Overview of SURFEX activities

- Ecoclimap
- Surface analysis
- Last developments
- Use of Surfex

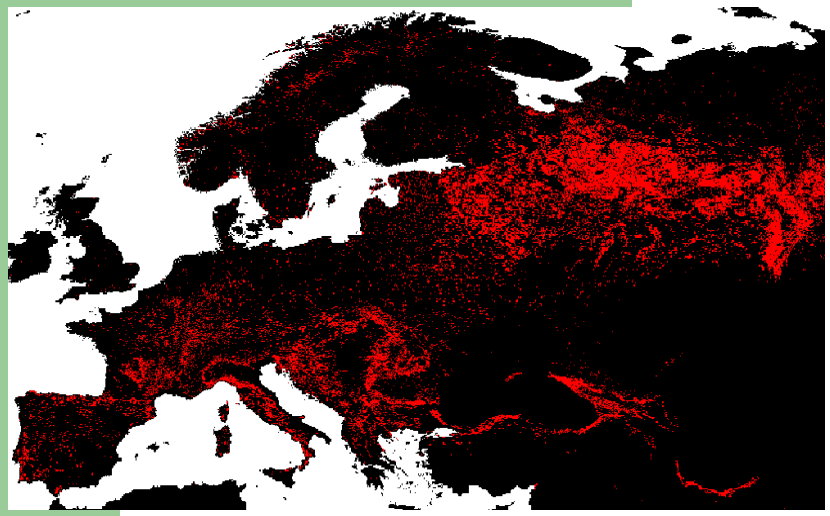
P. Le Moigne

Ecoclimap (1)

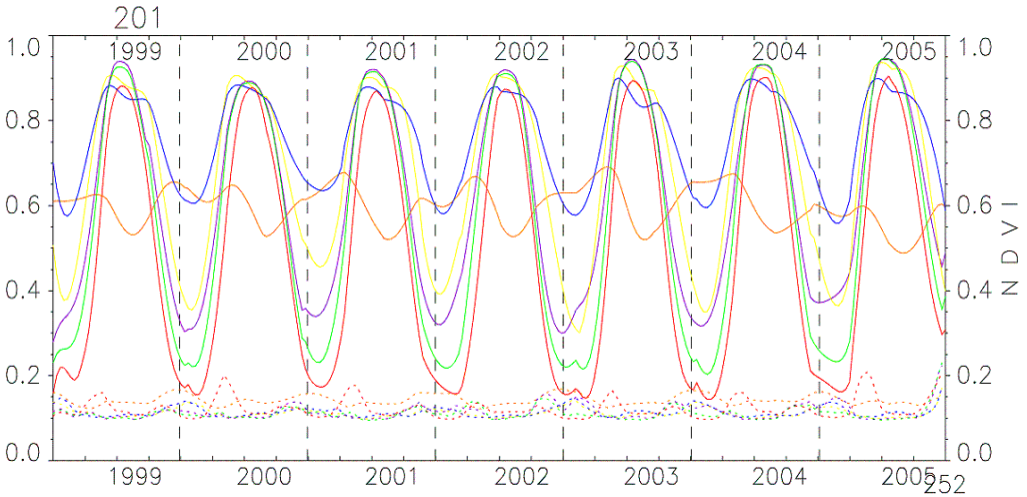
- Global database for surface parameters
- Improvement of NDVI profiles:
  - SPOT VEGETATION sensor presents better radiometric and geometric performances than NOAA-AVHRR
  - True 1km resolution (no resampling)
  - 10 days temporal resolution (1 month)
  - 7 annual cycles (1 cycle)

Ecoclimap (2)

- Current status of this new classification:
  - Nearly finished (this summer)
  - About 350 classes
  - Very little input data from partners:
    - Only Norway 1km data were used to improve locally GLC2000 classification
  - You can still send your data/database address to stephanie.faroux@meteo.fr for the products validation



Ecoclimap I



NDVI profiles

Broadleaf forest ecosystems

Ecoclimap II

Soil analysis (1)

