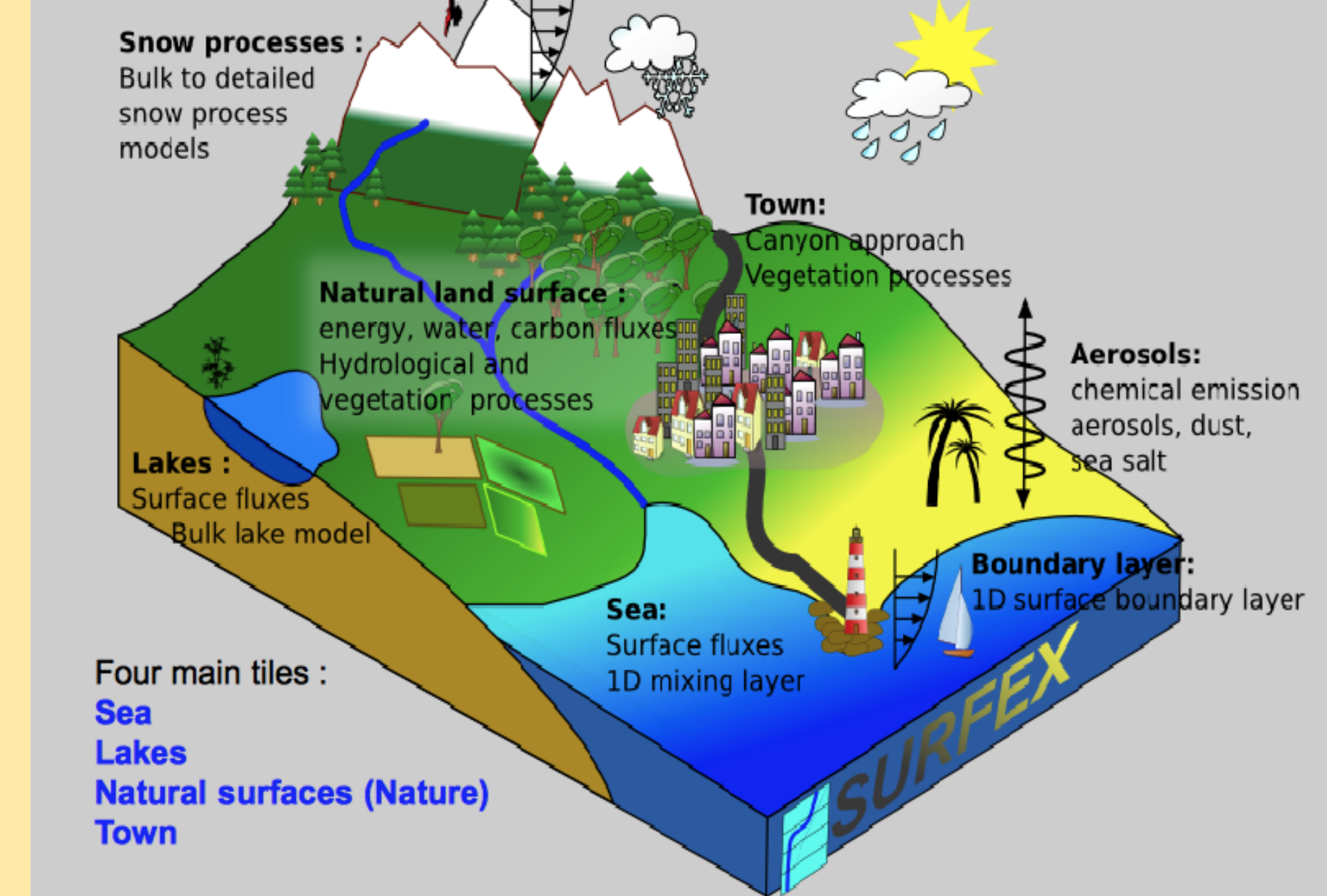
ECOCLIMAP II



- Land cover global database used to define SURFEX model parameters



Tiling



SURFEX Applications:

- NWP: global ARPEGE model, mesoscale AROME and Meso-NH models
- Climate apps: CNRM-CM (global ARPEGE climate model)
- Hydrology
- Data Assimilation
- Reanalyses
- Impact of CC

Code management:

- Open source code since May 2016
- GIT facilities
- CNRM/GMME/SURFACE team in Toulouse

