





Introduction to SURFEX

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SUW2017 February 27th - March 1st

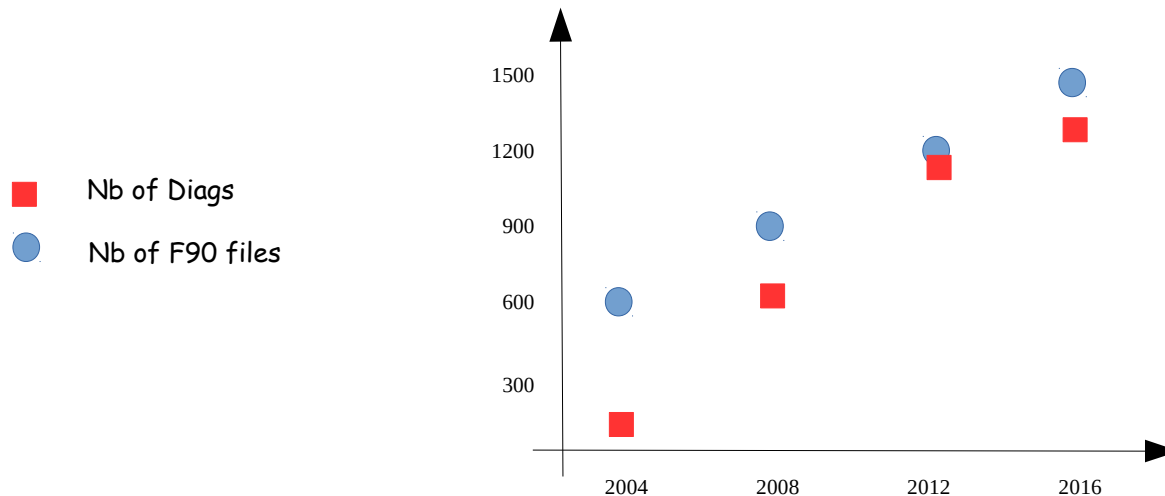
Genesis and History

- Construction of AROME model combining
 - ALADIN-NH non hydrostatic dynamics with
 - Meso-NH Cloud Resolving Model physics including
 - microphysics, turbulence,
 - radiation scheme and ... surface physics
- Decision to build SURFEX in ~2000
 - Usable for NWP, climate runs, monitoring, reanalysis, process studies
 - And for scales between 1km to 300km
- Externalization of surface physics
 - Version 0.0 in Feb. 2004, 13-yrs ago ! 
 - Coupled to Meso-NH and available for AROME
 - Basic off-line simulations with ISBA and TEB models
 - Code management outside IFS 



