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Soil moisture quantification and variability analysis in Hungary with respect to global climate tendencies

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Spatial and temporal characteristics of monthly dry and wet anomalies are examined for Hungary. Homogenised monthly temperature and precipitation data sets of 10 stations are used for the period of 1901-1999, as test period. Assessment of humidity conditions is performed by employing the Palmer Drought Severity Index (PDSI) computed both with Thornthwaite and Blaney-Criddle method for estimation of evapotranspiration. Besides these, the Standardised Precipitation Index (SPI) and the Palfai Aridity Index (PAI) are also calculated. Estimated soil moisture data are also used to quantify its correlation to the above drought indexes in order to validate usefulness of the latter values. Basic statistical parameters of indices are calculated for the indices such as standard deviation, distribution and statistical tests for normality of the distribution. Distribution of PDSI, determined in a process of long recursion, is close to normality in both versions, whereas the other two indices behave more asymmetrically, even if the PAI integrates ten months. In the vegetation season all applied indices exhibit strong correlation with the soil moisture, whereas the single-month SPI performs less successfully. In order to have more detailed, realistic picture about the drought-frequency trends in Hungary, objective spatial regionalisation is performed, using the spatial factor- and cluster-analysis on the PDSI values. It yielded three regions, and most characteristic stations of each region are further selected and used to visualise the rest of the computations. For analysis of long-term variations a 11years moving average and a Gauss-weighted filter is used. This smoothing makes the long-term drying-out tendencies more obvious. The indices' multi-annual relation to the global temperature series are analysed using the method of „slices" (Mika, 1988), dividing the local and global values into uniform time sequences, the so called time-slices, and calculating regression coefficients between the local (dependent) and hemispher-

ical (independent) variables. This correlation almost always performs negative and frequently significant, which means that in the 20^{th} century the local soil moisture conditions, indicated by the set of various drought indices, became drier parallel to the hemispherical changes. Continuation of this correlation is being checked on the more recent five years period (2000-2004). Proper consideration of the above features in agricultural hydrology may lead to better preparation of water regulation projects and adaptation to long-term changes in this vulnerable hydrological region of Central Europe.