

The impact of different surface parameterizations and vertical resolutions on the simulation of sea-breeze episodes at the island of Fuerteventura



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On 8-10 April 2007, several episodes of intense sea-breeze fronts were registered at the island of Fuerteventura (Canary Islands). The sea-breeze circulation was primary driven by daytime heating contrasts between land and the Atlantic Ocean during a period of weak trade winds. Numerical simulations of these events were carried out using the 3.1.1 version of the Weather Research and Forecasting (WRF) Model. Two different domains with 6.6-km and 2.2-km horizontal grid spacing and two sets with 27 and 51 vertical sigma levels were defined. The simulation was performed using two-way interactive nesting between the first and the second domain, using different land surface model parameterizations (Thermal diffusion, Noah LSM and RUC) for comparison. Initial conditions were provided by the NCAR Dataset analysis from April 2007, which were improved using surface and upper-air observations. The poster is focused on the 9 April episode.

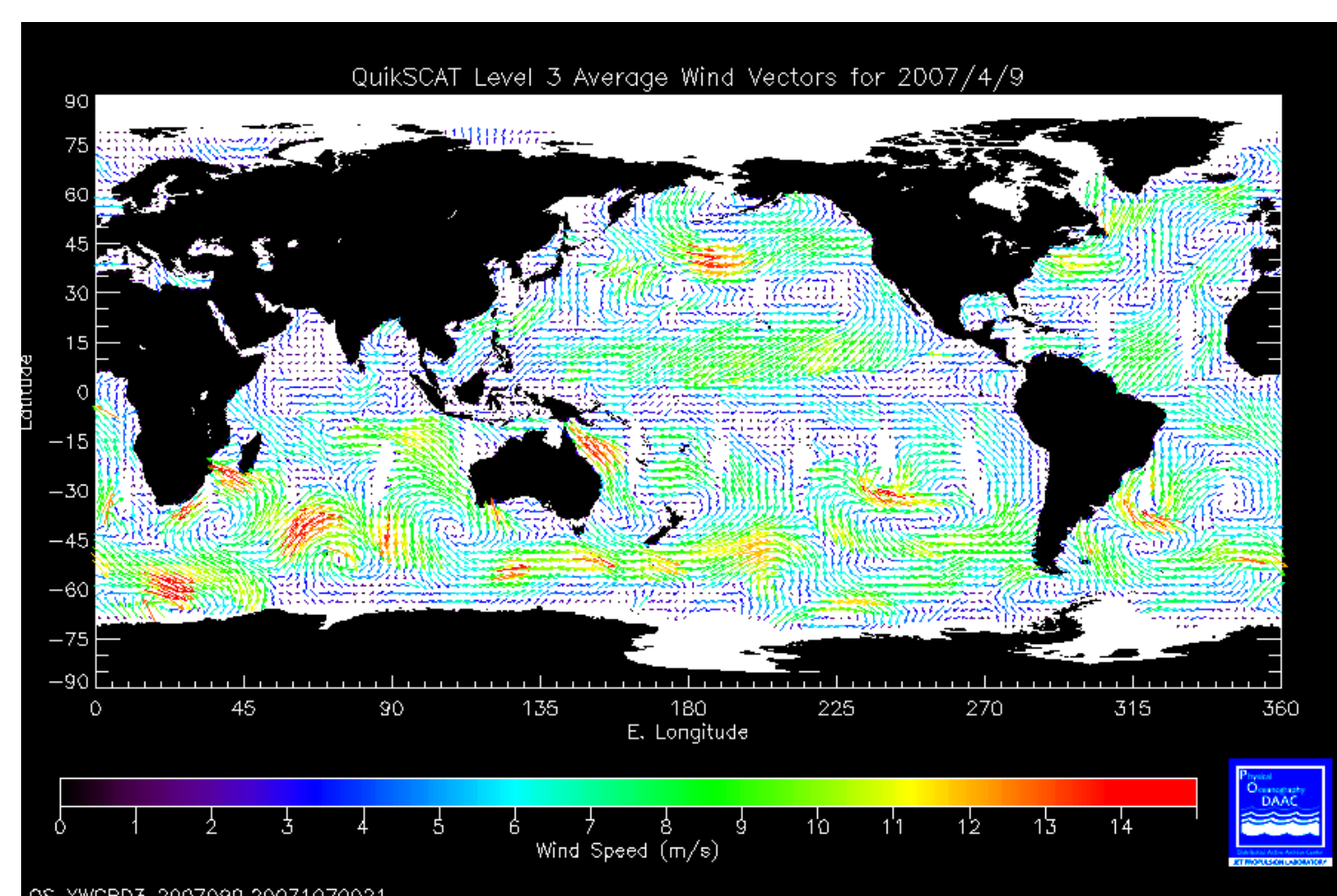
Sea-breeze episode on 9/04/2007



Convection triggered by the sea breeze, 12:30 GMT

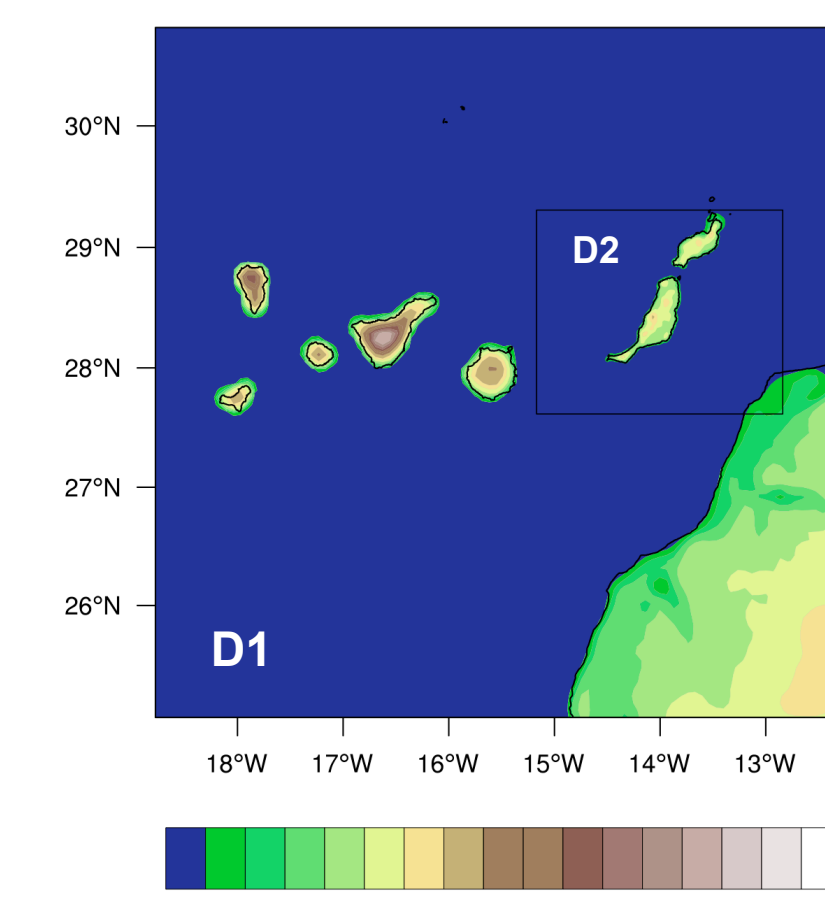


Visible image of Fuerteventura
on 9/04/2007, 14:00 GMT



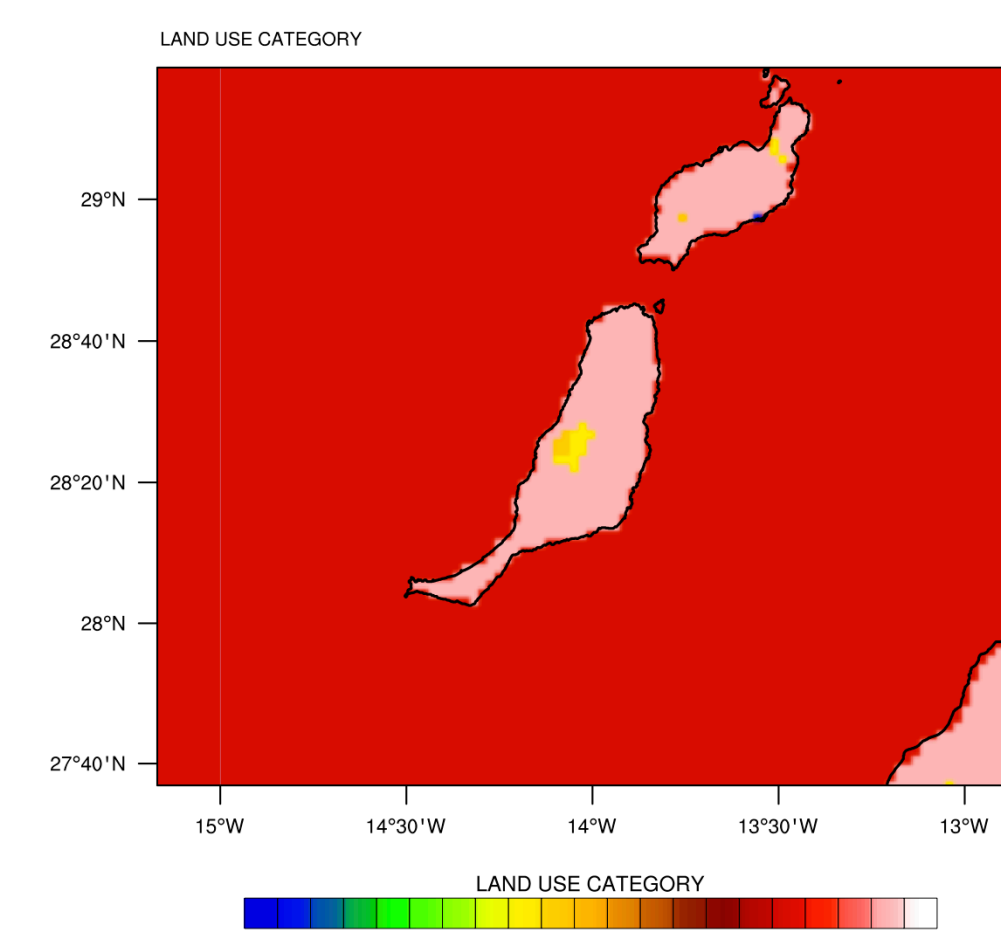
Quikscat image on 9/4/2007

WRFV3.1.1 Configuration



- 2 nested domains (6.6, 2.2 km), two-way nested feedback
- Input data: FNL dataset ds083.1 with $1^\circ \times 1^\circ$
- Improved using surface and upper-air observations (ds353.4 and ds464.0)
- 2 sets of runs with 51-level and 27-level

- Microphysics scheme : Lin et al. (opt. n° 2)
- Cumulus scheme : Kain-Frisch (new Eta scheme)
- Planetary boundary layer (PBL): Monin-Obukhov
- Atmospheric Radiation scheme: RRTM (LW) & Dudhia (SW)

