Geophysical Research Abstracts
Vol. 15, EGU2013-46-8, 2013
EGU General Assembly 2013

Evaluation of the Weather Research and Forecasting (WRF) Model over Portugal: Case study

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Established in 1756 the Demarcated Douro Region, became the first viticulturist region to be delimited and regulated under worldwide scale. The region has an area of 250000 hectares, from which 45000 are occupied by continuous vineyards (IVDP, 2010). It stretches along the Douro river valleys and its main streams, from the region of Mesão Frio, about 100 kilometers east from Porto town where this river discharges till attaining the frontier with Spain in the east border. Due to its stretching and extension in the W-E direction accompanying the Douro Valley, it is not strange that the region is not homogeneous having, therefore, three sub-regions: Baixo Corgo, Cima Corgo and Douro Superior. The Baixo Corgo the most western region is the "birthplace" of the viticulturalist region.

The main purpose of this work is to evaluate and test the quality of a criterion developed to determine the occurrence of frost. This criterion is to be used latter by numerical weather forecasts (WRF-ARW) and put into practice in 16 meteorological stations in the Demarcated Douro Region. Firstly, the criterion was developed to calculate the occurrence of frost based on the meteorological data observed in those 16 stations. Time series of temperatures and precipitation were used for a period of approximately 20 years. It was verified that the meteorological conditions associated to days with frost (SG) and without frost (CG) are different in each station. Afterwards, the model was validated, especially in what concerns the simulation of the daily minimal temperature. Correcting functions were applied to the data of the model, having considerably diminished the errors of simulation. Then the criterion of frost estimate was applied do the output of the model for a period of 2 frost seasons. The results show that WRF simulates successfully the appearance of frost episodes and so can be used in the frost forecasting.