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Validation of ELPIS baseline scenarios using ECA&D observed data

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Local-scale daily climate scenarios are required for assessment of impacts of climate change (Semenov & Stratonovitch 2010). These scenarios incorporate changes in climatic variability as well as extreme events which are particularly important when used in conjunctions with process-based non-linear impact models (Semenov & Shewry 2011). ELPIS is a dataset of climate scenarios for Europe, which is based on the LARS-WG weather generator and future projections from the CMIP3 and EU-ENSEMBLES multi-model ensembles (Semenov et al. 2010). In ELPIS, the site parameters for climatic variables were estimated by LARS-WG from observed daily weather interpolated over 25 km grid in Europe obtained from the European Crop Growth Monitoring System (CGMS). The objective of this paper was to compare ELPIS baseline scenarios (1980-2010) with observed daily weather available from the ECA&D archive (Klein Tank & co-authors 2002). We selected approximately 300 sites from the ECA&D archive, where daily precipitation, minimum and maximum temperature and sunshine hours were available for the period of 1980-2010. Several statistical tests were used to compare monthly means and distributions of climatic variables from observed ECA&D dataset and generated from ELPIS. We also used a statistical test to detect a potential bias in ELPIS-generated baseline data. About 20% of selected sites had more than 100 meters difference in altitude compared to the grid altitude from the CGMS dataset. Differences in site-grid altitudes can explain most of the significant results in the K-S tests for distribution of daily temperature and in t-test for temperature monthly means, because of well-known negative correlation between temperature and elevation. For daily precipitation, the K-S test showed little differences between generated and observed data for each month; however, more sensitive t-test for monthly mean precipitation showed significant results for the sites where grid-site altitudes were substantially different. Approximately 30% of sites showed small positive or negative bias in monthly radiation, which cannot be explained by differences in altitudes, but more likely can be attributed to limitation of a relationship used to convert sunshine hours in to radiation (Rietveld 1978). We conclude that, considering limitation above, ELPIS climate scenarios can be used for impact assessment studies in Europe with confidence. We acknowledge the data providers in the ECA&D project. Rothamsted Research receives strategic funding from the BBSRC.

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