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- SURFEX developments : CANOPY, Flake
- ECOCLIMAP evolution
- ALADIN-SURFEX coupled system

# CANOPY : princip

- Masson, 2008 : 1d surface boundary layer scheme
- U, θ, q, TKE are the prognostic variables
- TKE scheme : Cuxart, 2000
- takes into account effects of obstacles in the gridcell and the equation system writes :

$$\frac{\partial U}{\partial t} = \frac{\partial U}{\partial t}(z = z_a) + Turb(U) + Drag(U)$$

$$\frac{\partial \theta}{\partial t} = \frac{\partial \theta}{\partial t}(z = z_a) + Turb(\theta) + \frac{\partial \theta}{\partial t}$$

$$\frac{\partial q}{\partial t} = \frac{\partial q}{\partial t}(z = z_a) + Turb(q) + \frac{\partial q}{\partial t}$$

$$\frac{\partial TKE}{\partial t} = Dyn.Dyn + Therm.Prod + Dissip. + \frac{\partial TKE}{\partial t}$$

Boundary conditions are given by the lowest atmospheric level and by the surface turbulent fluxes.

CANOPY : vertical grid

6 extra-layers between lowest atmospheric level and surface
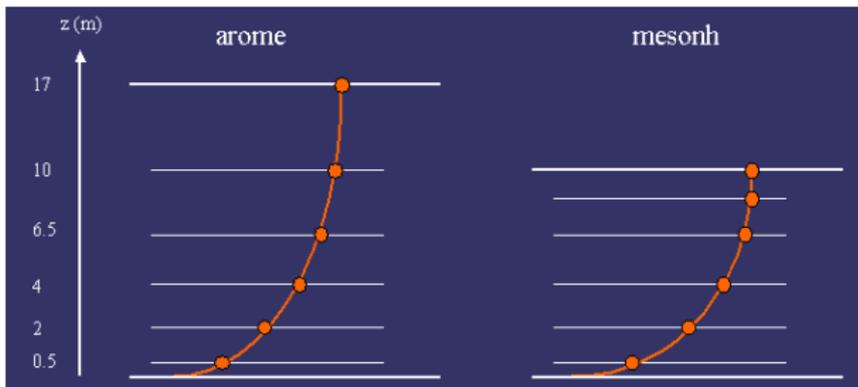
- T_{2m}, q_{2m} and U_{10m} are forcasted by the model (no more diagnostics)
- surface fluxes are modified : lowest SBL level used instead of lowest atmospheric level

Flake

- Flake is now included in Surfex software (R.Salgado)
  - available in CY33T1
- phase of validation
- need of database to describe lake depth
- ongoing work on Flake :
  - Alqueva lake in Portugal (R.Salgado) :
    - offline runs to compare Flake inside and outside surfex
    - coupled runs using mesoNH and/or Arome
  - Balaton lake in Hungary (M.Vorös) :
    - offline runs
    - coupled runs using Arome model

Alqueva lake : sensible heat flux
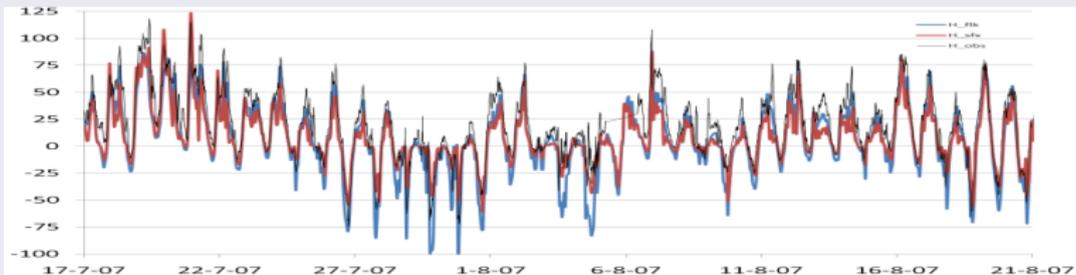
sensible heat flux bigger with Flake than with surfex

Alqueva lake : surface temperature
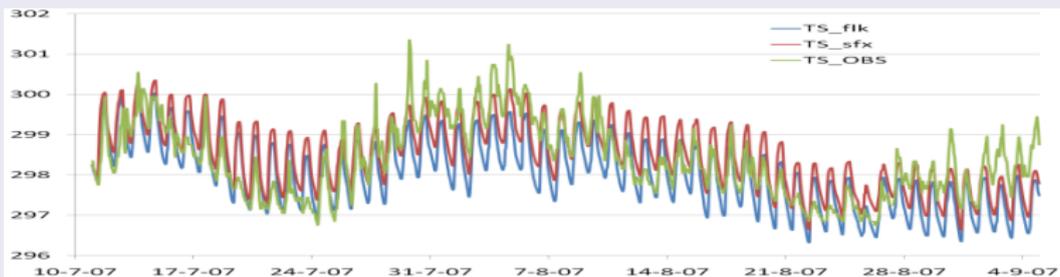
surface temperature bigger with surfex than with Flake

