

MAP-fis Essay Proposal, 2013-2014

(please write in English)

Supervisor

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Title

Improvement of short range weather forecasts by using numerical models

Area

(*Materials, Optics, Condensed Theory, High Energy Theory,....*);

Meteorology

Summary of Proposal

Weather has a tremendous effect on people's lives. In recent years there has been an increase of reported extreme weather events in Portugal, some with fatalities. These events, depending on their nature, are difficult to predict. This difficulty arises from several reasons; the temporal and spatial scales of weather phenomena can be greatly reduced as well the lack of reports and weather observations which reduces our knowledge about the weather phenomena, making it difficult to forecast. Short range forecast or nowcasts are of great importance since they can improve commercial activities like aviation, wind and solar energy, outdoor and fishing activity, sport events, construction and agriculture.

In this work proposal the student is expected to improve short range weather forecasts (6 to 12h) by using a numerical model. During the course of this work it will be necessary to explore several configurations of a weather numerical model, in terms of domain geometry, initialization and parameterizations, in order to produce a more realist forecast. Since numerical models outputs can be unrepresentative of local phenomena, it will be also necessary to develop a model output statistic (MOS) to improve model skills.

References

(to allow students first look at topic)

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Fonte, P. M., Gonçalo Xufre Silva, and J. C. Quadrado. “Wind speed prediction using artificial neural networks.” *WSEAS Transactions on Systems* 4.4 (2005): 378.384

Fragoso, M., et al. “The 20 February 2010 Madeira flash-floods: synoptic analysis and extreme rainfall assessment.” *Natural Hazards and Earth System Science* 12.3 (2012): 715-730

Luna, T., Rocha, A., Carvalho, A. C., Ferreira, J. A., and Sousa, J.: Modelling the extreme precipitation event over Madeira Island on 20 February 2010, *Nat. Hazards Earth Syst. Sci.*, 11, 2437-2452, doi:10.5194/nhess-11-2437-2011, 2011.