



A 6-year climatology of upper-tropospheric troughs and associated precipitation in the Mediterranean region based on AMSU observations

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The Mediterranean basin is an area of frequent cyclonic activity, where both local effects and large scale dynamics have significant contribution to the extent and severity of weather events. Synoptic-scale perturbations such as southward stratospheric intrusions and tropopause folds are often precursors of surface cyclogenesis and occurrence of extreme events, among them, heavy precipitation. We present a novel climatology of upper-tropospheric troughs and their associated precipitation, using 6 years (2001-2006) of Advanced Microwave Sounding Unit (AMSU) data. Channel 8 of AMSU-A is used to identify upper-level troughs, while combinations of channels 3 to 5 of AMSU-B are used to detect moderate rainfall and convective areas. Results show that troughs are more frequent or persistent during November through March in the whole of the Mediterranean basin, with up to 25% of days in the northwestern part of the basin. There is pronounced interannual variability of number of intrusions in all of the Mediterranean from September through June. During summer, the variability is reduced except in the NW region, and no troughs were observed in the SE region (Turkey and Levant). Moderate precipitation occurs in at least 60% of the cases when an upper-level trough is present, and the frequency presents weak seasonal dependency. These results show small year-to-year fluctuations, especially in the southern Mediterranean, where moderate precipitation is an ubiquitous feature. The occurrence of deep convective rain associated with trough is lower, around 50%, and reduces to

20% in the northern part of the basin during winter. This occurrence varies a lot with individual years, especially in the southern Mediterranean. This suggests that the association of troughs and moderate precipitation is robust there while the upper-level trough forcing of deep convection is not always effective. We further examine the dependency of the frequency of precipitation on the axis of inclination of the trough, and the position of precipitation area relative to the center of the trough. No particular dependency of occurrence of precipitation (whether moderate or convective) on the inclination of the upper-level trough was found. The location of precipitation however is distinctly favored downstream.