

Impacts of climate change on drought at different temporal scales

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In recent decades it has become clear how vulnerable developing and developed regions are to drought. This seems to continue and can worsen when considering possible impacts of climate change. For many regions it is well established what the possible impact is, however mostly at a large spatial scale and with a high level of uncertainty. This study tries to reduce this uncertainty and uses projections at a small spatial scale (~25 km). The main purpose is twofold: to identify new methods to assess the impacts of climate change on drought and to apply these methods to a case study: the Meuse basin in France and Belgium. Drought is assessed by applying the Standardized Precipitation Index at different temporal scales (1, 3, 6 and 12 months) related to different types of droughts; meteorological, agricultural, hydrological and extreme long-lasting events respectively. The assessment is based on the output of 13 high resolution Regional Climate Model (RCM) runs driven by five different Global Climate Models using SRES A1B as emission scenario. Results show that in general RCMs have difficulties in simulating drought indicators and tend to simulate a more temporally variable climate than observed. For each drought indicator a weighted average is calculated based on the error of each RCM run. Based on this weighted average it was found that for most temporal scales there will be a significant increase in the number of drought events (between +7% and +44%). For meteorological drought, it was found that the average duration increases (11%), the average deficit increases (40%) and the average intensity increases (28%). For agricultural drought, the average duration increases (14%), the average deficit increases (50%) and the average intensity increases (40%). For hydrological drought, the average duration does not increase significantly (less than 10%), the average deficit increases (34%) and the average intensity increases (27%). For extreme hydrological drought events, the average duration increases (12%), the average deficit increases (40%) and the average intensity increases (22%). For all temporal scales, changes in the variability of drought duration, deficit and intensity are larger than changes in average values. The different drought types will affect a larger area in the future compared to the historical period.