- Develop an analysis of soil prognostic variables suitable for the various Météo-France NWP models (ARPEGE, ALADIN, AROME), that can assimilate various observation types (conventional obs., satellite data, precipitation, surface radiative fluxes)

Soil analysis (2)

- First proposal :
  - Method : Simplified 2D-Var/EKF (Jacobians of observation operators obtained in finite differences) within SURFEX
  - Control variables : Tp and Wp
  - Observations : T2m, RH2m (first stage)
  - Assimilation window : 6-h (ARPEGE, ALADIN), 3-h (AROME)
  - Forcing : short-range forecasts from the atmospheric model that will use the soil analyses as initial conditions

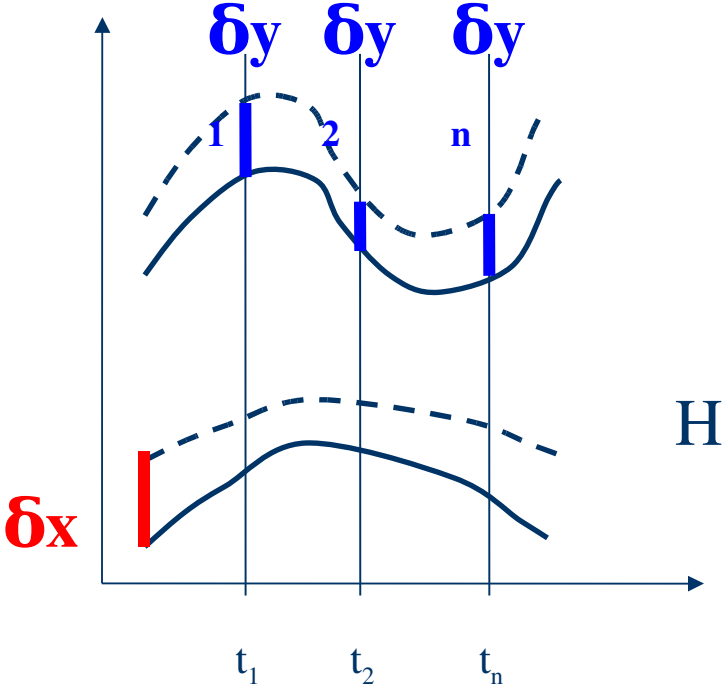
Soil analysis (3) : simplified 2Dvar

Equations of the problem:

$x^a = x^b + K(y_0 - H(x))$

$K = BH^T(HBH^T+R)^{-1}$

Covariance matrixes B and R are constant



$$H = \begin{pmatrix} \delta y_1 / \delta x \\ \delta y_2 / \delta x \\ \dots \\ \delta y_n / \delta x \end{pmatrix}$$

Last developments

- Sea flux parameterization (Lebeaupin)
  - Multi-campaign calibration of exchange coefficients

