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Tropical influences on Mediterranean precipitation variability

S. Seubert, J. Jacobeit

Institute of Geography, University of Augsburg, Germany
(stefanie.seubert@geo.uni-augsburg.de)

The major modes of teleconnection patterns between Mediterranean March to November precipitation and large-scale geopotential height fields are identified, described and analyzed with respect to potential tropical influences.

Following datasets are used for this study: monthly resolved precipitation grids from GPCC for the period 1951 to 2000; monthly geopotential heights, and zonal and meridional wind components at different levels (1000 hPA, 850 hPA, 500 hPA, 250 hPA, 100 hPA) from NCEP-/NCAR- reanalyses for the same period; various CPC/NOAA circulation-, SST- and precipitation-indices like NAO and Nino3.4. All these datasets have been high-pass filtered by a Gaussian filter with a period of 11 years to remove trends for variability analyses.

For taking into account tropical-extratropical interactions affecting Mediterranean precipitation variability, a southward extension of the investigation area with respect to rainfall has been useful: thus two successive s-mode varimax-rotated principal component analyses are performed - a first one for defining the Mediterranean region including Northern African desert margins in a dynamical manner, and a second one for obtaining subregions of homogeneous precipitation variability. Resulting subregional precipitation indices are correlated with geopotential heights at different levels within a larger area (90˚W-150˚E and 20˚S-70˚N) on monthly to varying seasonal timescales (Mar-Nov). In order to find dominant teleconnection maps, these heterogeneous one-point maps are used as input variables for a t-mode like varimax-rotated principal component analysis - operating with the map-correlation coefficients for the 5 different pressure levels as ‘observation cases’. Particular modes of geopotential height

teleconnection patterns for March to November Mediterranean precipitation variability are extracted in this way. The major mode describing autumn precipitation variability mainly for Iberia/Western North Africa and the eastern Mediterranean strongly resembles ENSO signatures in pressure fields for this area.