Identifying drivers of extreme impacts

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This document shortly describes the experimental setup, bias correction methods, data structure and where to download the data from.

Large ensemble meteorological data

The EC-Earth global climate model (Hazeleger et al., 2012, ClimDyn) was used to create 2000 years of present-day weather simulations. Present-day was defined as the 5-year model period in which the global mean surface temperature matched that observed in 2011-2015 (HadCRUT4 data; Morice et al., 2012, JGR). Because of a cold bias in EC-Earth, in the model this period is 2035-2039.

To create the large ensemble, 25 ensemble members were branched of 16 long transient climate runs (forced by RCP8.5). Each ensemble member was integrated for 5 years. Differences between ensemble members were forced by choosing different seeds in the atmospheric stochastics perturbations (Buizza et al., 1999, QJRMS). In total there are 16 x 25 x 5 = 2000 years of meteorological data. More details on these climate simulations are provided in (Van der Wiel et al., 2019, GRL, supporting information).

Bias correction meteorological data

Biases in the EC-Earth simulations result in unrealistic growing conditions for crops. Therefore, minimum and maximum temperatures and precipitation fields were bias corrected. The AgMERRA reanalysis (Ruane et al., 2015, AFM) was used as 'truth'. AgMERRA years 1981-2010 were used, for EC-Earth the long transient runs were used (16 x 2005-2034).

Minimum and maximum temperature - For each grid point, a model bias field was defined as the difference between the model climatology and the AgMERRA climatology. Climatologies are the best estimate of the annual cycle, i.e. the mean plus the first three annual harmonics.

Precipitation - For each grid point, on a monthly basis the number of rainy days and the total amount of precipitation is corrected. First the number of rainy days in AgMERRA is computed (threshold 0.1 mm/day), then the same threshold is determined for EC-Earth data, which results in the same number of rainy days. All days with simulated precipitation smaller than this threshold are set to 0 mm/day. Last, the total amount of precipitation is corrected by means of a multiplicative factor.

Large ensemble crop data

The analysis will be based on APSIM simulated (Zheng et al., 2014, online) rainfed winter wheat. Winter wheat is sowed in the autumn and grows over winter, hence the five year climate runs result in four year of simulated wheat crops.

Point locations

Location	Coordinates	Sowing date	Average growing season length
France	47.7 °N, 1.1 °E	304	291 (269 - 310)
China	33.1 °N, 114.8 °E	272	247 (223 - 294)
USA	42.0 °N, 91.1 °W	276	290 (270 - 315)

Files

File	Variable	Units	Dimensions
crop_growingseason_length_FR.nc	growingseason_length	days	(16, 25, 4)
crop_sowing_date_FR.nc	sowing_date	Julian day	(16, 25, 4)
crop_yield_FR.nc	yield	kg/ha	(16, 25, 4)
meteo_dps_FR.nc	dps	K	(16, 25, 1826)
meteo_pr_FR.nc	pr	mm/day	(16, 25, 1826)
meteo_sfcwind_FR.nc	sfcwind	m/s	(16, 25, 1826)
meteo_rsds_FR.nc	rsds	W/m^2	(16, 25, 1826)
meteo_tasmax_FR.nc	tasmax	K	(16, 25, 1826)
meteo_tasmin_FR.nc	tasmin	K	(16, 25, 1826)

The same files for CN and US.

Download

All files can be downloaded from: http://climexp.knmi.nl/Karin/DAMOCLES_project1/