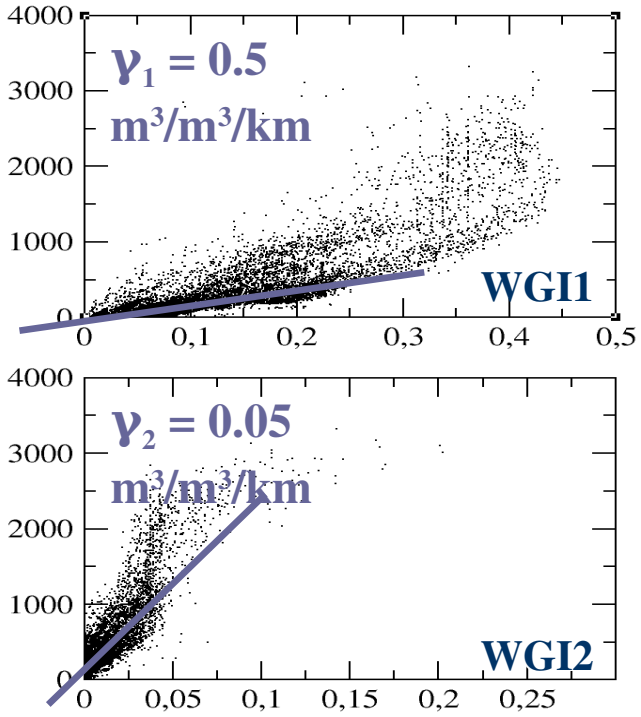
Off-line validation on Toga-Coare data

Lebeaupin, 2006

Last developments

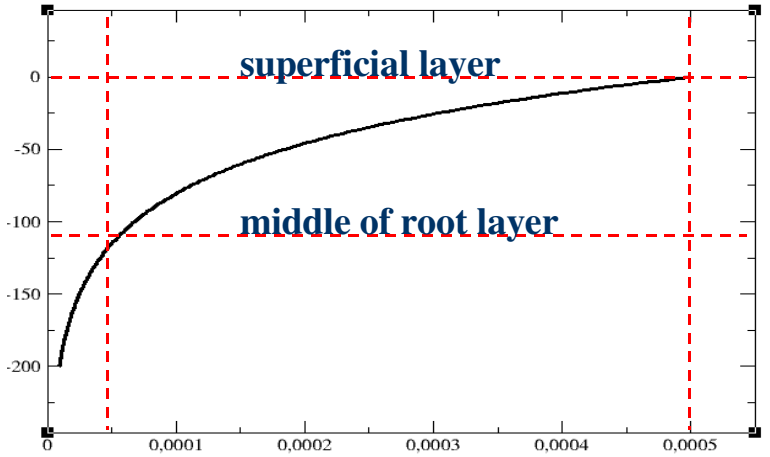
- Initialization: vertical interpolation of ice reservoirs from Aladin (P. LeMoigne)
  - Replace the old way (not physical enough)
  - Climatological vertical gradient of ice contents in the soil
    - Winter 2005 data for soil ice profile from SIM system
    - Tested with the off-line surfex version

