SOIL WATER DEFICIT, CONSUPTION, SURPLUS, RECHARGE AND NUMBER OF DRY DAYS AS INDICATORS OF SOIL MOISTURE DYNAMICS IN AGRICULTURAL LAND OF SLOVAKIA

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Many soil processes are influenced by spatial and temporal changes of soil moisture. Therefore, soil processes can indicate or reflect the character and intensity of the possible impact of climate change on agricultural land. The aim of paper was to i) present a method of evaluation based on selected indicators of soil moisture conditions dynamics in agricultural land of Slovakia; ii) describe how to create temporal and spatial model of agricultural soil moisture conditions in Slovakia at different spatial levels (points, polygon coverage) and iii) identify and describe basic characteristics of soil moisture dynamics at different time horizons (1970 – 1979; 1980 – 1989; 1990 – 1999; 2000 – 2009 and normal set for the period 1961 to 1990).

APPLIED DATA

- ***data on water capacity*** (%) for selected localities (Hurbanovo, Beluša, Spišské Vlachy, Rimavská Sobota and Milhostov);
- ***weather data*** from 71 meteorological stations;
- ***soil profile texture data*** comming from national soil profile database for agricultural soils of Slovakia

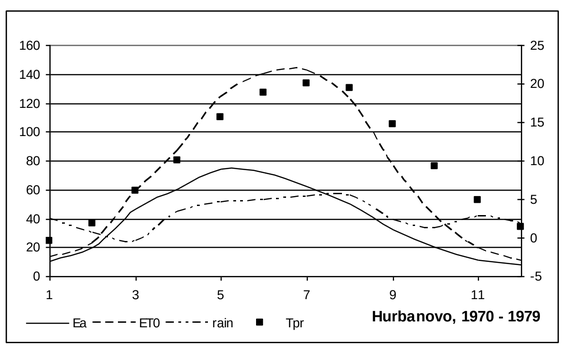


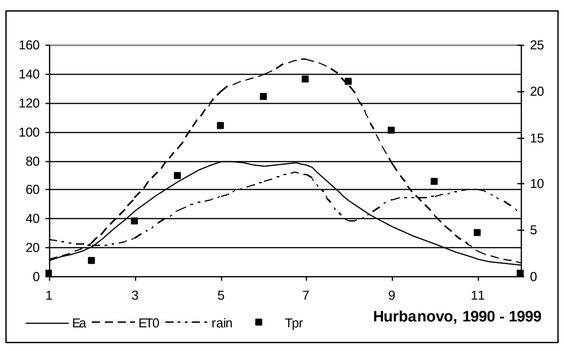
APPLIED METHODS

- ***spatial interpolation of weather data*** (potential evapotranspiration, average temperature and rainfall) into grid with spatial resolution of 10 km through methods implemented in SK_CGMS (Nováková 2007);
- ***set of pedotransfer rules*** was applied on soil profile texture data with the aim to obtain values of available soil water capacity (%) for 1 m deep soil layer; calculated data were spatially interpreted to 1 km spatial resolution grid;
- ***simplified soil water balance equation*** (Kutílek 1978) was used to calculate soil moisture status in one day time step in 1 km spatial resolution grid (actual evapotranspiration, soil water store)

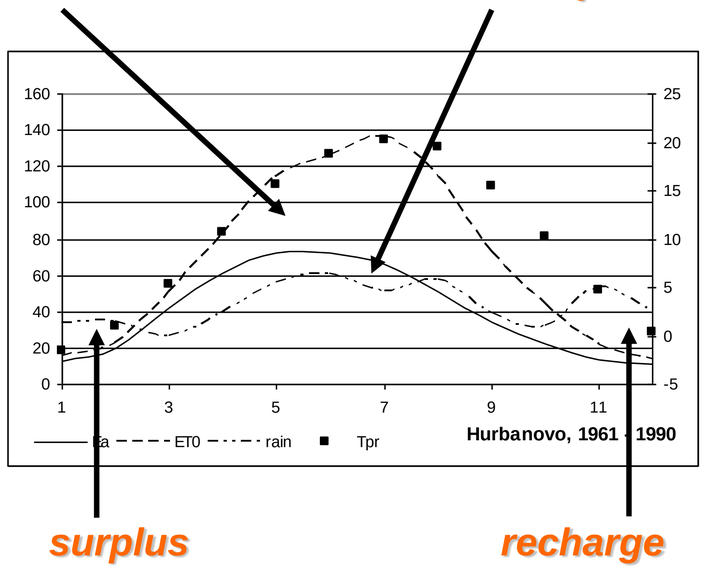
RESULTS - POINT LEVEL: DIFFERENCES IN TIME HORIZONS

