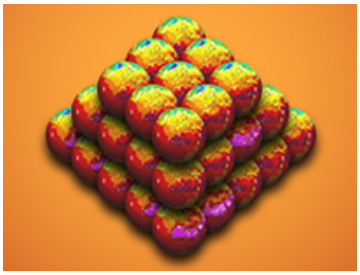

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Feature-based diagnostics for understanding surface extremes

The weather in the midlatitudes and its extremes are governed by the passage of extratropical cyclones. The conceptual model developed through inspecting specific case studies related three main features to cyclones: 1. Fronts, 2. Dry-air intrusions (DIs), and (3) the Warm conveyor belts (WCBs).

A climatological study quantifying the co-occurrence of fronts and DIs (Raveh-Rubin and Catto, 2018?) found it to cause more extreme surface weather. Our goal is to extend the climatological study of the relationship between cyclones, fronts and DIs to a time evolution perspective of weather systems. We focus on the climatological relationship between extratropical cyclone characteristics, DIs and cold fronts, their co-evolution throughout the lifetime of a cyclone, and consequently their impact on the surface weather. The main challenge in doing so is to accurately identify and track the cyclones, and to properly associate the fronts and DIs related to the tracked weather system.

Tracking and identification is strongly dependent upon the spatial and temporal resolution of the data. Using the new ERA-5 reanalysis we assess the sensitivity of the identification and tracking tools of fronts, cyclones, and DIs, to the spatial and temporal data resolution. Furthermore, we analyze the surface impact of these key meteorological features using surface parameters from the improved reanalysis model.

In our study we will present specific case studies to demonstrate how the ERA5 reanalysis can improve the automatic identification and tracking of cyclones (Wernli and Schwierz, 2006), fronts (using a thermal front parameter, Hewson 1998), and DIs (LAGRANTO v2.0, Sprenger and Wernli, 2015), in comparison to ERA-Interim. Then, we will use the ensemble forecast data to better understand the physical processes which influence the development of the weather system by focusing on "forecast bust"events and analyze the differences in the model forecasts among ensemble members.

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