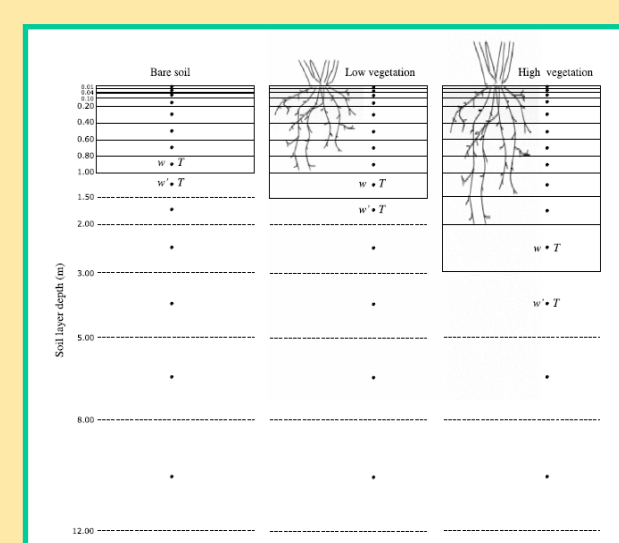
Coordination and training:

- SURFEX steering committee since 2011
- surfex@meteo.fr mailing list with 80 subscribers
- Yearly training course
- Special issue in GMD journal
- SURFEX Users Workshop every 2nd year

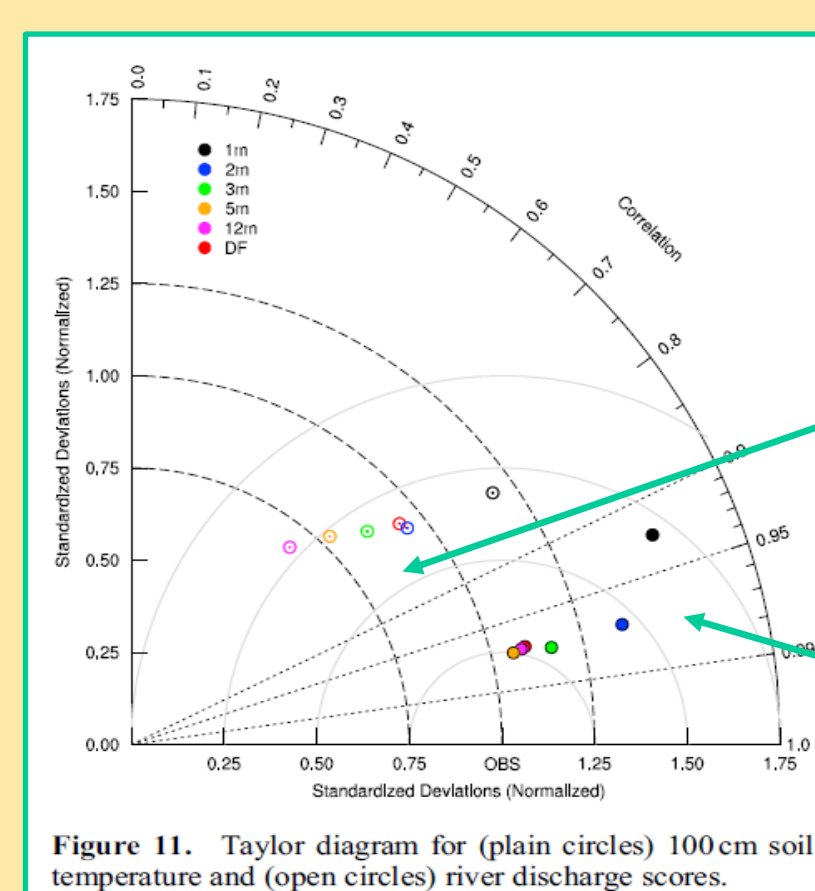
References

- Masson et al., 2013. Geoscientific Model Development
- Decharme et al., 2011, 2013. Journal of Geophysical Research
- Decharme et al., 2016. The Cryosphere
- Le Moigne et al., 2013, 2016. Tellus A
- Boone et al., 2017. Geoscientific Model Development
- Napoly et al., 2017. Geoscientific Model Development
- Faroux et al., 2013. Geoscientific Model Development
- Masson et al., 2000. Boundary Layer Meteorology