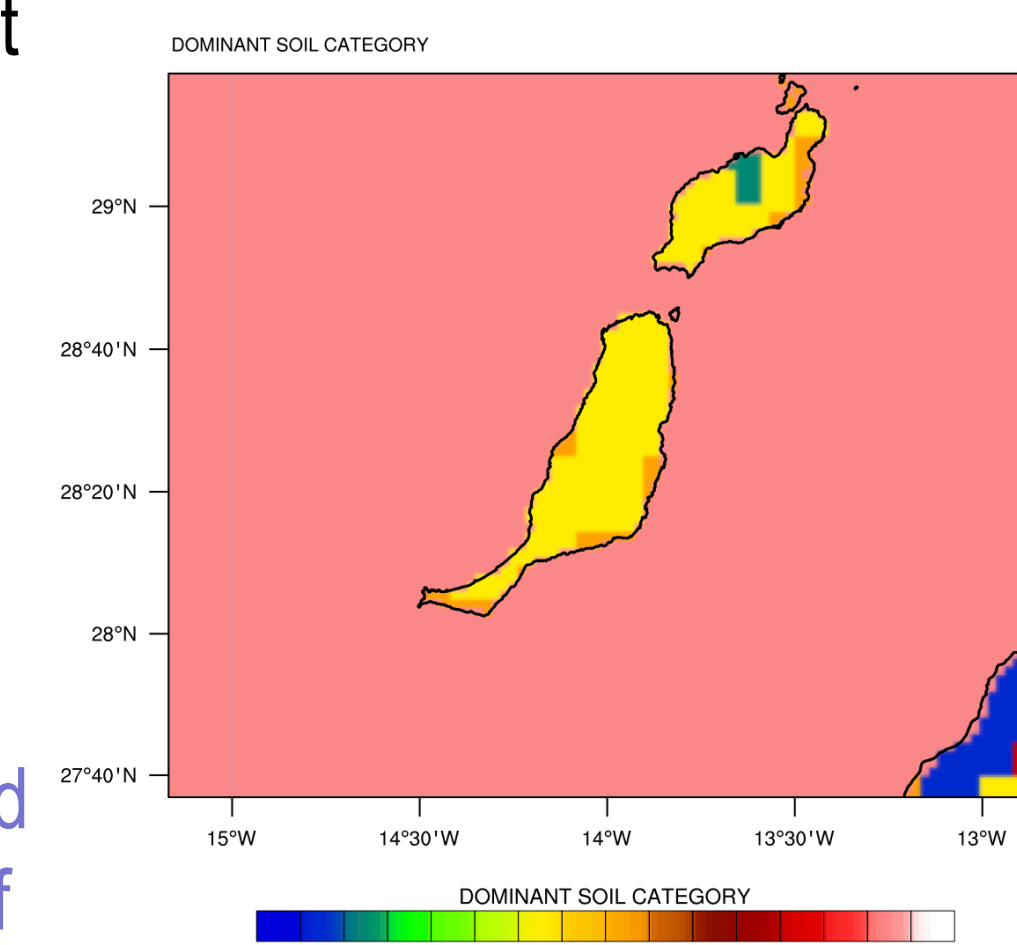


- Land use parameterization for Fuerteventura and Lanzarote (USGS 24-categories).
- The land use of Fuerteventura and Lanzarote islands is reduced to a few categories:
 - Barren or sparsely vegetated(19), water bodies (16), savanna(13) and urban and built-up lands (2)

