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ModObs: Atmospheric modelling for wind energy, climate and environment applications : exploring added value from new observation technique. Work in progress within a FP6 Marie Curie Research Training Network.

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The EC FP6 Marie Curie Training Network “ModObs” address the improvement of atmospheric boundary layer (ABL) models to investigate the interplay of processes at different temporal and spatial scales, and to explore the added value from new observation techniques. The overall goal is to bring young scientists to work together with experienced researchers in developing a better interaction amongst scientific communities of modelers and experimentalists, using a comprehensive approach to “Climate Change”, “Clean Energy assessment” and “Environmental Policies”, issues.

This poster describes the work in progress of 9 Ph.D students, funded by the network, under the supervision of a team of scientists within atmospheric physics, engineering and satellite remote sensing and end-users such as companies in the private sector, all with the appropriate expertise to integrate the most advanced research methods and techniques in the various topics as follow

MODELING:

Global-to-Meso Scale: Analytical and process oriented numerical models will be used to study the interaction between the atmosphere and the ocean on a regional scale. Initial results indicate an interaction between the intensity of polar lows and the subsurface warm core often present in the Nordic Seas (11). The presence of waves, mainly swell, influence the MABL fluxes and turbulence structure. The regional and global wave effect on the atmosphere will be also studied and quantified (7)

Meso-Scale: Applicability of the planetary boundary layer (PBL) parametrizations in the meso-scale WRF model to marine atmospheric boundary layer (MABL) over the North Sea is investigated. The most suitable existing PBL parametrization will be additionally improved and used for downscaling North Sea past and future climates (2). Application of the meso-scale model (MM5 and WRF) for the wind energy in off-shore and coastal area. Set-up of the meso-scale model, post-processing and verification of the data from the long simulation. Research of meso-scale phenomena for meteorological case study in Gulf of Finland (3).

Micro-Scale: Large eddy simulation (LES) is used to study the planetary boundary layer under different complex effects:

(a) *Forcing from general circulation model (GCM):* Comparison between GCM outputs and GCM-forced LES for maritime boundary layer (MBL) cases, namely the LASIE campaign (5).

(b) *Heterogeneity of the Marine Surface Layer (MSL):* Investigation of the air-sea turbulent exchange mechanisms under the effects of coastal discontinuity and horizontal gradient of temperature (6).

(c) *Heterogeneity of land surface:* Turbulence self-organization and its interaction with complex earth topography is studied (8).

(d) Wind farm complexity: Wind site assessment as well as turbulent effects for terrains with different complexity are studied (2).

OBSERVATIONS:

SATELLITE:

Contribution of satellite observations for the study and parametrization of marine boundary layer: Evaluate the added-value of observations from the current generation of satellite with emphasis on the potential of remote sensing data in describing temporal and spatial structures. Foreseen applications include: improvement of MBL description on coastal areas, identification of areas of interest for wind energy applications, gain of information of temporal and spatial scales of variability useful for numerical model parameterizations (6).

LIDAR, SODAR:

Remote sensing techniques applied for wind energy:

According to aeroelastic simulations, the production of the power curve of a large wind turbine (rotor diameter larger than 100m) requires wind speed measurements at several heights within the rotor disc. Suitable wind profiles can be measured by LiDARs and SoDARs (1).

The ModObs, home page is at http://www.modobs.windeng.net