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Spatial and temporal variability of the contribution of convection to winter precipitation in southeastern Europe

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The inter-annual variability and the spatial distribution of the convective fraction of precipitation in the Italian and Balkan peninsulas and the surrounding areas are examined for winter.
The data used consists of monthly values of Convective Precipitation Rate (CPR) and Total Precipitation Rate (TPR) at 126 grid points (1.875˚x1.905˚) in the area of south-eastern Europe (5.625˚E to 30˚E and 33.333˚N to 48.570˚N) for the winter months December, January and February and for the period 1950-2009 (60 years), obtained from the NCEP/NCAR Reanalysis data set. The seasonal (winter) values are calculated from the monthly ones for both parameters and the Convective Precipitation Percentage (CPP) values are calculated by dividing the CPR and TPR seasonal values.
At first, the average spatial pattern of the CPP for the period 1950-2009 is constructed. It is characterized by maximum over the sea (above 95% of the total precipitation) and minimum over the northern continental areas (below 5% of the total precipitation). This spatial distribution is in agreement with the fact that in winter, convection is intense over the sea, because sea surface is, averagely, warmer that the air above it. This is not valid for the continental areas, where land surface is, averagely, cooler than the air above it, not favouring convection.
Then, the inter-annual variability of CPP is examined by applying S-mode Factor Analysis to the 60 years x126 grid points data matrix of the CPP values. According to the SCREE plot of the eigenvalues of the correlation matrix, 11 factors are retained accounting for 76% of the total variance. The spatial distributions of the factor loadings reveal the high loading areas, indicating the sub-regions of the under study area that correspond to the 11 factors. The time series of the factor scores, express the inter-annual variations of CPP in the 11 sub-regions. According to these variations, a statistical significant (95% confidence level) decrease of the CPP is found for central Europe, northern Italy and the northern Adriatic Sea, while a statistically significant increase (95% confidence level) is found for the northern coasts of Tunisia and Algeria and the sea area south of Sardinia.