- Dominant soil categories for Fuerteventura and Lanzarote islands (16-categories)

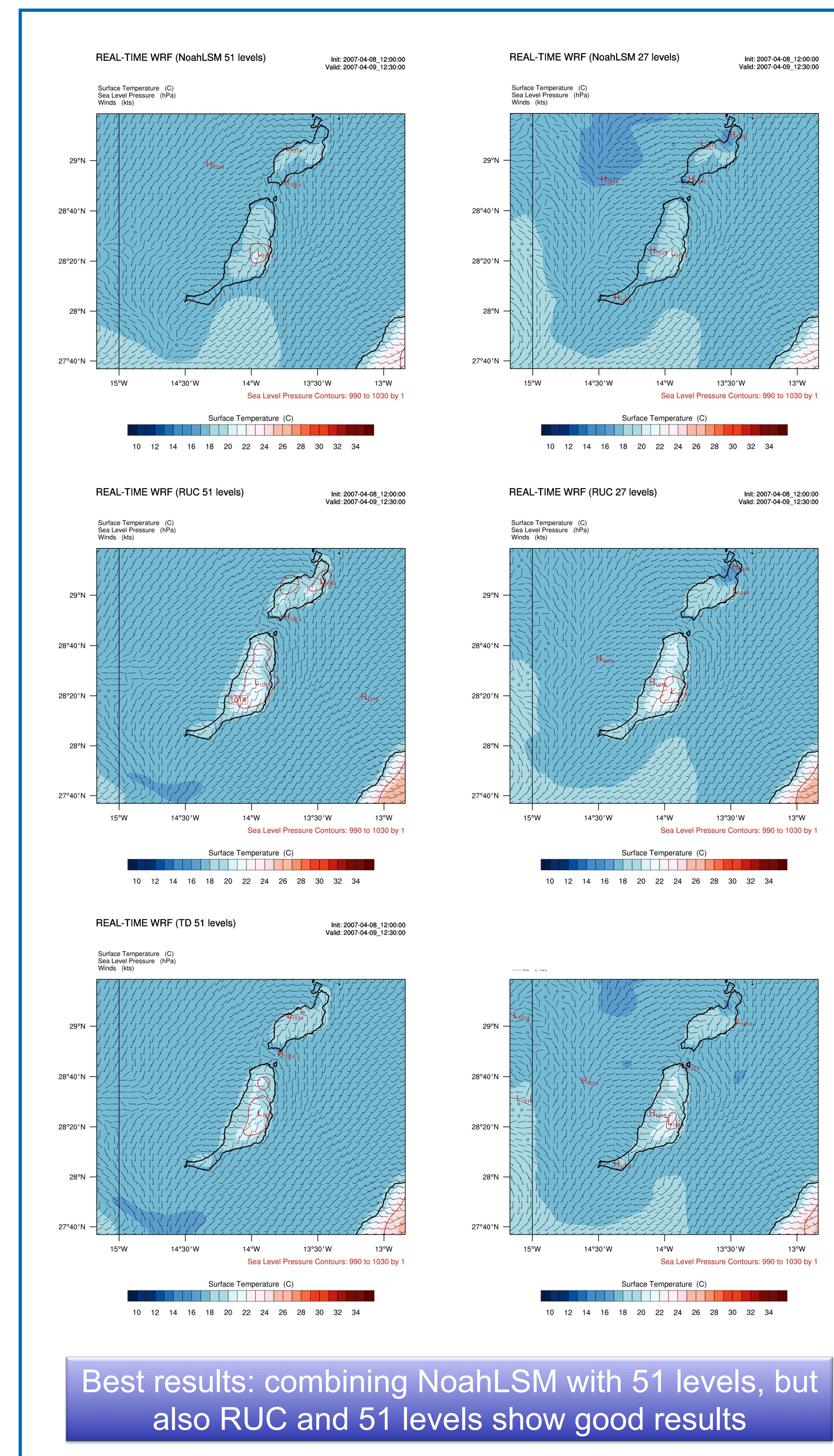
- As the land use, the dominant soil categories are reduced to very few:
 - Sand (1), sandy loam (3), Sandy clay loam (7), clay loam (9) and clay (12)

