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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Interaction between radiation fogs and turbulence: statistics, analysis and WRF simulations

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An accurate forecasting of fogs is one of the important goals for the operational meteorological services given the adverse effect that these events can produce over the daily life, especially on transport in its different ways: air, maritime and terrestrial. However, it is one of the tasks not solved yet. The role of the turbulence over the formation or dissipation of fogs is one of the most attractive research lines. While some authors establish that turbulence is a factor inhibiting the formation of fog, other found the opposite, i.e. turbulence acts favoring the formation of fog. Maybe, a combination of both theories leads to the conclusion that there exists a threshold on the relation between turbulence and fog.

This work studies the relation between turbulence and fog from a detailed analysis of different observational data recorded at CIBA (Research Centre for the Lower Atmosphere). This experimental site is placed around 30km north-west from Valladolid city, Spain, in the Northern Iberian plateau, on a region known as Montes Torozos, which forms a high plain of nearly 200 km2 elevated above the plateau. This place is especially suitable for the formation of radiation fogs in autumn and winter. Besides sonic anemometers and standard instrumentation (temperature, wind and humidity measurements), particle concentrations (PM10, PM2.5 and PM1) and high resolution microbarometers are available. The near airport Villanubla also supports METAR information in order to better determinate the fog events.

This study includes a statistical analysis from a large amount of radiation fog data and observational analysis of specific cases studies. WRF simulations of these days, using different PBL parameterizations, are validated with observations. Several meteorological magnitudes are studied at different heights during the fog events, including turbulent parameters. Also short-period surface pressure fluctuations are analyzed with data from microbarometers in order to study the propagation of possible internal-gravity waves interacting with the fog in the planetary boundary layer.