Plinius Conference Abstracts,
Vol. 11, Plinius11-115, 2009
11th Plinius Conference on Mediterranean Storms

Analysis of warm convective rain events in Catalonia

D. Ballart, F. Figuerola, M. Aran, and T. Rigo
Meteorological Service of Catalonia

Between the end of September and November, events with high amounts of rainfall are quite common in Catalonia. The high sea surface temperature of the Mediterranean Sea near to the Catalan Coast is one of the most important factors that help to the development of this type of storms. Some of these events have particular characteristics: elevated rain rate during short time periods, not very deep convection and low lightning activity. Consequently, the use of remote sensing tools for the surveillance is quite useless or limited.
With reference to the high rain efficiency, this is caused by internal mechanisms of the clouds, and also by the air mass where the precipitation structure is developed. As aforementioned, the contribution of the sea to the air mass is very relevant, not only by the increase of the big condensation nuclei, but also by high temperature of the low layers of the atmosphere, where are allowed clouds with 5 or 6 km of particles in liquid phase. In fact, the freezing level into these clouds can be detected by -15ºC. Due to these characteristics, this type of rainy structures can produce high quantities of rainfall in a relatively brief period of time, and, in the case to be quasi-stationary, precipitation values at surface could be very important.
From the point of view of remote sensing tools, the cloud nature implies that the different tools and methodologies commonly used for the analysis of heavy rain events are not useful. This is caused by the following features: lightning are rarely observed, the top temperatures of clouds are not cold enough to be enhanced in the satellite imagery, and, finally, reflectivity radar values are lower than other heavy rain cases.
The third point to take into account is the vulnerability of the affected areas. An elevated percentage of the Catalan population lives in the coastal region. In the central coast of Catalonia, the urban areas are surrounded by a not very high mountain range with small basins and steep slopes. These factors increase the number of flash floods and the risk indexes.
In the present study it is showed the general characteristics of the warm rain events observed in Catalonia, using meteorological, pluviometric, thermodynamic, and remote sensing data. Beside this, other heavy rain events with different features have been analyzed with the purpose of identify the main differences and to improve the knowledge in order to provide enough information for surveillance tasks