Geophysical Research Abstracts
Vol. 17, EGU2015-12328, 2015
EGU General Assembly 2015

What was driving land-scape drying in the Czech Republic between 1961 and 2012?

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The drying trends in the Czech Republic especially during May and June are of great concern as they influence the key part of growing season in the region. The fact that April-June period of 2001–2012 showed 50% increase of drought probability compared to 1961–1980 is alarming. In the same time the probability of extreme drought was found to be also rising significantly. This study tries to understand what has driven reported changes in the soil moisture especially during the warm half of the year. Therefore trends of global radiation, temperature, precipitation, relative humidity, wind speed, reference and actual evapotranspiration, snow cover but also start of key phenology phases were assessed and their relationship with the changes in the soil moisture analyzed. In addition measured pan-evaporation data as well as results of studies were used to assess reliability of the reported trends. We have found that increased global radiation and air temperature together with decreased relative humidity (all significant at 0.05) lead the increase of the reference evapotranspiration in all months of growing season. That was the case especially in April, May and August when over 80% of the territory showed statistically significant trends in reference evapotranspiration values. This finding was shown to be consistent with the observed pan evaporation (1968-2012) that was characterized by increasing trends especially during April-June period. These changes in combination with the earlier end of snow cover and earlier start of growing season (in some regions by up to 20 days) led to increased actual evapotranspiration at the start of growing season that tends to deplete the soil moisture earlier, leaving landscape more exposed to impacts of rainfall variability. These results support the concerns about the potentially increased severity of drought events in Central Europe. While the evaporative demand is clearly increasing, it is not matched by the similar increase of precipitation thus leading to higher rate of soil moisture withdrawal by plants leaving less water for latter part of growing season. The reported trend patterns are of particular importance with regard to the expected climate change given the robustness and consistency of the trends shown, and the fact that they can be align with existing climate model projections. Finally comparing results of our analysis with available literature we also point out how significantly different might be outcomes of large-scale studies from regionalized assessment. The results have been submitted to International Journal of Climatology.

The research was funded by projects “Establishment of International Scientific Team Focused on Drought Research” (no. OP VK CZ.1.07/2.3.00/20.0248) and KONTAKT LH110010 helped plan and execute this study. Petr Hlavinka and Michael Hayes were supported by project “Partnership in Climate Research and Adaptation Strategies” (no. CZ.1.07/2.4.00/31.0056), Rudolf Brázdil and Petr Dobrovolný by projects of the Grant Agency of the Czech Republic (P209/11/0956 and 13-04291S/P209, respectively), and Petr Štěpánek, Martin Možný and Zdeněk Žalud by project of the National Agency for Agricultural Research no. QI91C054, QJ1310123.