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Lagged correlations of sea surface temperature regimes and Mediterranean climate variables

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Related to large-scale oceanic variability sea surface temperature (SST) regimes are identified as predominant patterns of SST variability with a temporal persistence of at least one season. SSTs are taken from the ERSST (Extended Reconstruction Sea Surface Temperatures)- Dataset, Version 2 of Smith and Reynolds (2003). The identification of the SST regimes is accomplished by grouping similar loading patterns of s-mode principal component analyses (PCAs) of monthly, two-month, and three-month mean SST fields in the area 20˚S-60˚N for the years 1950-2003. As a result 21 regimes are determined with eleven regimes having their spatial centres of variation (regions of high positive or negative PC loadings) in the Pacific Ocean, six in the Atlantic Ocean, and two in the Indian Ocean. Two further regimes show a simultaneous variability in different oceans. Some of the regimes persist, with varying strength and spatial extent, throughout the entire year, whereas other ones are only characteristic for a particular season.

High-resolution precipitation and temperature data, uniformly covering the Mediterranean land areas on a 0.5˚ x 0.5˚ grid, are provided by the Climatic Research Unit (CRU05 dataset, New et al. 1999, 2000), updated and homogenized by Oesterle et al. (2003). PCA is separately applied to the monthly Mediterranean precipitation and temperature fields in order to remove linear dependencies and to reduce dimensions of the data. The resulting spatial centres of variation can be interpreted as different temperature and precipitation regions, respectively.

The SST regimes are related to the Mediterranean precipitation and temperature re-

gions by means of cross correlation analyses between corresponding high-pass filtered PC time coefficients. Time lags from 1 to 12 months are considered with SSTs leading Mediterranean climate. These time lags are used to explore the prognostic suitability of the SST regimes for Mediterranean seasonal predictions.

A prominent SST regime which represents the ENSO phenomenon, shows higher lagged correlations only with precipitation of October and November in the western Mediterranean area. However, there appears a significant influence of a SST regime with its centre of variation in the Eastern North Atlantic at 30˚N to 50˚N on Mediterranean precipitation and temperature in almost every month of the year. But also other SST regimes show higher lagged correlations with Mediterranean climate: e.g. for Mediterranean temperature from spring until autumn there are significant correlations with a regime having its centres of variation in the central North Pacific at 40˚N and, with opposite sign, in the eastern North Pacific between 50˚N and 60˚N.

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