ISBA land surface model: Diffusion of heat and water

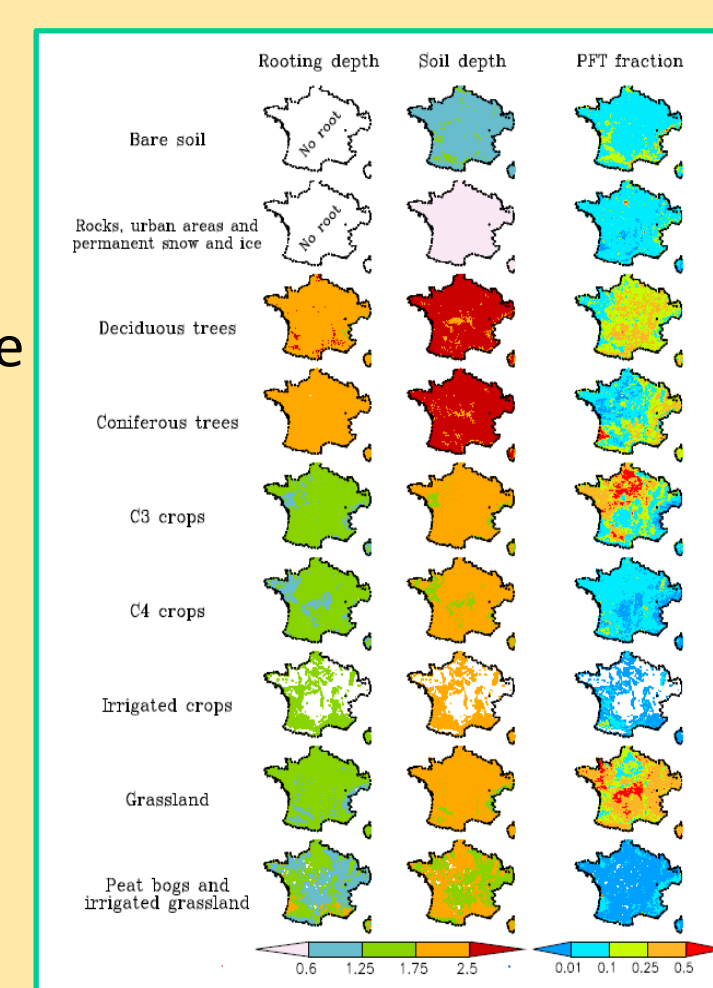


Fourier law for temperature
Richard's equation for moisture



River discharge
500 stations

T @ 100cm
120 stations



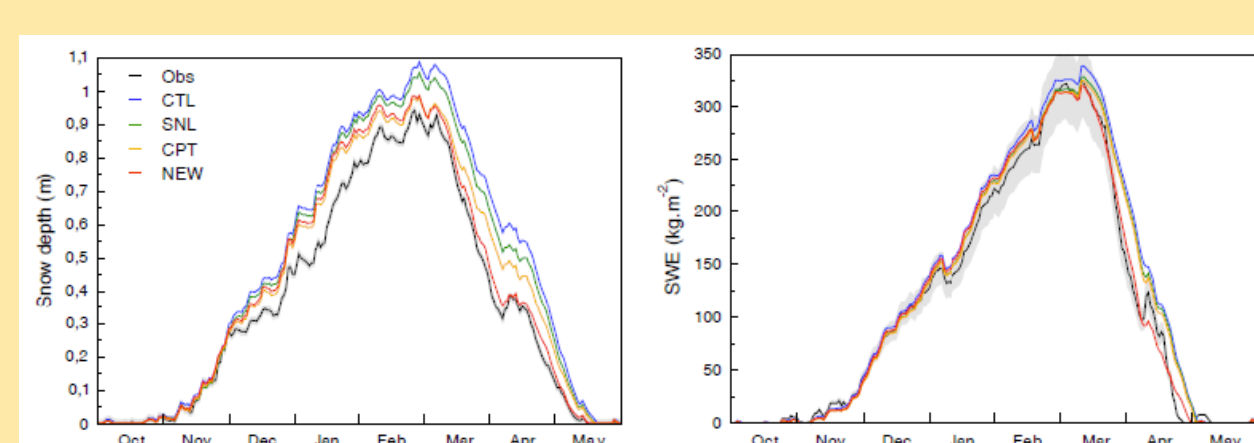
ISBA Explicit Snow model

Layering: 12 layers. Thin layers at surface (diurnal cycle) and coarser layers below