- Neither the land use nor the dominant soil are accurate, and should be updated because of the much increased urban and built-up lands across the coast of both islands



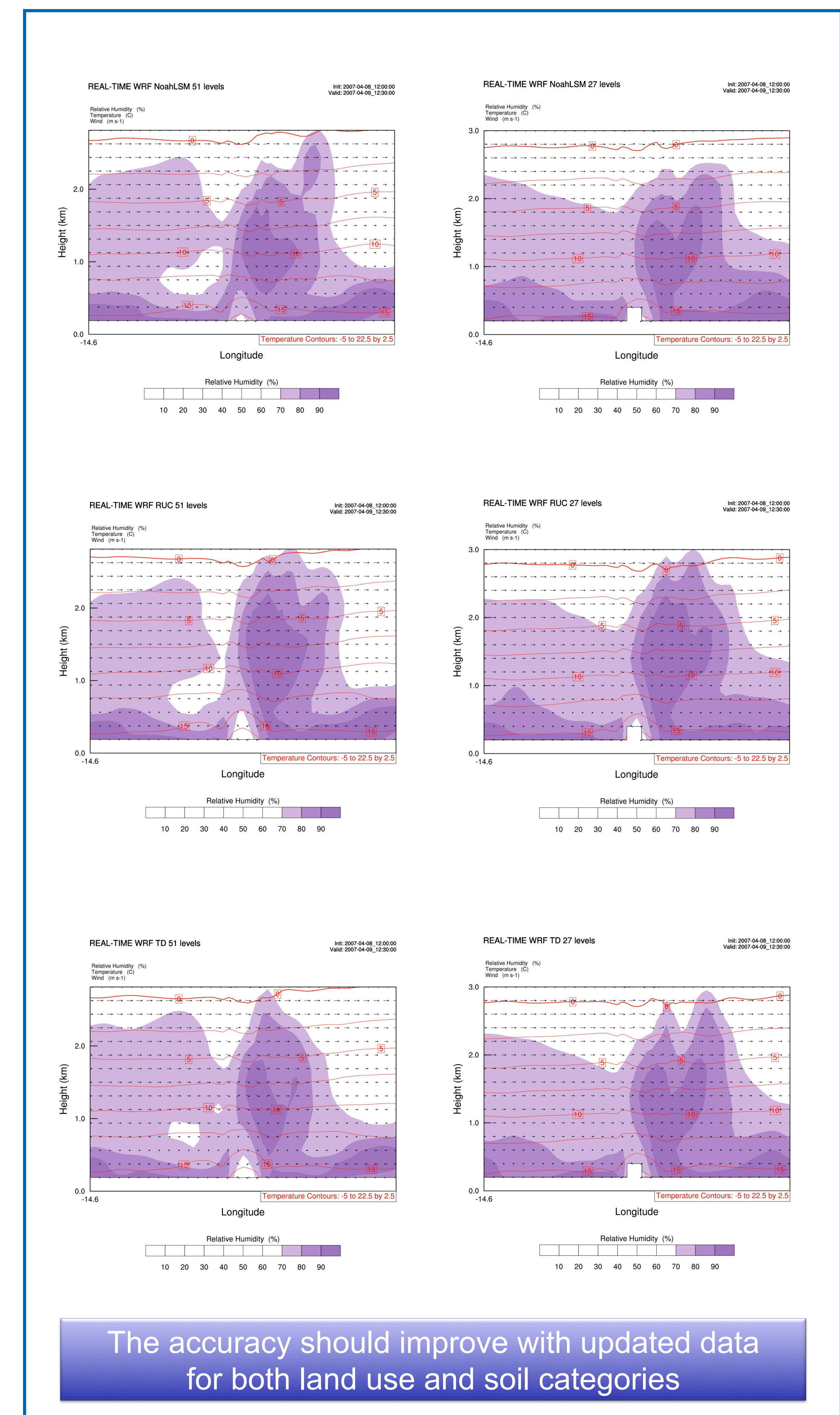
Schemes of the different inputs used in all the simulations

Surface maps: SLP, T and horizontal wind



Best results: combining NoahLSM with 51 levels, but also RUC and 51 levels show good results

Cross section: RH, T and wind



The accuracy should improve with updated data for both land use and soil categories