Evolution of the model over time

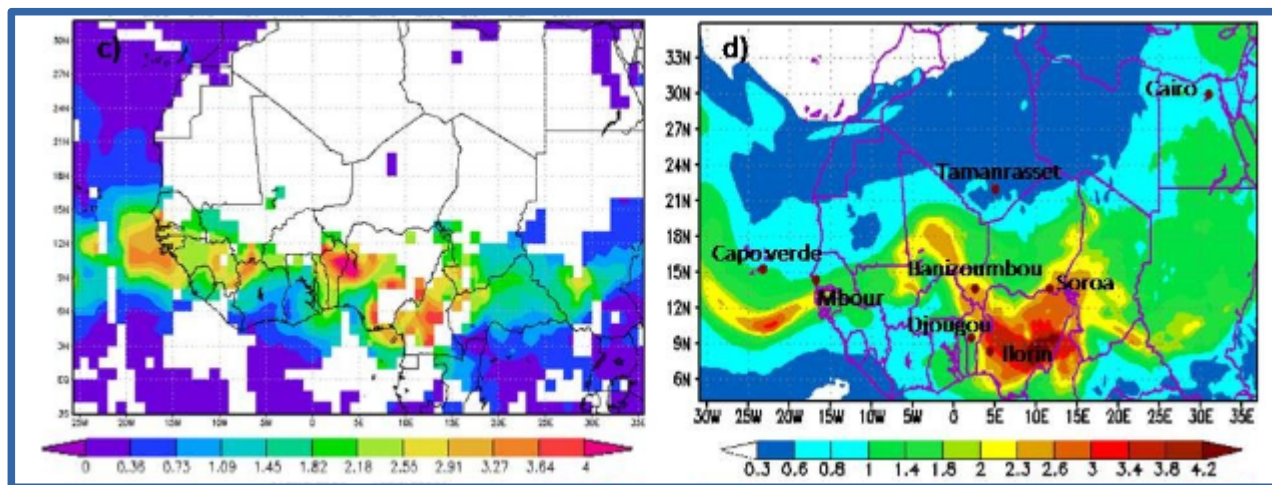
- Starting point 2004, main features:
 - An interface to couple surface to atmospheric models via fluxes
 - Tiling approach and patches for vegetation - ECOCLIMAP as vegetation database
 - ISBA model for vegetated areas; A-gs module for photosynthesis
 - TEB model for urban areas
 - Simple parametrizations based on Charnock formulation over water surfaces
 - Few diagnostics: per tile, on average over a grid-cell
- A continuously growing code



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Evolution of the model: 2004 - 2008

- Implicit coupling to ARPEGE climate model
- Implementation of ORILAM scheme for deposition and emission of primary aerosols (black and organic carbon)
- Implementation of DEAD "Dust Entrainment And Deposition" scheme

