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Atmospheric moisture content over Europe and its circulation conditionings

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The importance of atmospheric water vapor in physical processes in the troposphere, i.e. radiation budget, cloud formation or precipitation is unquestionable. Atmospheric water vapour is also a crucial element of climate change analyses.

The aim of the study is to investigate the circulation background of seasonal patterns of atmospheric moisture content over Europe.

Gridded daily values of total column water (TCW), specific humidity (SHUM) and relative humidity (RH) obtained for 18 pressure levels (950-300 hPa) from ERA-Interim reanalyses were taken into consideration to describe atmospheric moisture. Subsequently sea level pressure (SLP) and geopotential high at 850 hPa, 700 hPa and 500 hPa levels as well as the direction of air mass advection were used to define circulation conditions. The calculations were performed for the period 1981-2015.

In the first step moisture vertical structure was described and clustered to distinguish particular types. Their spatial distribution and intra-type deviations were further analyzed under the most common circulation patterns (EOF modes). Moisture content evaluation was complemented with moisture deficit analyses exemplifying air masses characteristics.

Atmospheric moisture structure demonstrates a significant spatial differentiation highly dependent on circulation factor and different intensity of water cycle processes within boundary layer. Oceanic and continental influences are visible in both vertical structure and spatial patterns. Detailed analysis of extreme (dry or wet) episodes confirmed their dependence on large scale circulation but indicated also an important role of mesoscale atmospheric and local environmental conditions.