



Atmospheric circulation conditions during events of high precipitable water content in troposphere (PW) over south-west Poland.

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Spatial and temporal variability of high values of precipitable water content (PW) in specific atmospheric circulation condition were analyzed. The study was focused on the area of south - west Poland and covered the 1981-2010 period. Gridded values of PW were calculated with standard procedure with the use of high resolution meteorology calculated with Weather Research and Forecasting (WRF) model. The WRF model had been run using three nested domains with spatial resolution of 45 km x 45 km, 15 km x 15 km and 5 km x 5 km. Data from the innermost domain were used to PW calculation, whereas data from the second domain were used for classification of atmospheric circulation. Classification of air circulation types was composed of 20 types with different direction of advection (SW, NW, NE, NW, XX-undefined) as well as low level and upper level vorticity (A- negative, C- positive).

Areal multiyear mean of PW above south-west Poland amounted $15,5 \text{ kg}\cdot\text{m}^{-2}$ – from $9 \text{ kg}\cdot\text{m}^{-2}$ for winter months to $23,8 \text{ kg}\cdot\text{m}^{-2}$ for summer. In the analyzed period the highest values in winter exceeded $20 \text{ kg}\cdot\text{m}^{-2}$ and accordingly $40 \text{ kg}\cdot\text{m}^{-2}$ in summer. The air circulation types and groups of types with the same direction of advection and type of vorticity favorable to high and extreme high values of PW above south-west Poland were selected for each month. The most often higher PW values were observed in circulation types with advection from the southern sector (SW and SE), but in winter months also from the north-western sector. Type of vorticity favorable to high and extreme high values of PW was CA - lower cyclone, upper anticyclone. In summer very high PW were also noted in types with vorticity CC (lower and upper cyclone), whereas in other seasons – in AA (lower and upper anticyclone). The seasonal shift of PW content dependence on both direction of air mass advection and type of vorticity was discussed. For selected circulation types (SECA, SWCA, SWAA, SWCC) favorable to highest PW values, spatial variability of monthly mean PW over south-west Poland was presented. Areas with the highest values of PW in these circulation types were selected. Spatial layouts of extremely high PW values were added as a basis to discussion about Polish locations particularly exposed to natural hazards in specific circulation conditions.