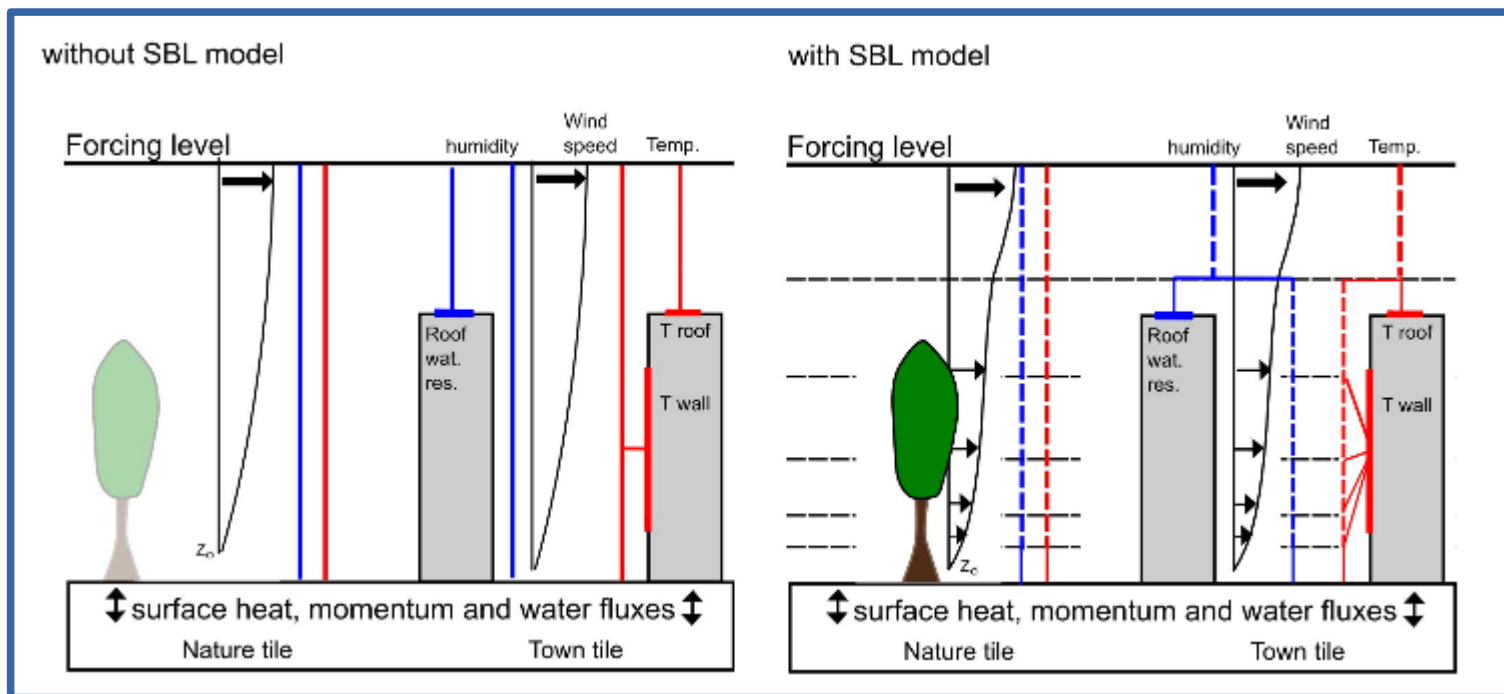


Daily mean AOD, 2006 March 10: MODIS / ALADIN

Mokhtari et al., 2012, GMD

Evolution of the model: 2004 - 2008

- Implementation of a 1D Ocean mixed layer model
- Implementation of COARE and ECUME fluxes parametrizations over sea/ocean
- Development of a Surface Boundary Layer ("Canopy")



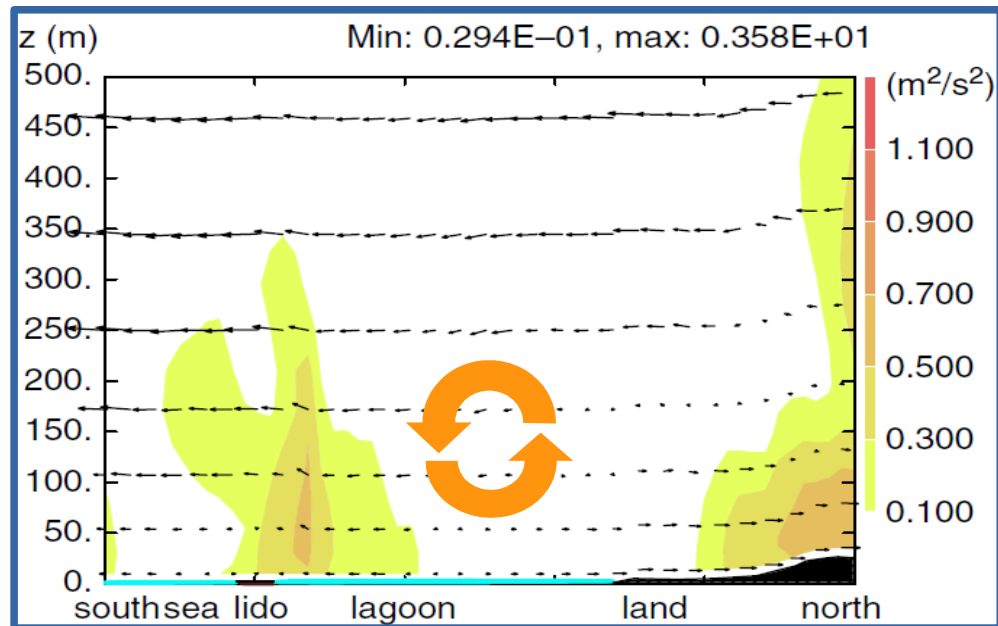
SBL scheme adding a drag force to nature and town tiles for the wind

Masson et al, 2013, GMD

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Evolution of the model: 2008 - 2012

- Implementation of FLake model and lake DB development
- Reflection to develop a surface DA
- Introduction of vegetation into TEB model