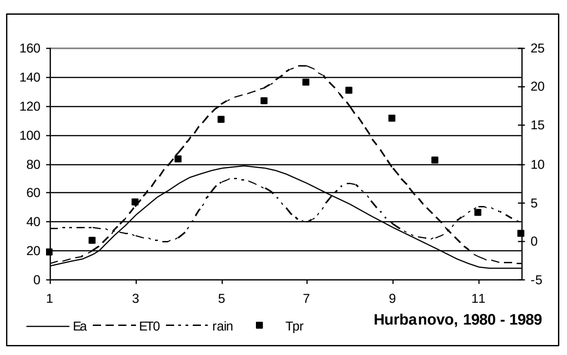
Indicators of soil water dynamics: **soil water deficit (mm); soil water consuption (mm); soil water surplus (mm) and recharge (mm)**

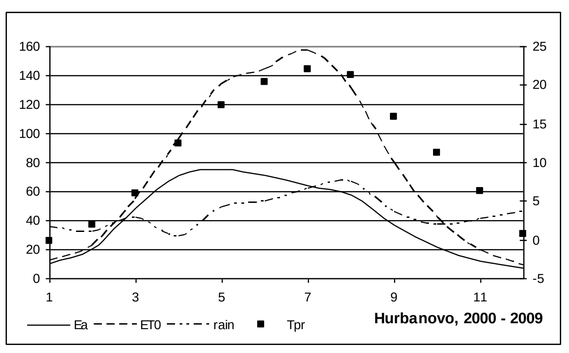




Example - Hurbanovo







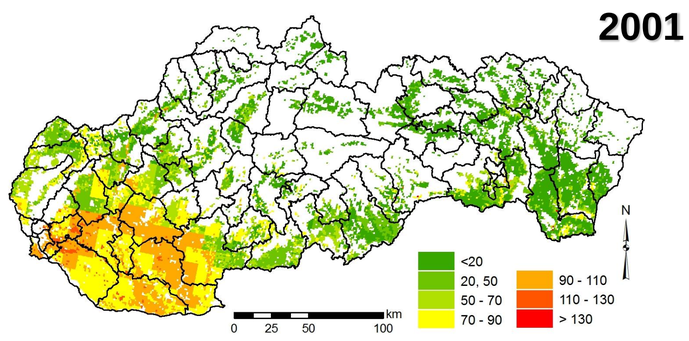
Following trends were observed for all localities:

- change of relations between soil water deficit, consumption, surplus and recharge;
- increase of average monthly temperatures, potential evapotranspiration and soil water deficit;
- intensive dryness up in spring months;
- negative changes in soil water balance of agricultural soils in comparison to normal.

