Parametric drift correction for decadal hindcasts on different spatial scales

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05.10.2016

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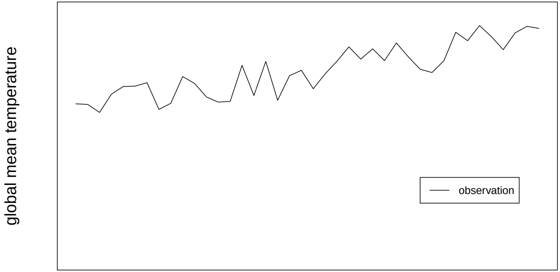

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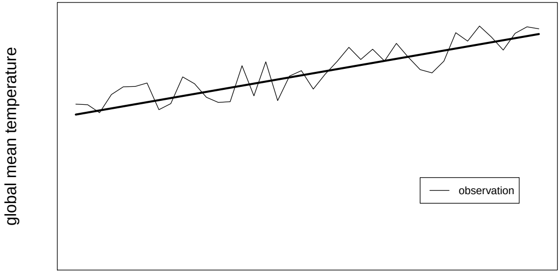

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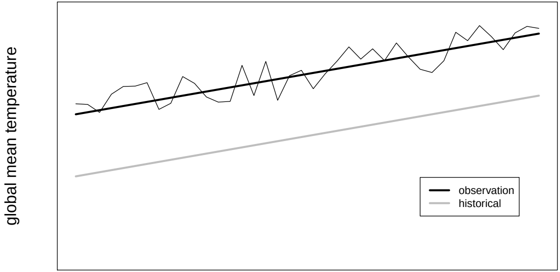

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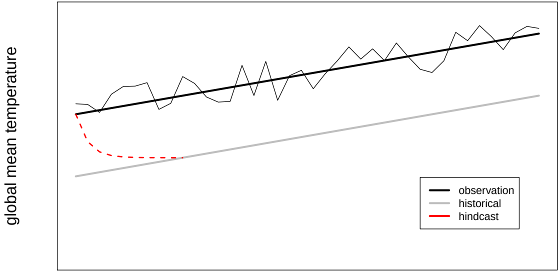

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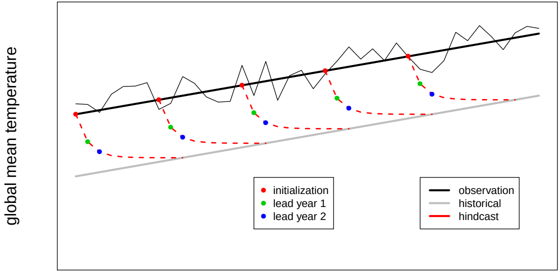

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  - $\partial b / \partial \tau \neq 0$
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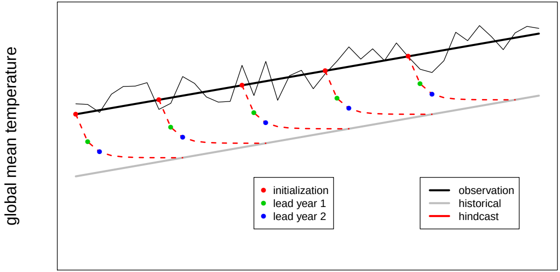

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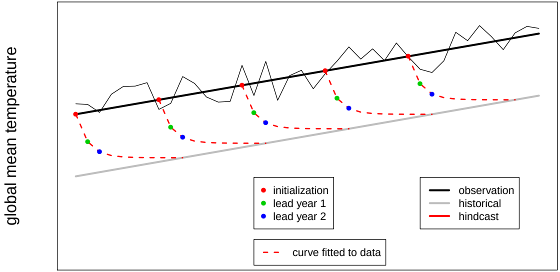

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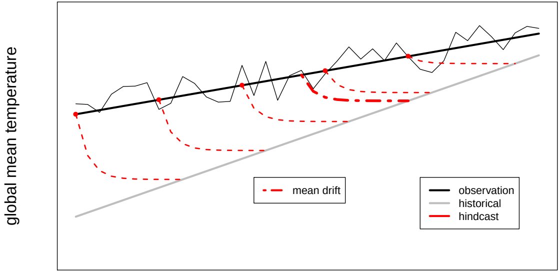