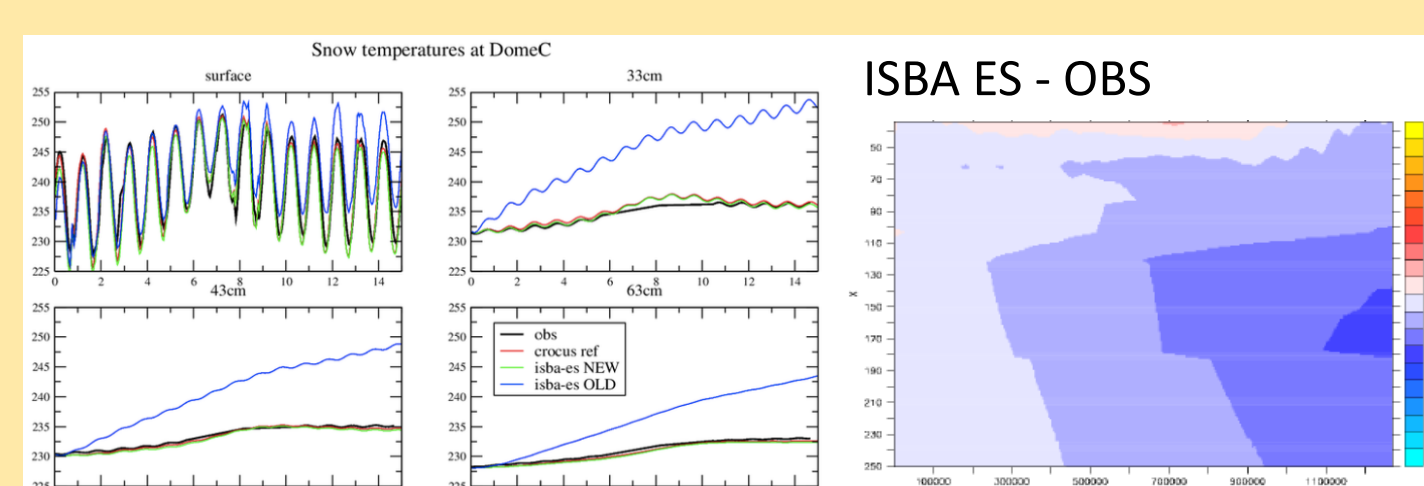
Compaction: due to changes in viscosity and surface wind-induced densification

Absorption of SW down: depends on snow albedo and extinction coefficients (function of snow optical diameter, density, age)

