III. TECHNICAL NOTE FOR DCPP-Component C Pacemaker Experiments

This short technical note provides some guidelines to implement DCPP-Component C Pacemaker experiments based on the SST files available from input4MIPs.

1- Sea surface temperature anomalies and masks

Two netcdf files containing Sea Surface Temperature (SST) anomalies from the latest version of the Extended Reconstructed SST dataset (ERSSTv4, Huang et al 2016, https://www.ncdc.noaa.gov/data-access/marineocean-data/extended-reconstructed-sea-surface-temperature-ersst-v4) are provided for the Pacific and Atlantic pacemaker experiments, respectively. The climatological period used for anomalies computation is 1950-2014 and monthly data are provided *GLOBALLY* on the original grid of ERSSTv4 from Jan. 1910 to Dec. 2014. For `atl-pacemaker`, a 12-month running mean has been applied, whereas raw anomalies are given for `pac-pacemaker`.

Two netcdf files containing masks where SST restoring must be applied, are provided for the Pacific and Atlantic Pacemaker experiments, respectively. For the Pacific, `mask4resto-pac-pacemaker` follows Kosaka and Xie (2013)'s setup and is limited to the Eastern Tropical Pacific. For the Atlantic (`mask4resto-atl-pacemaker`), the same mask as in the idealized experiment (`mask4resto-amv`) is used.

2- Interpolation

The same protocol as for the idealized experiments should be followed here in the pacemaker case. Modeling groups should first interpolate the global SST patterns on their own ocean model grid. Regional masks should be also interpolated from the provided netcdf files or can be redefined by each modeling group on their own ocean model grid (see GMD the paper for the precise definition of the mask extension).

Modeling groups are strongly encouraged to check the quality of the interpolated SST and mask fields before running the experiments and use ad-hoc corrections (especially along the coast and in the buffer zones) if necessary. For example, attention should be paid for the `atl` (`pac`) pacemaker experiments on possible undesirable masked grid points that may appear in the Pacific (Atlantic) due to interpolation effects (especially off the coast of Central America) and because of the very coarse resolution of ERSSTv4 compared to most ocean model grids now used in CMIP6. The ideal steps to follow are given and illustrated below (Fig.1) for the `atl` (=$\mathrm{AMV}_{\mathrm{Full}}$) mask interpolation:

- Extrapolation of the original mask (Fig.1a) over land on the source grid (Fig.1b) to minimize interpolation errors
- Interpolation on the ocean model grid (Fig.1c)
- Ad-hoc (often manual point-by-point) correction to remove spurious values due to interpolation along the coast (e.g. central America), to obtain the final mask on ocean target grid (Fig.1d).

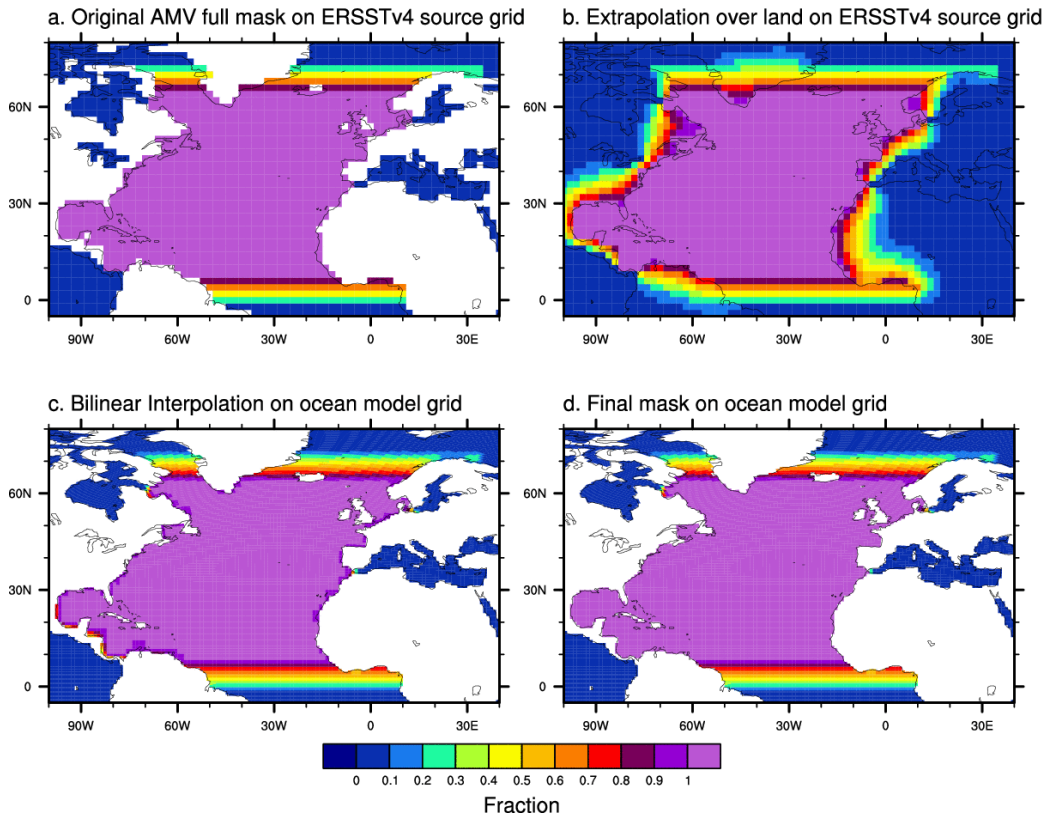

Figure 1: a. *Original Atl (=AMV_{Full}) mask on ERSSTv4 grid. b. Extrapolation of the mask over land. c. Interpolation on the ocean model ORCA1 grid. d. Final mask after correction of spurious points along continents.*

For group using a flux formulation restoring, mask should be ideally applied on the flux term and not on the SST to avoid spurious effects along the buffer zones.

Interpolated SST anomalies should be added to the model climatology estimated from the ensemble mean of historical simulations over 1950-2014 in order to be consistent with the observational period used for their generation.

3- Restoring

The exact same procedure as for the idealized experiments should be followed and all the recommendations are provided in a dedicated technical note (TechNote2_DCPPcomponentC_restoring_protocol_v1.pdf)

References

Huang, B., P. W. Thorne, T. M. Smith, W. Liu, J. Lawrimore, V. F. Banzon, H-M. Zhang, T. C. Peterson and M. Menne, 2016: Further Exploring and Quantifying Uncertainties for Extended Reconstructed Sea Surface Temperature (ERSST) Version 4 (v4). *J. Climate*, **29**, 3119-3142, doi: 10.1175/JCLI-D-15-0430.1

Kosaka, K. and Xie, S.-P.: Recent global-warming hiatus tied to equatorial Pacific surface cooling, *Nature*, **501**, 403–407, 2013.

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