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The role of nocturnal Low-Level-Jet in nocturnal convection and rainfalls in the Mediterranean coast: the episode of 14th December 2010 in northeast of Iberian Peninsula

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Low-Level-Jets (LLJ's) have been detected in several parts in the world (Kottmeier, 1982; Corsmeier et al., 1997; Stensrud, 1996; Daran L. et al., 2010) since in 1957 Blackadar proposed an explanation of this phenomenon (Blackadar, 1957). He described the nocturnal jet as an inertial oscillation that develops over flat terrain in response to the rapid stabilization of the boundary layer that occurs near sunset under relatively dry, cloud-free conditions, and overall a strong radiative cooling. Usually, the LLJ reaches its maximum intensity in the early morning hours, and then decays shortly after dawn, when the convection begins.

The development of a LLJ typically occurs at levels less than 1 km above ground level, and frequently at levels less than 500 m above ground level. As discussed in Stensrud (1996) and Shapiro and Fedorovich (2009), nocturnal LLJ's (NLLJ's) exert significant influence on weather and regional climate. The jets provide dynamical and thermodynamics support for the development of deep convective storms and heavy rain events. Daran et al. (2010) discuses the most important places in the world where have been detected LLJ phenomena created by inertial oscillations. The Mediterranean coast is not a typical area mentioned by these authors.

The aim of this job is to show and describe the NLLJ detected in the mouth of some rivers in the north-east of Iberian Peninsula during the night of 13th-14th of December 2010. Analysing radar images from the Spanish Weather Service (AEMET) we have observed a rainfall area formed by the air convergence of a drainage winds in the mouth of some rivers and a synoptic wind.

By using MM5 simulations we have detected that the drainage wind adopts a typically LLJ profile from midnight to the early morning of 14th. The LLJ drives a cold slope wind that converges few kilometres offshore with a prevailing warm and wet southeast wind. The air is lifted, and presents a return flow of heat and moist air around 800-1200 meters height. The contact of this mass air with the cool air of NLLJ sloping down by the coastal mountains produces a condensation in the slope of the coastal mountains, forming clouds and rainfall onshore.

Analysing the nights before and after this episode large drainage winds producing a convergence area off-shore were simulated. However, the model simulation doesn't generate a LLJ. Consequently, the convergence is not enough to condensate the air and producing precipitation. This fact is in agreement with radar observations which reported no precipitation during these days. Consequently, the NLLJ could enhance the formation of rainfall areas near the coast.