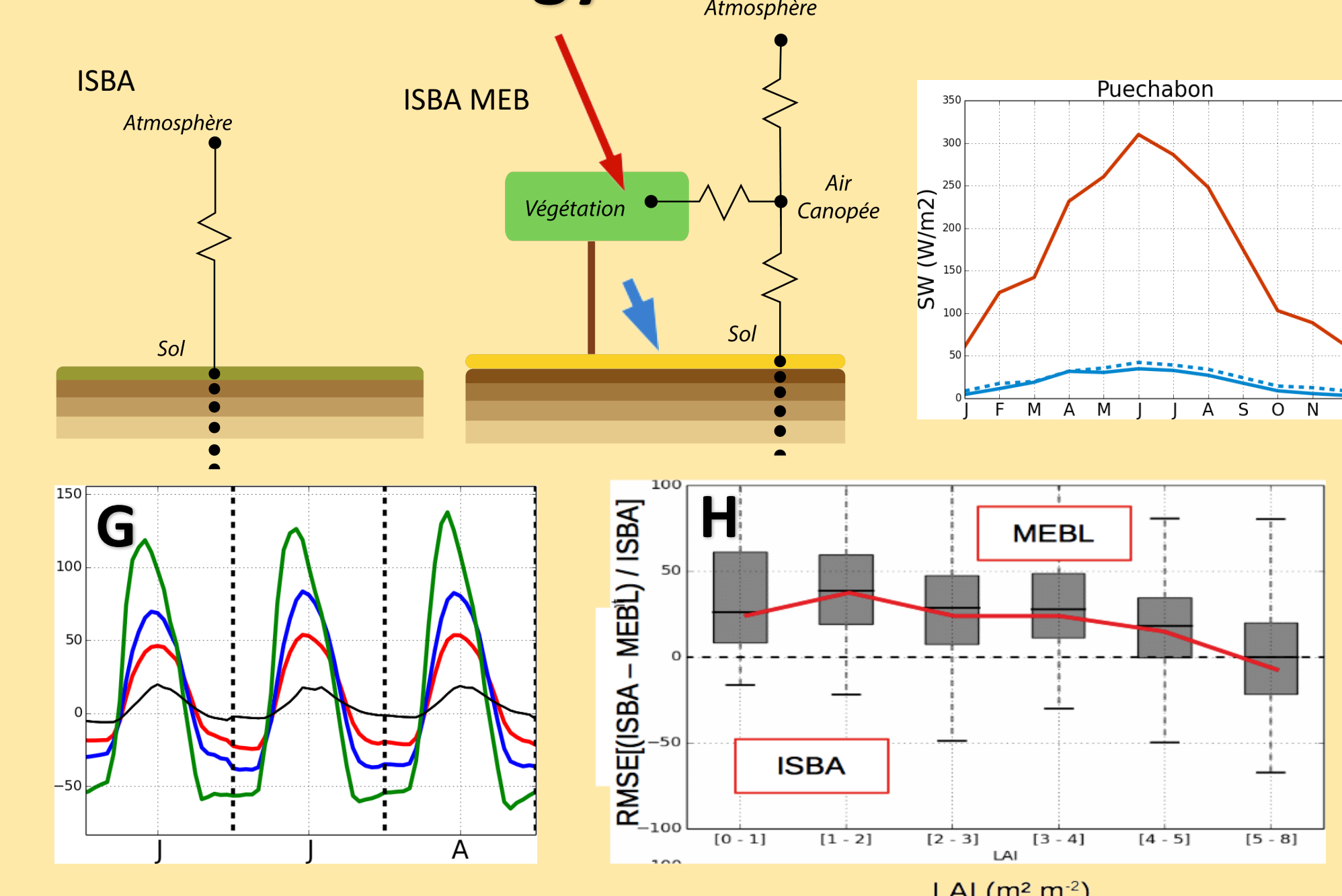
Validation @ Col de Porte - French Alps



Validation @ DomeC - Antarctica

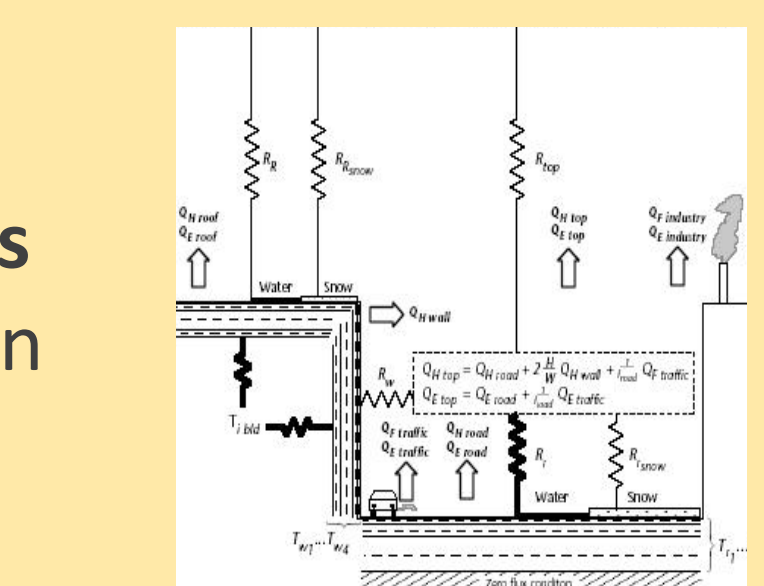
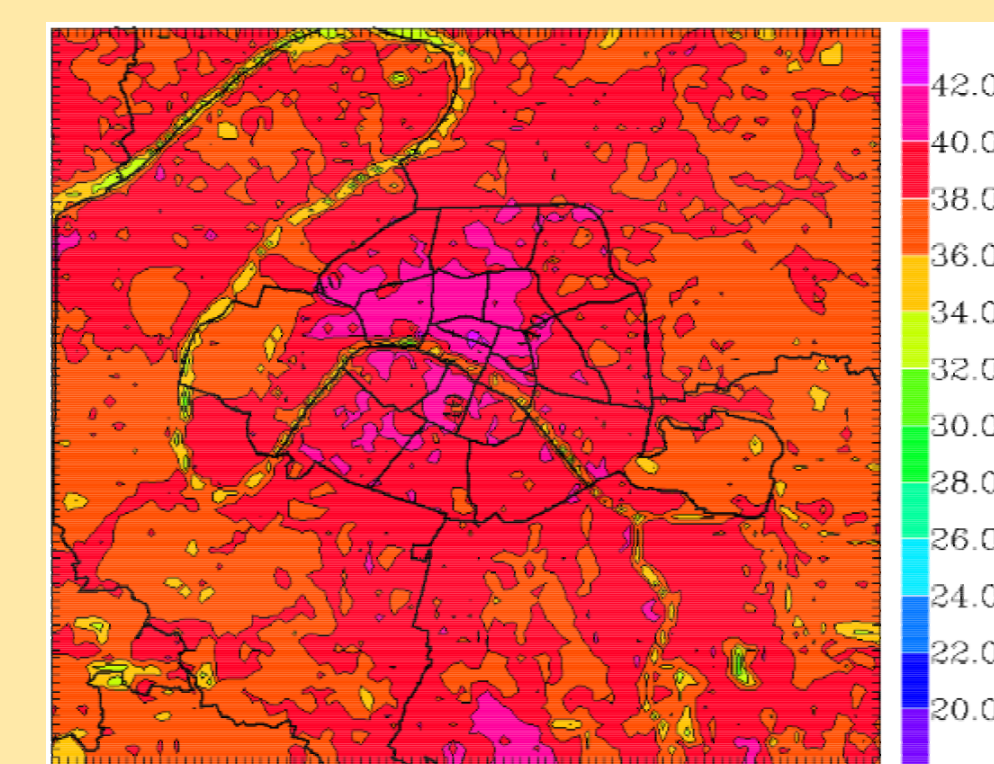


