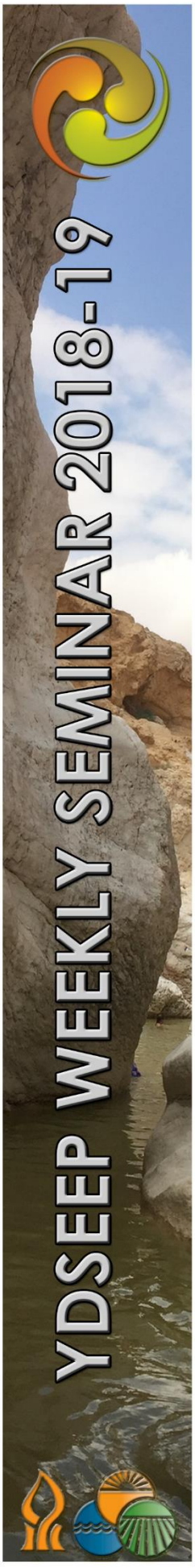

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The role of dry air in frontal precipitation

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Abstract

The conceptual picture of an extratropical cyclone typically includes warm and cold fronts and various cyclone-related airstreams, including the dry intrusion (DI). The DI is a stream of air descending slantwise from the upper troposphere equatorward behind the cold front. This may have a dynamical impact on the cold front and the cold sector behind it, helping to produce instability and potentially convective activity.

Based on the ECMWF ERA-Interim dataset for 1979-2014, we combine case studies, feature-based climatologies and composite analysis. We have combined a global climatology of DIs produced using a Lagrangian trajectory analysis, and an objective climatology of cold fronts to investigate and quantify the climatological link between DIs and cold fronts, and understand the role of DIs in shaping the frontal environment and impact. The cold fronts have been separated into different types: central fronts, where the front lies within the closed pressure contours of a cyclone; trailing fronts, where the front is connected to a central front but lies outside the closed pressure contours; and isolated fronts that exist away from a cyclone.

The global spatial distribution of cold fronts linked to DIs are presented, along with an investigation of the differing strengths of fronts with and without the presence of DIs. Case studies demonstrate the development of an extratropical cyclone associated with a DI and the associated surface wind and precipitation. Although the DI contributes to drying of the atmospheric column, it created a potentially unstable environment for convection to be triggered. This insight is generalized using composite analysis, indicating that fronts that occur with DIs are substantially larger, sharper and more impactful in terms of precipitation and surface winds.

Date & Location:

Tuesday, December 11, 2018, 11:00
Lecture room, Physics Building (ground floor)