



Ensemble of different planetary boundary layer schemes in WRF model for wind speed and direction prediction over Apulia region

Andrea Tateo (1), Francesca Fedele (2), Menegotto Micaela (2), Roberto Bellotti (1,3)

(1) Dipartimento Interateneo di Fisica, Università degli Studi di Bari A. Moro, Bari, Italy, (2) Apulia Region Environmental Protection Agency (ARPA Puglia), Corso Trieste 27, 70126 Bari, Italy, (3) Istituto Nazionale di Fisica Nucleare, Sezione di Bari, Bari, Italy

article authblk

1]Tateo A. [1]Dipartimento Interateneo di Fisica, Università degli Studi di Bari A. Moro, Bari, Italy 2]Fedele F. 2]Menegotto M. [2]Apulia Region Environmental Protection Agency (ARPA Puglia), Corso Trieste 27, 70126 Bari, Italy 1,3]Bellotti R. [3]Istituto Nazionale di Fisica Nucleare, Sezione di Bari, Bari, Italy

ENSEMBLE OF DIFFERENT PLANETARY BOUNDARY LAYER SCHEMES IN WRF MODEL FOR WIND SPEED AND DIRECTION PREDICTION OVER APULIA REGION

[

The Weather Research and Forecasting mesoscale model (WRF) was used to simulate hourly 10m wind speed and direction over Apulia region in the city of Taranto, which is characterized by a large industrial area including the biggest European steel plant [1, 2]. In this area wind forecast could be of fundamental importance in order to know in advance the pollutant displacement. Although this model solves atmospheric equations with a resolution up to tens of meters, WRF surface outputs are affected by systematic errors. These errors depend primarily on uncertainties of the initial and boundary conditions provided by global models and secondarily on the physical parameterization used for represent processes such as turbulence, radiation exchange, cumulus and microphysics. In our work, the different Planetary Boundary Layer (PBL) parameterizations are investigated for ground wind speed and direction prediction. Model validation was performed on a single measurement point located in Taranto bay of Apulia region in the southern part of Italy. A total of five combinations of PBL and Surface Layer (SL) schemes were considered. We chose the Yonsei University with topographic correction, Mellor-Yamada-Janjic and Mellor-Yamada Nakanishi and Niinjo level 2.5 schemes for PBL parametrization. Each PBL schemes are considered with all SL supported schemes. In particular, for the first we used Revised MM5 Monin-Obukhov scheme, for the second we used Monin-Obukhov scheme with Janjic Eta modification and, for the third PBL scheme we used both above mentioned and MYNN surface layer scheme. The assessment of performance predictions were computed by comparing the WRF output and ground data from the already mentioned Taranto weather monitoring station. In addition, an ensemble of all the setup was considered and both simple (e.g. average) and more complex methods (e.g. weighted average, neural network) are adopted to verify whether an improvement is obtained with respect to the performances of each single setup [3, 4].

References

- [1] F Fedele, MM Miglietta, MR Perrone, P Burlizzi, R Bellotti, D Conte, and A Guarnieri Calì $\frac{1}{2}$ Carducci, Numerical simulations with the wrf model of water vapour vertical profiles: A comparison with lidar and radiosounding measurements. *Atmospheric Research*, 166:110-119, 2015.
- [2] F Fedele, M Menegotto, L Trizio, L Angiuli, A Guarnieri Calì $\frac{1}{2}$ Carducci, R Bellotti, R Giua, and G Assennato. Meteorological effects on pm10 concentrations in an urban industrial site: a statistical analysis. In *Conference Proceedings - 1st International Conference on Atmospheric DUST*. Pg. 162-167 DOI:10.14644/dust.2014.026 ISSN: 2283-5954, 2014.
- [3] F. Fedele, A. TATEO, M. Menegotto, A. Turnone, B. Figorito, A. Guarnieri Calì $\frac{1}{2}$ Carducci, A. Pollice, R. Bellotti, Impact of Planetary Boundary Layer parametrization scheme and land cover classification on surface processes: wind speed and temperature bias spatial distribution analysis over south Italy, 15th EMS Annual Meeting & 12th European Conference on Applications of Meteorology (ECAM) , September 2015, Sofia, Bulgaria.
- [4] A. TATEO, R. Bellotti, F. Fedele, A. Guarnieri Calì $\frac{1}{2}$ Carducci, A. Pollice: Post-processing of the Weather Research and Forecasting (WRF) mesoscale model by Artificial Neural Networks, GRASPA-SIS Biennial Conference, Bari, 2015, ISBN 978-88-88793-77-1.