Synoptic climatological analysis of “wet” and “dry” Red Sea Troughs over Israel

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This study presents results of a synoptic-climatological analysis of the Red Sea Trough (RST) in Israel and vicinity for the period of March 1985 - November 1994, based on a simple algorithm for identifying RST situations. The algorithm was applied to the NASA GEOS-1 reanalysis gridded data set (2.0^0 Lat x 2.5^0 Lon). Daily rainfall data from 10 representative rain-measuring stations were supplied by the Israel Meteorological Service.

We categorized the RSTs on the basis of measured rainfall, into "wet" and "dry" RST situations. We examined the main differences of the synoptic and meteorological features between these two categories, and also studied the differences between wet RSTs and non-RST rain situations (NRR).

Results show that RSTs are most frequent in October with a secondary maximum in April. A pronounced diurnal variation in the frequency of occurrence of RSTs is found, with the majority of wet RST situations occurring at 12 and 18 UT.

It was found that Dry RSTs are associated with a general decrease of cyclonic activity in our region, and wet RSTs are associated with a northward shift of the cyclone tracks over the Eastern Mediterranean. Centers of Transient Cyclonic Disturbances (TRADs) were found to be related to the northward penetration of the RSTs. Non-RST-associated rain is accompanied by a laterally wider upper trough, located right over the Israeli coastline with a relatively shallow southward penetration. On the other hand, RST-associated rain is accompanied by a relatively narrow upper trough, located to the west of the Israeli coastline and characterized by a deeper southward penetration.

Results suggest that the immediate moisture source for the non-RST rains is the Eastern Mediterranean and Europe, both near the surface and at mid-troposphere. On the other hand, during RST rain situations two moisture sources may be operating: 1. Combined moisture transport from the Eastern Mediterranean and Europe with Equatorial Africa by the west-northwesterly flow near the surface. 2. Moisture transport from Equatorial Africa by the southwesterly mid-tropospheric flow.

Non-RST rains are associated with increased intensity of the Subtropical Jet Stream (STJ) at 200 Mb throughout the rainy season. On the other hand wet RSTs are not associated with a considerable increase of the STJ (except in March and April) but

with pronounced divergence over our region. However, in contrast to the finding concerning the wind intensity at 200 Mb, maps of vector anomalies show that wet RST's, especially in fall and spring, are associated with a jet stream directly over Israel.