Climatological ice contents



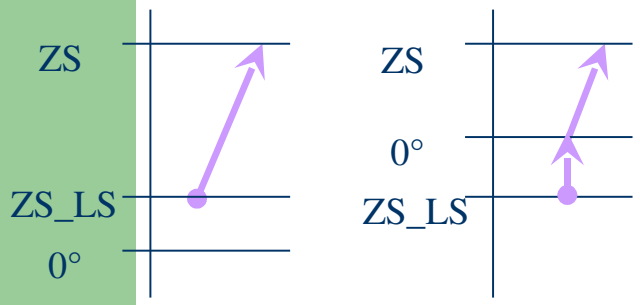
$$\gamma(h) = \gamma_0 \exp(-h/H_0)$$

$\gamma_0 = \gamma_1$ et $H_0 = 0.5$m



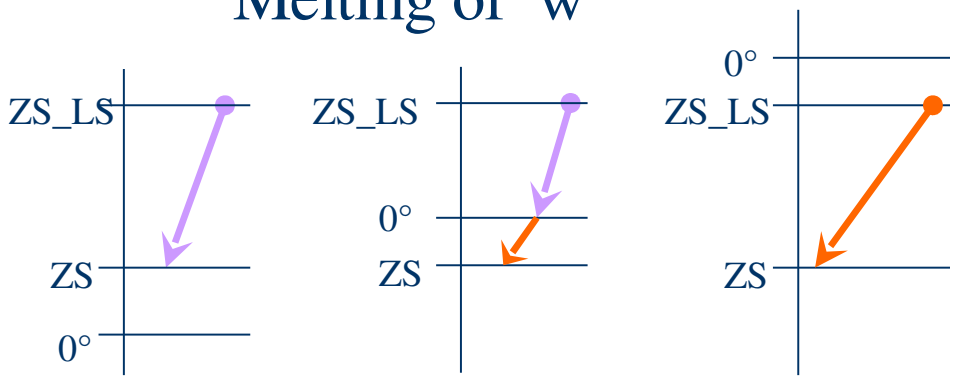
γ_2 γ_1

Freezing of w



$\gamma(h)$ $\gamma(h)$

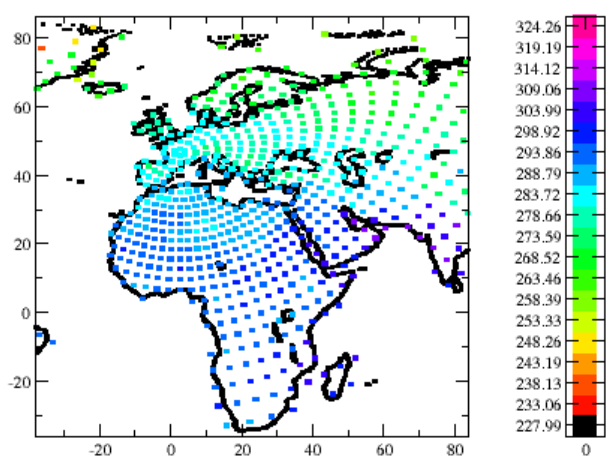
Melting of w



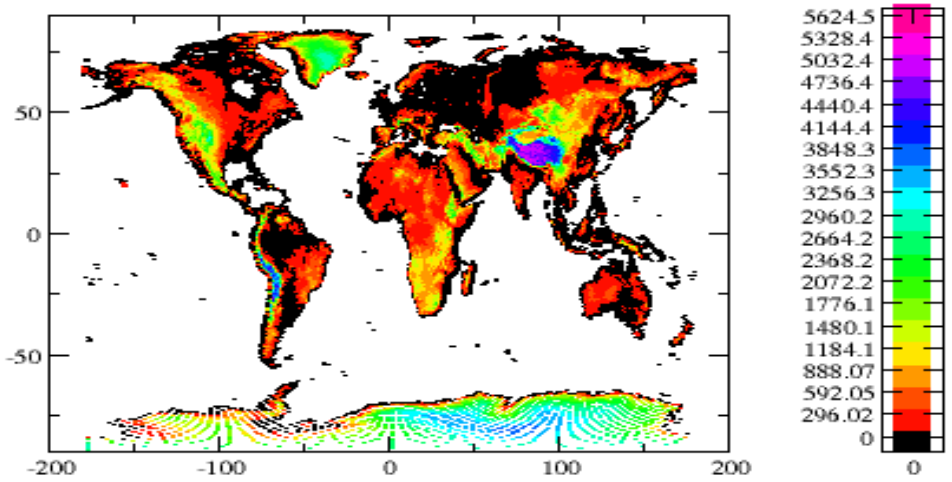
$\gamma(h)$ $\gamma(h)$, $\gamma(0)$ $\gamma(0)$

Last developments

- Gaussian grid (V. Masson, P. LeMoigne)
  - namdim, namgem and namrgri introduced into surfex



Surface temperature (100km mesh)



Orography (10km mesh)

Last developments

- Other aspects:
  - Possibility to prescribe surface parameters (useful for implementation in Aladin) (P. LeMoigne)
  - Implementation of Arpege/Aladin snow scheme (A. Dziedzic)
  - Introduction of ORILAM model for deposition and emission of chemical species (P. Tulet)
  - Introduction of dust DEAD model in ISBA (A. Grini)
  - Introduction of an irrigation model in ISBA (P. LeMoigne)
  - Development of a 1d surface boundary layer scheme for TEB (V. Masson, R. Hamdi)
  - Development of a 1d oceanic boundary layer based on TKE (C. Lebeaupin)

Use of surfex (1)

