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Identifying main moisture sources affecting the Mediterranean Basin

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We investigate precipitation dynamics over the Mediterranean region using 4 different reanalysis data (ERA-Interim-European Center for Medium-Range Weather Forecast Reanalysis data, MERRA-Modern Era Retrospective-analysis for Research and Applications, CFSR-Climate Forecast System Reanalysis, JRA25-Japanese 25-year ReAnalysis). In order to allow the comparison among the different reanalysis data, common time period as 1980-2013 preferred. We use a Lagrangian based moisture back trajectory analyses to understand the role of various oceanic and terrestrial evaporative sources that contribute to the winter (December-January-February) precipitation distribution. The key in determining the moisture sources and sinks through Lagrangian moisture source analysis is the identification of the major regions that contribute to the precipitation for the Mediterranean Basin. In this approach, we defined 10 different complementary moisture source regions for the Mediterranean land region (target region, 30-49.5N and 9.75W-61.5E) grid points between 10S-71.35N and 80W-84.88E and daily precipitation over each grid point within the Mediterranean basin is backtracked to one of the ten source regions.
Our results indicate that the domain size allows to account for up to 90% of the moisture sources during winter season. All reanalysis data generally exhibit similar precipitation patterns and recycling ratios. The average winter precipitation for the target region is up to ∼6mm/day according to the CRU data and the results obtained by using reanalysis are extremely consistent with this result in terms of amount and distribution. On average, recycling ratios exhibit a dipolar pattern as high values in southern and low values in the northern parts of the core region. Results also reveals the importance of the remote moisture sources to the Mediterranean land region. For instance, we found that North Atlantic, Mediterranean Sea and Mediterranean Land (core region) are the major moisture source regions dominating the winter precipitation over the core region.

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