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# Application of a Frontal Tracking Scheme (FTS) in the Mediterranean region

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Contrary to the extensive research that has been conducted on automatic identification and tracking of fronts in the ocean regions, climatological studies focusing on the Mediterranean fronts are relatively few and quite outdated, based on subjective approaches with the aid of synoptic surface maps. Since the Mediterranean is a closed sea basin with complex topography, fronts appear over smaller spatial and temporal scales, and they often exhibit a more complicated evolution, regarding their kinematic and thermodynamic structure as compared to fronts over oceans. A state-of-the-art frontal tracking scheme (FTS) was developed in the University of Melbourne to identify and explore the climatological characteristics of cold fronts in the Southern Hemisphere where the topography is rather uniform. The algorithm employs, as the only criterion for the identification of the cold fronts, the wind shift at 10 m, succeeding in identifying cold fronts and it is able to reveal interesting frontal features, such as position, length, meridional tilt, and intensity.

The objective of this study is to apply the FTS in the Mediterranean region to identify cold fronts with the aid of ERA-Interim reanalysis data and to verify the results in comparison with operational surface charts and satellite data for selected cases for both winter and summer. More specifically, the following criteria are employed to reflect a vigorous shift in the origin of the air mass to more southerly regions a) the 10-m wind shift from the northwest quadrant to the southwest quadrant, and (ii) the magnitude of change of the meridional wind component exceeding 2 $m/s^2$. Sensitivity tests are performed for different wind speeds starting from 2 $m/s^2$with an interval of 1 $m/s^2$. It is found that values of wind change, ranging between 4-5 $m/s^2$ represent better Mediterranean cold fronts, while wind change greater than 7 $m/s^2$does not succeed in efficient front tracking.

It is demonstrated that the algorithm succeeds in representing the large-scale systems over the Atlantic, but often fails in capturing the position and length of the Mediterranean fronts, due to their smaller scale and the thermodynamic mechanisms acting in their development, that are not encountered in the above mentioned wind regime criteria. Therefore, it is suggested that additional criteria referring to vertical temperature gradient should be incorporated in the algorithm in order to improve its efficiency in simulating Mediterranean cold fronts.