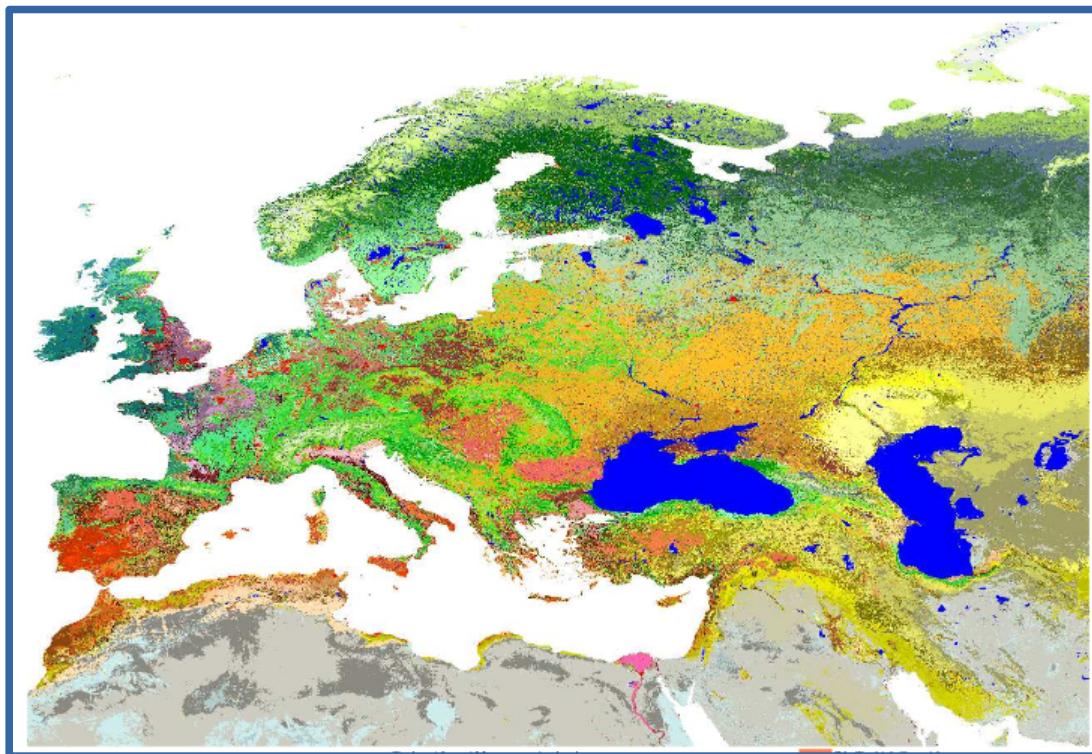


Wind and TKE, 2011 August 30, 10UTC: local breeze effect

Le Moigne et al., 2013, TellusA

Evolution of the model: 2008 - 2012

- Publication of ECOCLIMAP-2
- Implementation of coupling to CROCUS
- Development of an ISBA version dedicated to carbon cycle