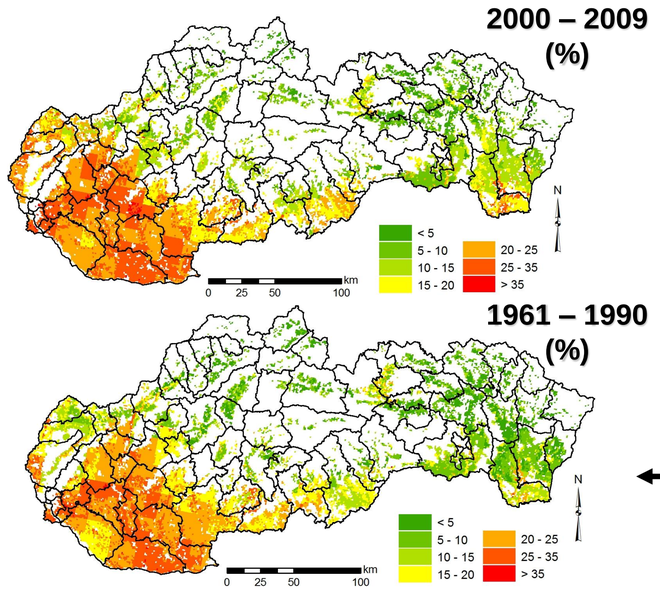
RESULTS – POLYGON LEVEL: TEMPORAL AND SPATIAL VARIABILITY OF SOIL DROUGHT

Indicators of soil water dynamics: **number of dry days (-) defined as days with relative soil moisture under 50% of available soil water, probability of dry days occurrence (%)**

YEAR: Number of dry days

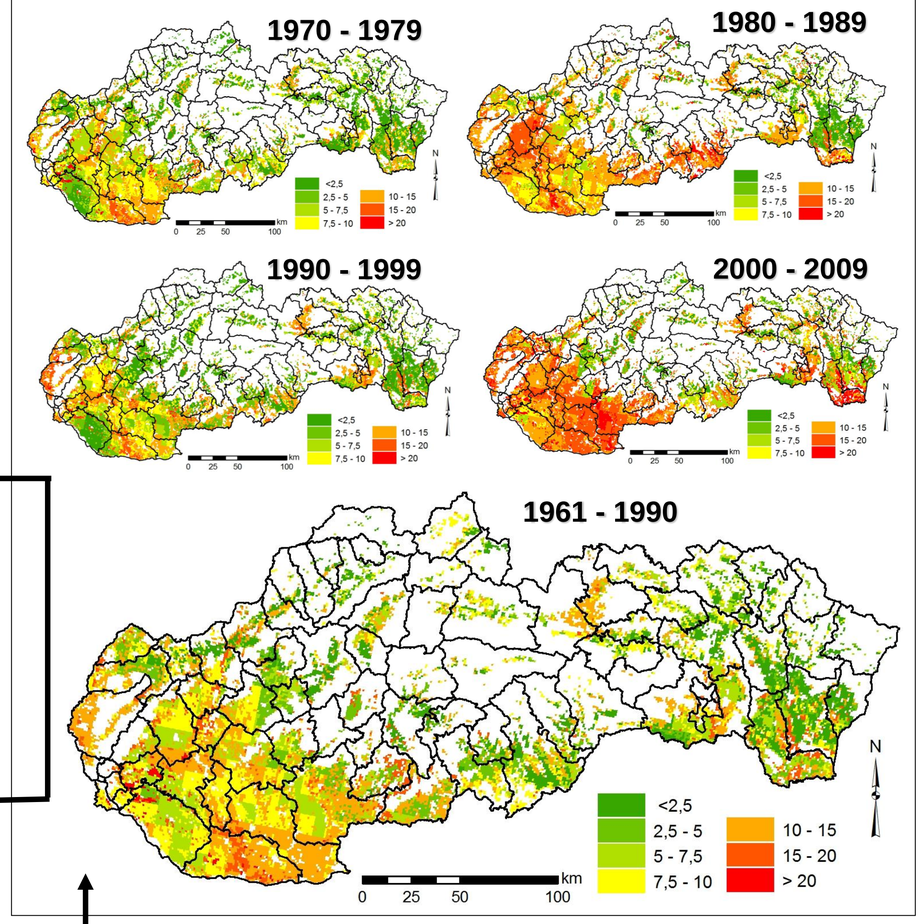


10 YEARS: Drought probability



- increase of area with higher number of dry days observed from the spatial patterns of soil moisture balance;
- significant changes in dry days number pattern observed also as being distributed over the year;
- increase of dry days number area observed during vegetation season in May, June and July.

MAY: Number of dry days



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CONCLUSIONS

The paper presents *application of geographical approach to assessment of selected indicators* of soil moisture content and dynamics at the area of agricultural land in Slovakia. Presented approach is considered to be additional to classical analysis of time series (rainfall, potential and actual evapotranspiration or air temperature).

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