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Drought Conditions in the Czech Republic in Present and Changed Climate

M. Dubrovsky (1), M. Trnka (2), M. Svoboda (3), M. Hayes (3), D. Wilhite (3), Z. Zalud (2), D. Semeradova (2)

(1) Institute of Atmospheric Physics, Academy of Sciences of the Czech Republic, Prague, Czech Republic (dub@ufa.cas.cz); (2) Institute for Agrosystems and Bioclimatology, Mendel University of Agriculture and Forestry, Brno, Czech Republic; (3) National Drought Mitigation Center, School of Natural Resources, University of Nebraska, Lincoln, USA

Two common drought indices were used to indicate drought conditions: The Standardized Precipitation Index (SPI) and the Palmer Drought Severity Index (PDSI). The SPI is based solely on precipitation data and the PDSI is based on both precipitation and temperature data. The lower the index value (of either index), the drier the conditions. The two indices were calculated by programs available from the National Drought Mitigation Center and Computer Science and Engineering, both located at the University of Nebraska-Lincoln. In the original versions of both indices, the values are calibrated using station-based data so that the range of the values is approximately the same for all input weather series. In our current analysis, the original programs were modified to allow for comparisons of future climate vs. present climate, and observed weather series vs. stochastically generated weather series.

The contribution will consist of three parts:

1. Analysis of present-climate drought conditions in the Czech Republic. The analysis will be based on 1961-2000 temperature and precipitation series from 52 Czech stations. The drought climatology will be represented in terms of the drought spells characteristics (e.g. frequency, mean duration, maximum intensity). The drought spells are defined as continuous periods in which the SPI (or PDSI): (a) does not exceeds the selected upper threshold value, and (b) falls at least once below the lower threshold value. Threshold values of 0 and -1 are used to define the SPI-based drought spells, threshold values of PDSI are to be determined.

2. Assessment of the impacts of ongoing climate change on drought conditions. The analysis will be based on weather series representing the future climate. The weather series will be obtained by direct modification of the observed weather series according to the GCM-based climate change scenarios (projections for 2050). Four GCMs will be used to define the scenarios to account for the uncertainties in developing the scenario. To assess the effect of climate change, parameters of the equations for determining the drought indices will be calibrated using the present climate weather series and then applied to the changed-climate weather series. The drought spell characteristics derived from the changed climate weather series will be compared with those obtained in part 1.

3. Validity of the stochastic weather generator in terms of the drought spell characteristics. The purpose of this task is to assess the ability of the weather generator, which is commonly used to provide input weather series for the agricultural and hydrological climate change impact studies, to reproduce the drought conditions. In this task, the drought indices will be derived from the weather series produced by the stochastic daily weather generator Met&Roll. As in the second task, the indices will be calibrated from the present-climate observed weather data and then applied to the series synthesized by the generator. The validation of the generator will consist of comparisons between drought characteristics derived from the observed vs. synthetic weather series.

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