

Bias Corrected EURO-CORDEX Climate Projections from IPSL

1. Data set content

This server contains climate projections of daily fields post-processed from the EURO-CORDEX high-resolution (12 km) simulations (Jacob et al., 2014; Vautard et al., 2013), as obtained from ESGF servers. The post-processing is bias correction, often also called bias adjustment. It aims at post correcting model values in order to have corrected data with a distribution that is equal or close to the observed distribution over a reference period. Post processing is done grid cell by grid cell. The bias correction method is based on Vrac et al. (2012), and uses an updated algorithm, which is described in an article in preparation (as of 1 June 2015). The observed-based dataset used here for bias correction of temperature and precipitation is the 0.22-rotated E-OBS data set that can be downloaded from <http://eca.knmi.nl>. As the resolution of models is higher than that of observation-based data, a specific procedure is applied (see below). More variables than temperature and precipitation will be corrected in the future and made available on this server.

The files format is equivalent to that of EURO-CORDEX data: one variable and model (GCM and RCM couple) per file, five years per file. The files have undergone a series of verifications (see verification section below). However they have not undergone the ESGF standard quality check and are not ESGF compliant, in general. The name of GCM, RCM and bias correction information is included in the file name.

Terms of use: datasets should be considered as “not beta tested”. They should be used only for research purpose, as it has not undergone sufficient testing and quality checking. IPSL does not guarantee answering user questions, but users are welcomed to report any problem found with the data to improve the data. Users questions should be directed to: Thomas.noel@lsce.ipsl.fr, Robert.vautard@lsce.ipsl.fr or Mathieu.vrac@lsce.ipsl.fr. Terms of use are the same as those from EURO-CORDEX simulations as obtained from ESGF servers.

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2. Bias correction methodology

The bias correction methodology uses the general Cumulative Distribution Function transform method (CDFt) explained in Vrac et al. (2012). It assumes a reference period over which observation-based data is available. The reference period selected here is that common to all EURO-CORDEX simulations in the historical period: 1971-2005. The CDFt method builds quantile transformations functions between future and historical simulations and between historical simulation and observation-based data. Transformations are month-dependent and also depend on

time slices taken for future periods (we use the 21 years distribution for corrected 11 years). The time slicing method implies that part of historical period is corrected with data of future scenarios.

For temperature the method follows the classical CDFt approach. For precipitation, a specific development, correcting both precipitation amounts and occurrences is done and will be described in a forthcoming publication. Due to low number of rainfall occurrences, the correction may be under-constrained in very arid areas.

For temperature and precipitation, observation-based data are provided on a lower-resolution grid than the model outputs. Actually the E-OBS 0.22° rotated grid cells correspond exactly to aggregations of sets of 4 grid cells of the EURO-CORDEX 0.11° grid. The algorithm uses therefore three steps for bias correction: (i) aggregation of model data to the 0.22° E-OBS grid, (ii) bias correction on the 0.22° grid and (iii) disaggregation back from the 0.22° corrected fields to the 0.11° EURO-CORDEX grid. Only land values are bias corrected.

Verification

Testing of the bias corrected data includes:

- A test of bias over the historical period, comparing only 0.22° fields back with E-OBS. It has been verified independently that bias-corrected model simulations have small biases on all grid points (e.g., of the order of 0.1°C for temperature);
- A test of secular changes: it has been verified that the resulting bias corrected 0.11° data do not induce major changes in the mean changes between 2071-2100 and 1971-2005, as compared to changes (differences) obtained without bias correction. Differences are visible but the general pattern of changes is conserved;
- A test of disaggregation has been done, using the ECA & D station data set. The (i) non-corrected 0.11°, the (ii) bias corrected 0.22° and the (iii) bias corrected 0.11° data biases have been compared to hundreds of ECA&D stations measurements. The biases should be in the following order: (i) > (ii) > (iii). This is clearly the case for temperature. For precipitation, we obtain (i) > (ii) but do not find improvement brought by the disaggregation on biases.

References

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