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A separation between stratiform and convective precipitation from instability indices and a backward trajectories study

0.0.1 I. Iturrioz (1), E. Hernández (1), P. Ribera (2), R. Méndez (3)

(1) Departamento de Física de la Tierra II; Fac. CC Físicas; Univ. Complutense de Madrid, Spain

(2) Universidad Pablo de Olavide, Sevilla, Spain

(3) Río Piedras. Universidad de Puerto Rico

Two-daily radiosonde observations (00GMT and 12GMT) series covering 30-year periods for four observatories over the Eastern Iberian Peninsula have been used in order to estimate thermodynamic instability. The selected stations are: Barajas Airport (Madrid), San Javier (Murcia), Zaragoza Airport and Palma de Mallorca Airport. Dynamic instability has been estimated from ERA 40 reanalysis and precipitation data for the analyzed period. The thermodynamic instability indices used in our analysis have been: CAPE (Convective Available Potential Energy), LI (Lifted Index), SI (Showalter Index) and CIN (Convective Inhibition). The relationship between each of these indices and precipitation has been evaluated. As well, the relationship between precipitation and dynamic instability, characterized by an index such as Q divergence, has been analyzed. From our results we have been able to produce a classification of convective or stratiform precipitation depending on the previous indices by using a percentile threshold for each one of them.

Convective precipitation seasonal pattern obtained from instability indices reproduces quite well observational patterns, with a maximum of convective precipitation during September and October and a minimum during winter months.

Finally, air mass retrotrajectories have been calculated for selected days (as for example: days with very high atmospheric instability without precipitation; or days with

extreme precipitation) in order to identify sources for the humidity. The knowledge of atmospheric instability and its relationship with the associated precipitation type and the source of the air masses, have contributed to a better understanding of the water cycle over the Iberian Peninsula.