ECOCLIMAP evolution

ecoclimap 1

- Univ. Maryland, Climate map, Corine
- NDVI from NOAA/AVHRR for year 1999
- global at 1km resolution

ecoclimap 2

- CORINE2000, GLC2000
- NDVI from SPOT/VEGETATION for years 1999-2005
- classes splitted into several ones
- Enlarged Europe at 1km resolution : 11°W-62°E, 25°N-75°N

forest coverage

ecoclimap I/II

- tendency of a decrease of coniferous fraction
- less coniferous where they are dominant :
  - Scandinavia, north of Russia, mountainous areas
- more coniferous in the south part of the domain

forests

coniferous
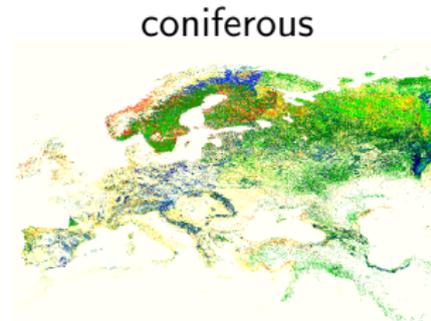
impact on LAI

ecoclimap 1/2

on average, decrease of LAI (crops), but increase over russian forests, near coasts and over mountains

differences of LAI in April
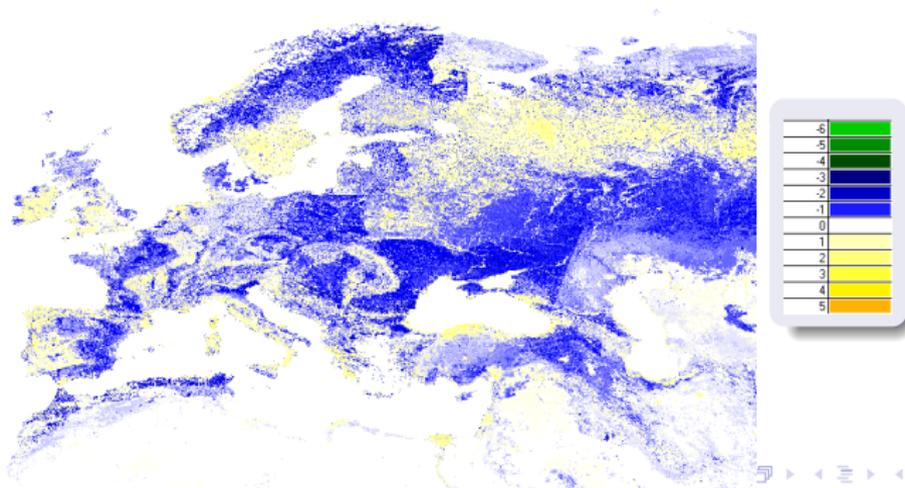
ALADIN-SURFEX coupled system

The goal is to try to reproduce the results obtained with operational Aladin-France model (OPER) and with Aladin coupled to Surfex. For that purpose, some adaptation of Surfex have been made like :

- climatological fields taken from e923
- atmospheric orography imposed at surface
  → SFX0
 - changes in surfex physics
    → SFX1

computation of climatological fields

use the possibility to run PGD tool without ecoclimap

- extract surface fields from aladin climate file (lat,lon,value)
- make the correspondance between aladin surface fields and surfex ones (veg. types, roughness length, ...)
- run PGD tool with surface parameters from aladin

SFX0 - OPER , difference in surface fields at 12UTC
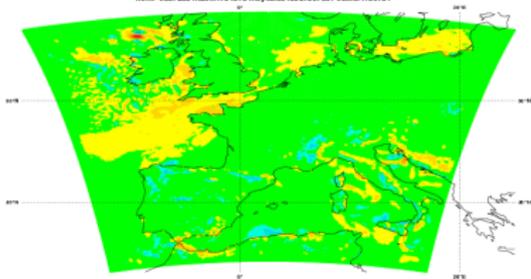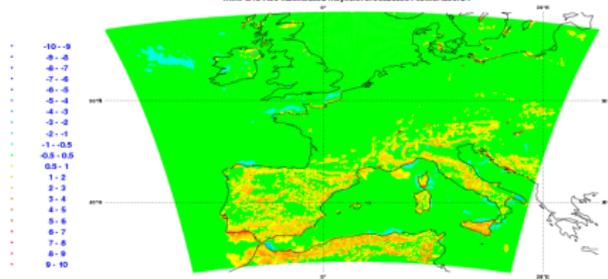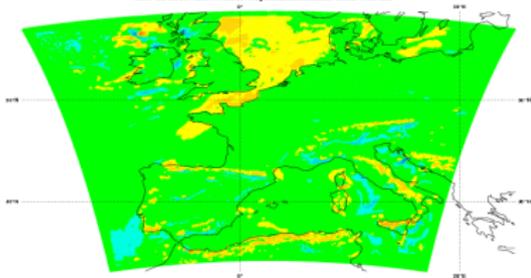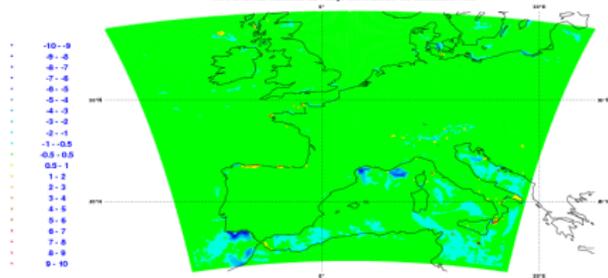
## SFX1 experiment configuration