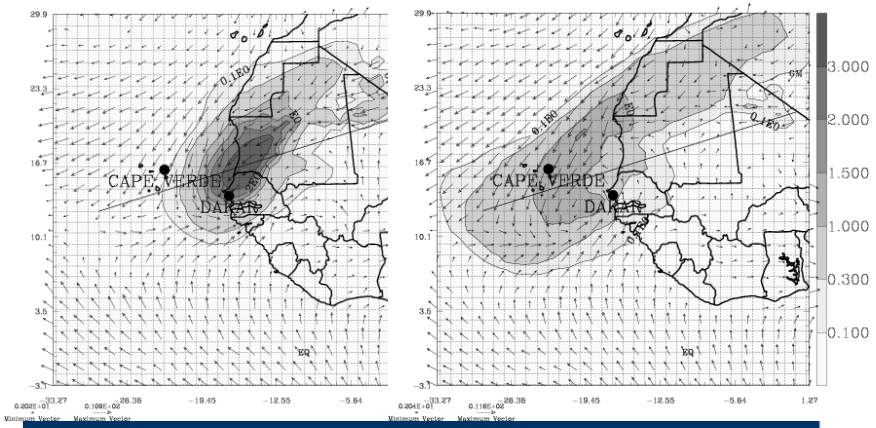
- Aladin:
  - see F. Bouyssel's talk on Wednesday (M. Jidane)
- Arpege-Climat:
  - Coupling: benefit of the work already done on Aladin setup and physics (A. Alias)
  - Off-line mode: evaluate surfex forced with GSWP2 data (A. Voldoire, N. Elguindi, A.-L. Gibelin)
- Hirlam: geoland2 framework
  - Evaluate first the differences in terms of interface to be able to use surfex within Hirlam (H. The)

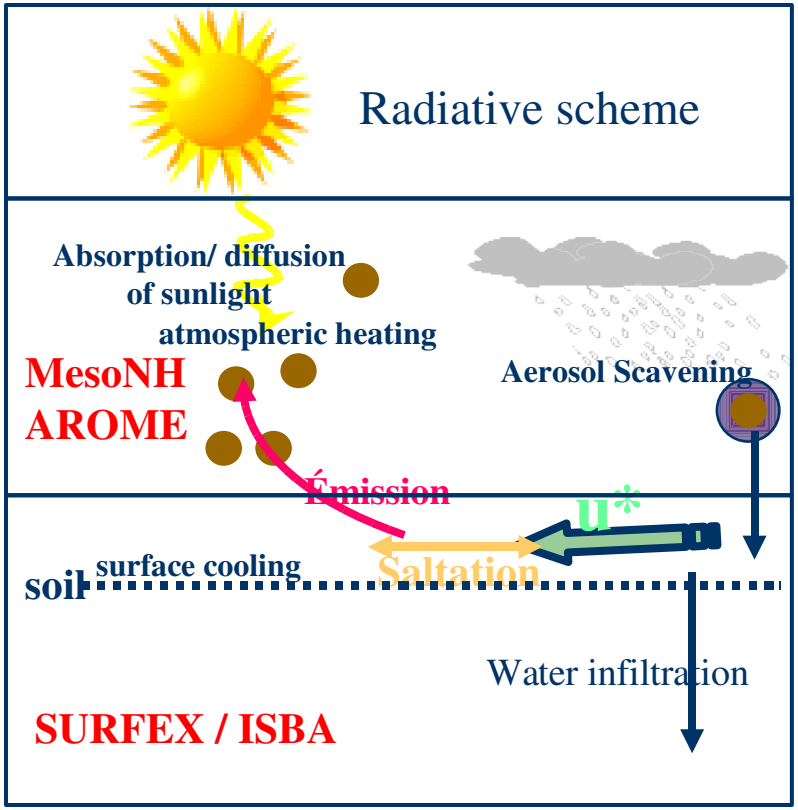
Use of surfex (2)

