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Characterization of Tropical Plumes that transport humidity from the Tropics to the Eastern Mediterranean over Africa

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Tropical plumes (TPs) are tropical-extratropical interactions that transport moisture from the Tropics to Mid-Latitudes in a continuous narrow band to the east of an upper level trough. By carefully analyzing the conditions that existed at times when TPs developed we find that they are always accompanied by an intensification of the Subtropical Jet (STJ) just to the north of the region of their formation, which confirms earlier observations of TPs worldwide. The presence of TPs over the eastern part of Northern Africa is an important element in generating precipitation in the deserts of the south eastern Mediterranean.

In this study we have identified 10 different occasions when TP prevailed over central and northern Africa during the winter seasons between 1988 and 2004 and by characterizing these events we obtained a canonical description of a TP event. In order to characterize the conditions during each of these events we used the NCEP-NCAR reanalysis data in isentropic coordinates and have selected criteria associated with the initial formation, structure and evolution of the TP.

A typical event, which roughly characterizes the essential features of all 10 cases, occurred in December 2003. The main novel characteristics of this typical case are as follows:

1. It originates at 12-15N,4-13E where the source of its humidity is the Gulf of Guinea.

2. Large vertical ascent of about 3-5km along its trajectory, from an altitude of 4-5

km to an altitude of 8-9 km.

3. Strong ageostrophic velocity component occurs in the entrance region of the TP to the STJ, i.e. in the southern tip of the trough. This ageostrophic wind component of the wind is westerly and has a magnitude of 20 m/s.

Once all 10 TP cases are characterized in a similar manner the insight gained from this characterization will, hopefully, produce a conceptual scenario of a general TP and help in understanding the role it plays as part of the global Hadley circulation.