adaptation of surfex code to initialize some parameters by namelist

- soil : limitation of CGMAX set to 8.e-6
- sea : value of Charnock cst, and flux formulation
- drag :
  - wind threshold formulation adapted (minimum wind shear and wind speed)
  - computation of turbulent exchange coefficients from Achmt

SFX1 - OPER , difference in surface fields at 12UTC
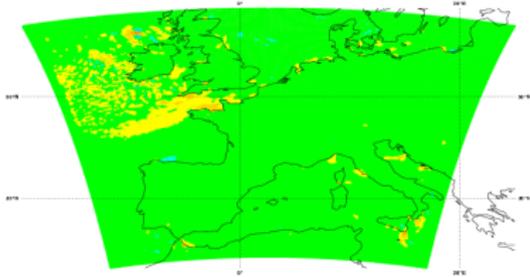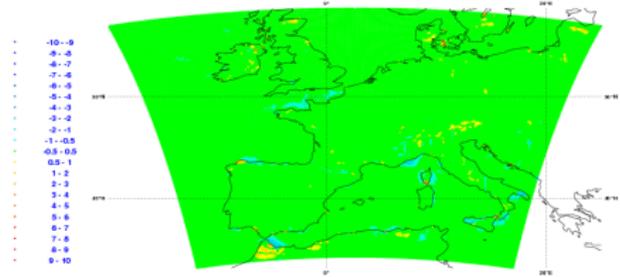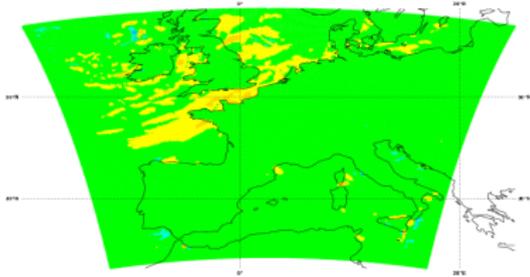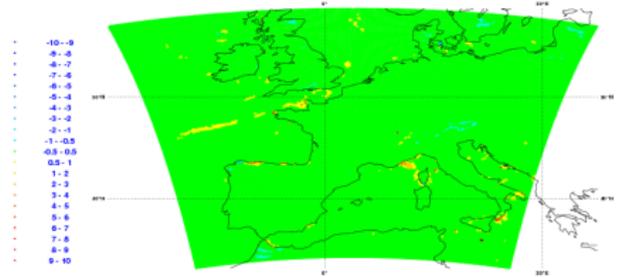
SFX0 − OPER at 12UTC

SFC	mean error	stdev
T_{2m}	0.01	0.48
RH_{2m}	-0.02	0.03
U_{10m}	0.08	0.42
V_{10m}	0.02	0.41

SFX0 − OPER at 24UTC

SFC	mean error	stdev
T_{2m}	-0.18	0.38
RH_{2m}	-0.02	0.04
U_{10m}	0.06	0.40
V_{10m}	-0.005	0.41

SFX1 − OPER at 12UTC

SFC	mean error	stdev
T_{2m}	-0.14	0.20
RH_{2m}	0.005	0.01
U_{10m}	0.06	0.22
V_{10m}	0.08	0.24

SFX1 − OPER at 24UTC

SFC	mean error	stdev
T_{2m}	-0.10	0.20
RH_{2m}	-0.003	0.01
U_{10m}	0.05	0.34
V_{10m}	0.06	0.31

Perspectives

- explain remaining differences (sea, mountains)
- perform more tests, especially in winter (snow)
- solve technical difficulties :
  - enable PGD fabrication outside MF (gmkpack)
  - adapt Aladin environment to initialize an Aladin-Surfex model from an Aladin-Surfex model
- SFX1 configuration available in CY33T1 : tests and evaluation by Aladin partners possible
- test the impact of using ecoclimap database