Sensitivity analysis to physical parameterizations schemes applied for wind forecasting

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The airborne research center called CIAR is placed in the airfield of Rozas (Lugo, Spain). It is a center for experimentation and development of new Unmanned Aerial Vehicles. Since you need to have a good planning of the flights of the prototypes, it is necessary to have a good prediction of the wind at different levels of height.

To obtain a reliable database for wind at different vertical levels, three types of instruments have been used: anemometers installed at 10 meters high to determine surface wind, a sodar for levels below 150 meters and a wind radar for those between 200 and 3000 m high above the CIAR level.

Concerning the mesoscale modelling: we have used the WRF with 48 sigma levels and horizontal resolution of up to 3 x 3 km. Therefore, we have applied multiphysics ensemble techniques. Five combinations of microphysics schemes (AEROSOL THOMPSON, MORRISON 2 MOMENTS, THOMPSON, GODDARD and WRF 2 MOMENTS), three of PBL (MYNN3, YSU and MYJ), and two of Surface (NOAA and RUC) have been selected.

Once the wind data databases were obtained, by means of the different instrumentation indicated above, it has been compared with each of the 20 WRF scenarios. To visualize the results, Taylor diagrams have been used for the different heights.

In summary, some conclusions have been found:

- It’s necessary distinguish between low levels and those of slightly higher heights. On the surface, the scenarios with the PBL parameterizations called YSU and MYNN3 show better results.
- It seems that the microphysics schemes settings have a less importance in wind forecast, which is consistent with the physical interpretation.
- Above 200 meter, the 20 scenarios behave more satisfactorily with excellent correlation coefficients and low standard deviations

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