Involvement of Stochastic Weather Generators within the DAMOCLES project

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Weather generators (WGs) are often used to produce input weather data for climate change impact studies. To justify their use, WGs are validated for their ability to reproduce various features of statistical structure of real-world weather series. The validation indices typically include characteristics of probability distribution functions of individual weather variables (mean, variability, quantiles, extremes) and characteristics of temporal & spatial (only for spatial WGs) structure (e.g. hot and/or dry spells). Occasionally, climatic indices based on more weather variables have been employed to validate WGs (e.g. drought indices and fire weather index have been used in our experiments). Our generators include mostly single-site WGs: they are either parametric or non-parametric and may run at various time steps (hourly, daily, monthly). Since 2016, emphasis has been put on developing the spatial (gridded or multi-site) weather generator SPAGETTA. Its development now proceeds within the frame of the GRIMASA project (2018-2020), which aims at further development of SPAGETTA towards the finer spatial & temporal resolution; while completing this task, it is being validated in terms of various climatic indices and its performance is compared with gridded weather data coming from other sources - including Regional Climate Models.

As the most important new feature of SPAGETTA (which was based on spatializing the single-site M&Rfi generator) is its ability to produce spatially coherent weather data for multiple sites/grid points, the first validation tests focused on its ability to represent spatial events. The validation was carried out for 8 European regions at 100 km grid resolution (double of E-OBS 50km grid) and we examined the WG's ability to reproduce "spatial" hot/cold days and spells. Later, we added a couple of temperature-precipitation compound event indices (e.g. frequency and length of hot-dry spells) into the set of validation indices.

We believe that involvement of SPAGETTA in the DAMOCLES project could help our generator to better reproduce various compound events and thereby improve the generator's quality. To provide a basis for this involvement, this presentation will give a brief overview of our weather generators developed since 1994, experiments, in which they were employed, and selected results obtained while validating the generators. We will focus on the most recent results obtained while validating SPAGETTA in terms of compound event indices. Finally, we will outline our plans for the nearest future (getting into finer spatial resolution, adding more variables).