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Bias adjustment breakout group

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From CMIP5 to CMIP6 bias correction guidance

- description of CMIP5 procedure

    Full field: remove bias computed over all hindcasts

    Anomaly: remove transient run climatology

- pros and cons

    FF : need obs, obs are noisy, changing obs

    Anom: doesn´t remove shocks

    Both: stationary bias (no drift correction), only mean correction

Recommendations for CMIP6 DCPP

- Compute anomalies with respect to model climatology and not with respect to observed climatology (the latter option can give false signals if short period used)

- Use a fixed reference period for all lead times (ex: 1969 to 2015) instead of sliding (1961 to 2015 for year 1, 1962 to 2015 for year 2 …) to maintain consistency

- Use longest reference period possible

- Same method for both anomaly and full field initialization

Recommendations for CMIP6 DCPP

- Compute bias adjustment on ensemble mean

-Apply bias correction on each individual model and then combine them

-Need to be aware that physical consistency might be needed for some applications (e.g. storm tracking) in which case bias adjustment should be applied to the result

Additional comments/explanations

- Volcanoes: since they can not be taken out from observations, volcanoes are needed in the hindcasts for bias correction
- But this potentially leads to overestimation of the forecast skill, hence need for additional hindcast without volcanoes

Still to be discussed

- Trend correction:
- Can be large differences between observed and forecast trends
- Trend correction is possible, but danger of over-fitting noisy obs especially on local scales
- Recommend treating trend correction with caution
- essential to assess how robust is the trend before applying any trend correction
- Approaches such as regression on GHGs or non-linear trends should be investigated

Future research lines

- Sensitivity of the drift to the climate state is possible but estimates might not be robust enough to use operationally – research line instead (model dependency ?)

Future research lines

- Ideas to correct for spatial shifts of patterns/spatial bias : EOF mapping ? But focus on physical processes.
- Generic scores would be damaged for shift of variability patterns – possibility for more suitable scores e.g. object oriented, spatial and/or temporal aggregating?

- Investigate other approaches e.g. parametric methods to improve bias and trend correction

- Changing observational network and data quality could affect the corrections: needs investigating e.g. by subsampling the available observations and considering multiple datasets

Future research lines

- signal to noise paradox: signal to noise ratio in models may be incorrect – potential to estimate predictable and non-predictable components and adjust pdf

- adjusting the forecast variance (and higher order moments) as well as the mean e.g. quantile mapping, but issue of sample size – risk of overfitting – could be tested in perfect model approach

Recommendations for CMIP6 DCPP

- Need for recommendations about forecast verification as well

- Write a review of all possible methods and their pros and cons?