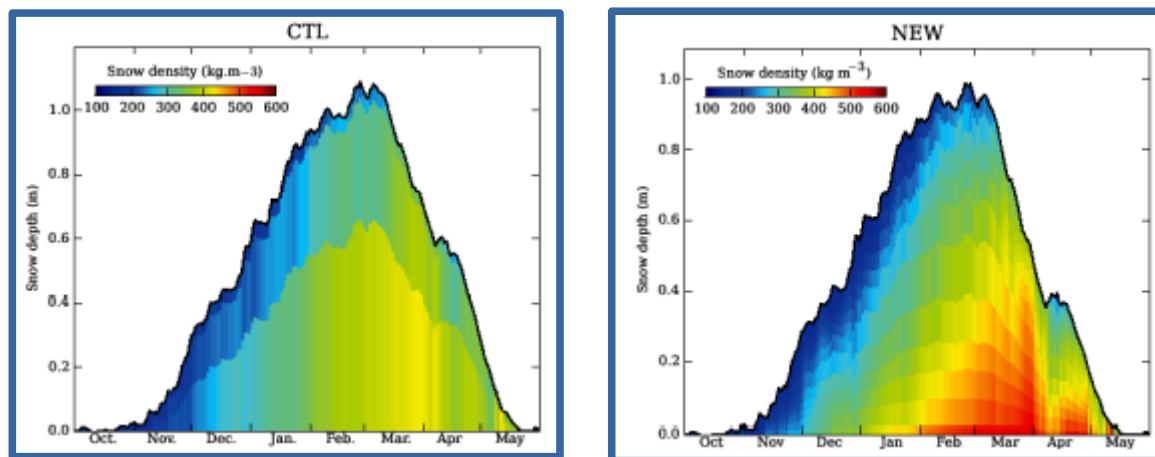
Ecoclimap-II map over Europe

Faroux et al., 2013, *GMD*

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Evolution of the model: 2012 - 2016

- Revision of ISBA-DF, ISBA-ES and ECUME schemes
- Development of the 1st SODA version
- Removal of global variables, OASIS, XIOS
- Update the coupling to hydrology: ISBA-TOP, ISBA-CTRIP

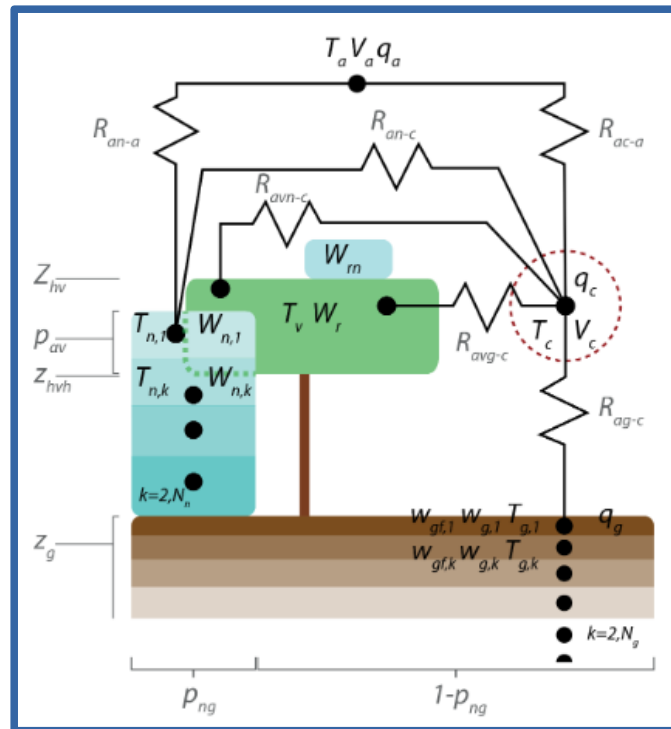


Snow density, Col de Porte, French Alps

Decharme et al., 2016, The Cryosphere

Evolution of the model: 2012 - 2016

- Update the French hydrological SIM suite
- Implementation of Gelato-1D sea ice model
- Development of TEB-BEM (Building Energy Model)
- Multi-Energy Balance MEB model



Schematic of MEB scheme

Boone et al., 2016, *GMD*

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Coordination and training

- Internal coordination meeting since 2009
 - Where essentially technical issues are discussed
- SURFEX steering committee since 2011
 - Representative of ALADIN, HIRLAM, LA (aerology laboratory), CNRM groups (GMAP, GMME, GMGEC, CEN)
 - Discuss surface work plans between consortia
- A mailing list surfex@meteo.fr with 80 subscribers
- Once a year a SURFEX training course is organized
 - Open to everyone, 2.5-day course, SURFEX basis, practical exercises
- Contribution to the Meso-NH training course
- Scientific documentation: 2009, 2012, 2017 to come
- Scientific reports available on SURFEX website
- Special Issue www.geosci-model-dev.net/special_issue14.html opened since 2011 in GMD journal

Thanks for your attention!

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