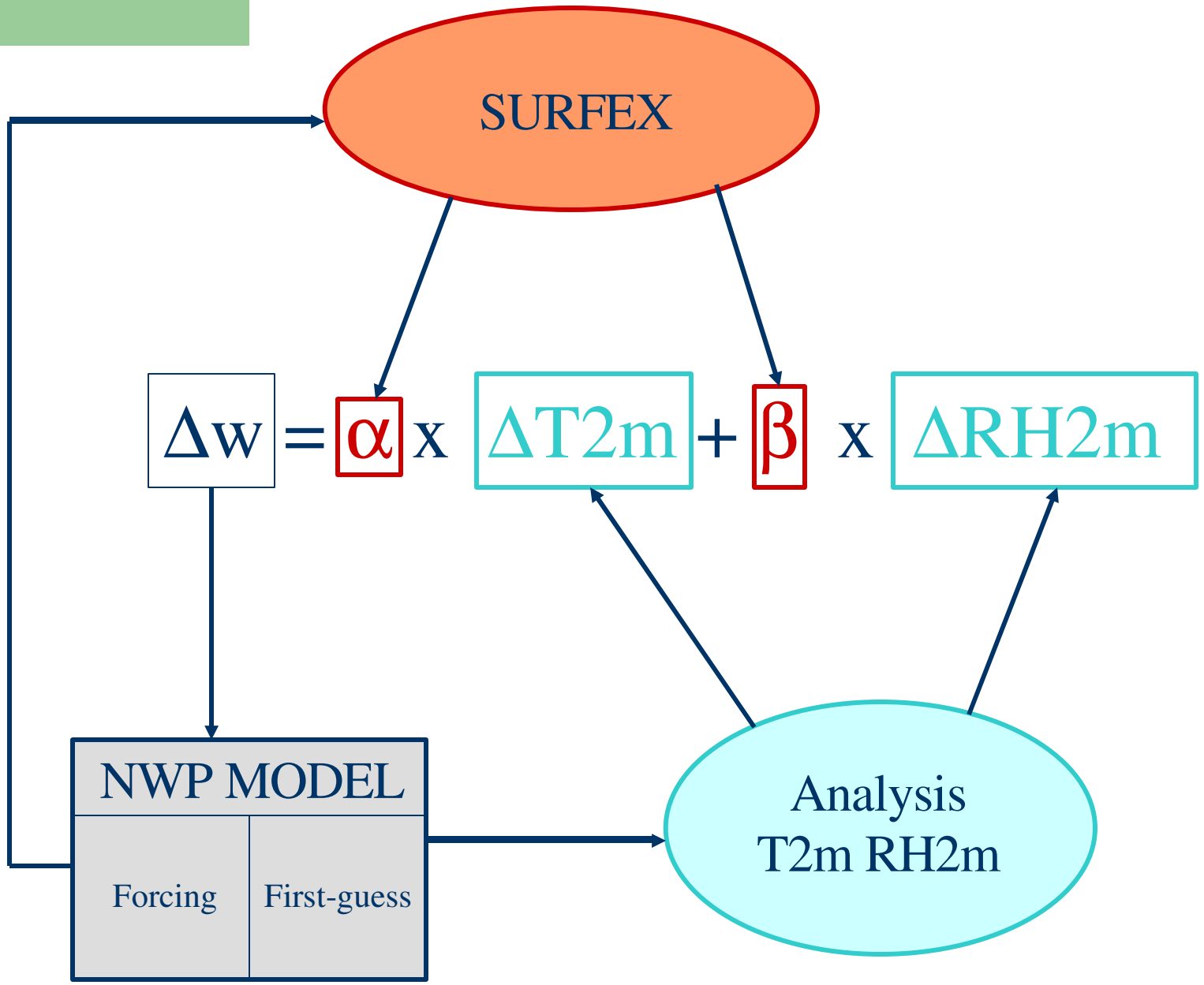
- Export version of surfex (several data sets)
  - Experiment at ZAMG to force surfex with INCA analysis (H. Seidl)
  - SNOWMIP2 intercomparison exercise where 2 surfex snow schemes have been tested (E. Martin)
  - Modelisation of continental surface in AMMA (A. Boone)
- Data assimilation:
  - Soil analysis: work has already started (J.-F. Mahfouf, K. Bergaoui)
  - Vegetation analysis: carbon cycle monitoring (C. Rüdiger)

Last developments

- Introduction of dust model DEAD in ISBA (Grini)






SURFEX
Δw = α x ΔT2m + β x ΔRH2m
NWP MODEL
Forcing
First-guess
Analysis
T2m RH2m