ISBA Multi Energy Balance model

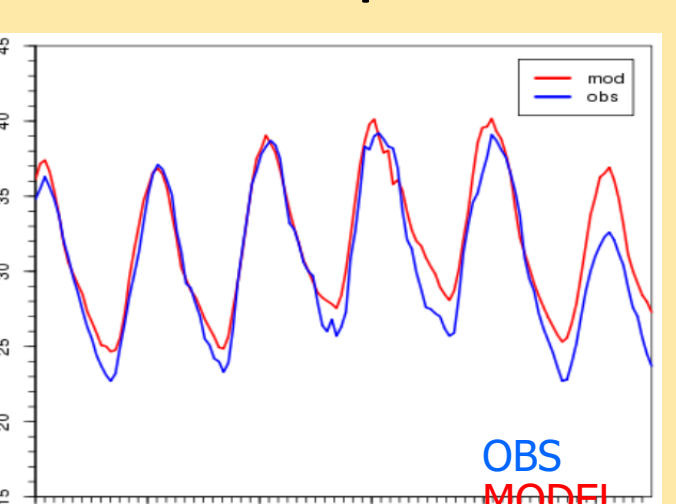


Town Energy Budget model

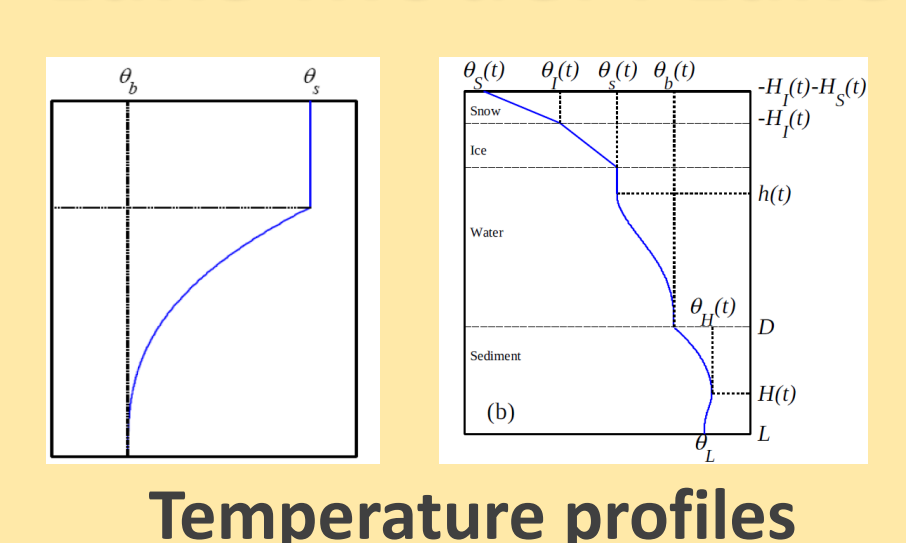
Simulation of 2003 heat wave over Paris with TEB / Meso-NH @ 250 m resolution



