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Splitting of the middle layer of LPW SAFNWC/MSG satellite product in order to improve the monitoring of pre-convective environments

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Seven of the infrared channels from the Spinning Enhanced Visible and Infrared Imagery (SEVIRI) instrument, on board the Meteosat Second Generation (MSG), are used to retrieve Layer Precipitable Water (LPW) and Stability Analysis Imagery (SAI) in the SAFNWC framework. Both products are retrieved using statistical retrieval based on neural networks.

The LPW provides information on the water vapor contained in a vertical column of unit cross-section area in three layers in the troposphere (low, middle and high) and in the total layer in cloud free areas. The SAI provides estimations of the atmospheric instability in cloud-free areas, in particular the Lifted Index (LI). The stability and precipitable water obtained with both products are routinely generated every fifteen minutes at a satellite horizontal resolution of 3km in NADIR.

It is important to note that many factors are involved in the development of severe weather and these parameters are only some of the indicators. However, due to the high resolution of these parameters, the use of them in conjunction with satellite and radar images can help to locate mesoscale events. The MSG moisture and stability time trend fields are especially useful during the period preceding the outbreak of convection due to the high resolution. Once the outbreak of convection occurs, the products calculated in the clear air pixels surrounding the convective system will allow to foresee the evolution of the convection.

SAFNWC LPW and SAI were analyzed for a severe weather event during August 2004. A thunderstorm over Teruel (Spain) produced intense precipitation and hail; a tornado developed while this thunderstorm was moving towards SSW. The pre-convective stability and moisture SAFNWC products changed accordingly with the

severe weather and delimited the hazardous area. In previous stages, the atmospheric moisture in medium levels was represented by only one level parameter (ML). However, as shown in a previous paper (Martínez, 2007), this layer is too thick (840hPa-437hPa) to perform an adequate monitoring of this severe weather event. Therefore, an improvement on the LPW algorithm has been carried out by splitting the middle layer into two new sub-layers (approximately separated at 700 hPa) and training two new neural networks. The behavior of the new sub-layers in this severe weather event has been tested, and the improvements obtained with these new sub-layers in the monitoring of the pre-convective event have been evaluated.