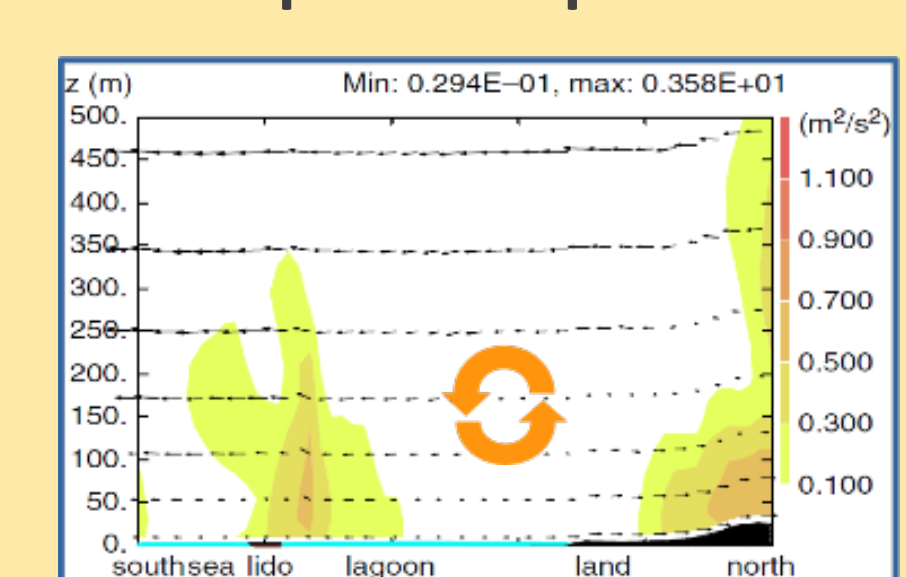
T2M comparison



Lake model FLake



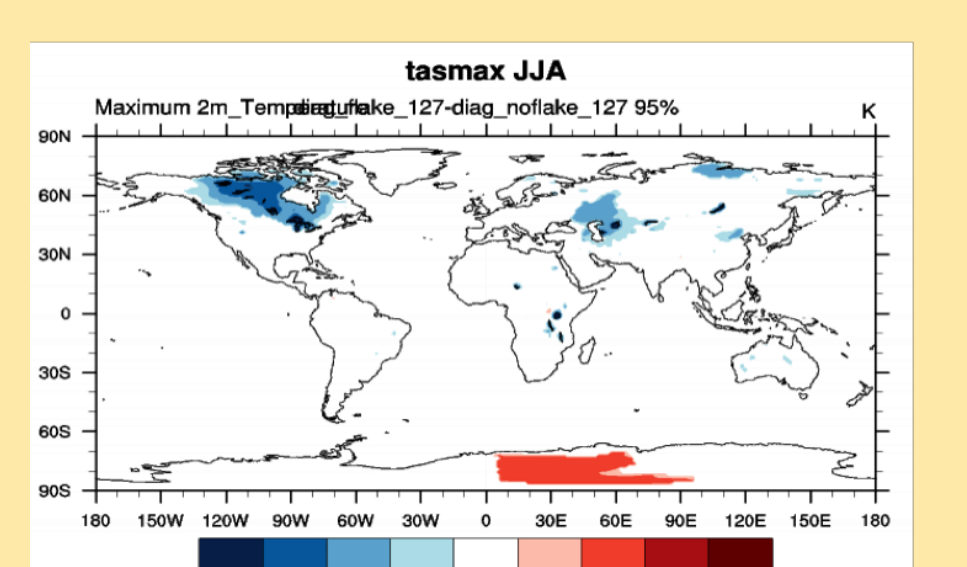
Temperature profiles



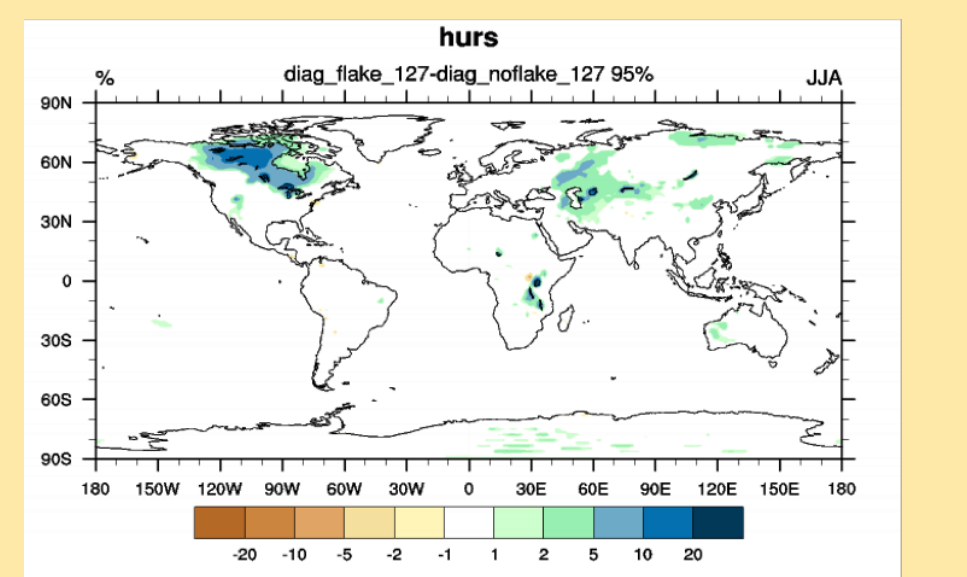
TKE and wind. Meso-NH 200m

T2M

RH2M



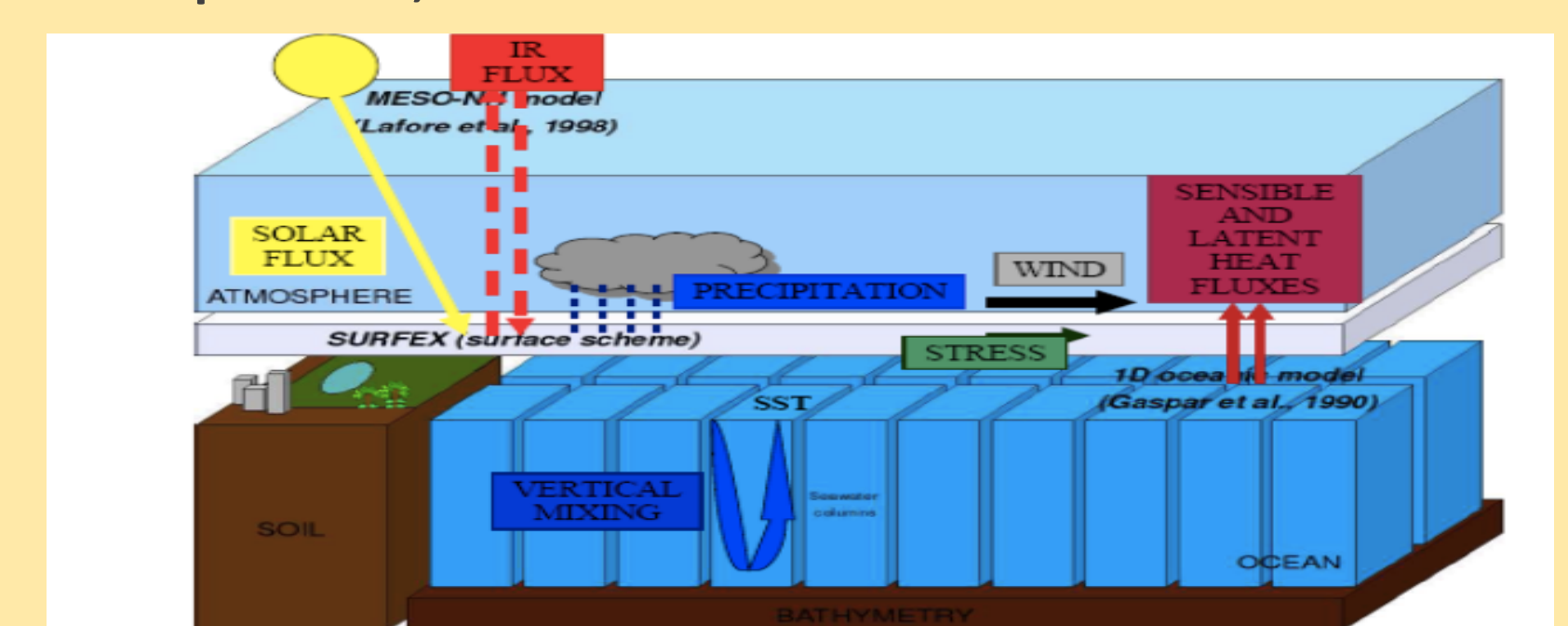
Cooling effect



Moistening effect

1D Ocean Mixed Layer model

Based on Gaspar et al., 1990



Temperature, current, salinity, turbulent kinetic energy

Aude November 1999, 21UTC

- Fresh water supply
- Decreased salinity
- Increased stratification
- Lower temperature