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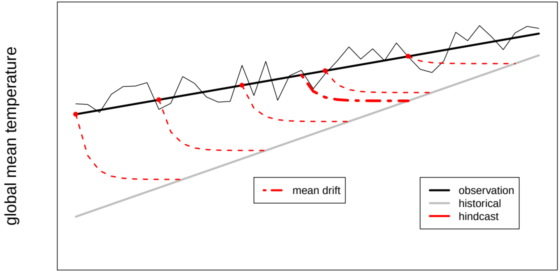

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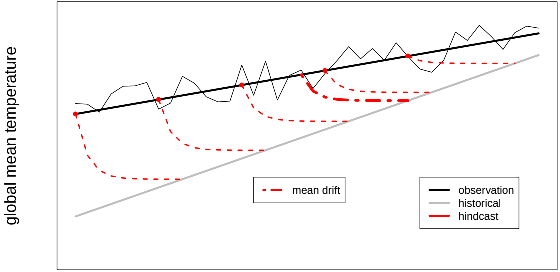

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$$D(\tau, t) = a_0(t) + a_1(t)\tau + a_2(t)\tau^2 + a_3(t)\tau^3$$

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Parametric drift correction on
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  - data on small scale can have wrong trend: correction approach can lead to artificial skill
- does the best choice of the parametric model depend on the spatial scale?

Data

- yearly mean near surface temperature (tas)

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observation

- **HadCRUT4** [Jones et al., 2012]
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model simulations

- **decadal hindcasts** with **MPI-ESM**, 10 ensemble members
- full-field initialized with ERA in the atmosphere and ORA S4 [Balmaseda et al., 2013] in the ocean
- integrated at T63: $\approx 1.85^\circ$ grid

Method: bias adjustment

- correction is done for yearly mean values
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parametric drift correction [Kruschke et al., 2015]

$$D(\tau, t) = a_0(t) + a_1(t)\tau + a_2(t)\tau^2 + a_3(t)\tau^3$$
$$D(\tau, t) = (b_0 + b_1 t) + (b_2 + b_3 t)\tau + (b_4 + b_5 t)\tau^2 + (b_6 + b_7 t)\tau^3$$

Method: verification

verification [Illing et al., 2014]

- using mean square error skill score (MSESS) comparing forecast (FC) and reference (REF)

$$\text{MSE} = \frac{1}{n}\sum_t (H_t - O_t)^2$$

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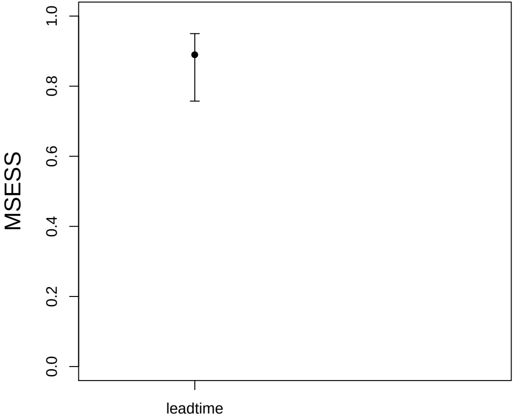
Results: global mean



- leadyears 2-5
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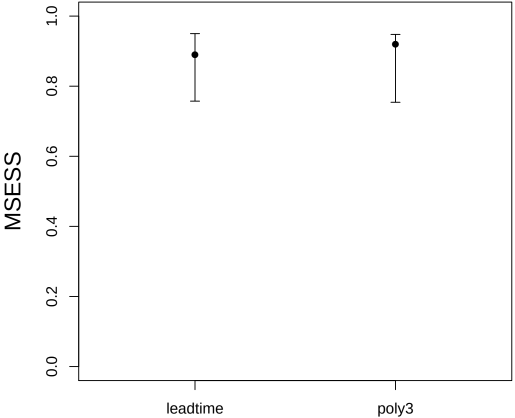

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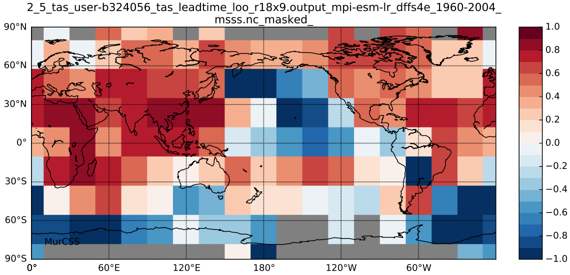
Results: 20°grid



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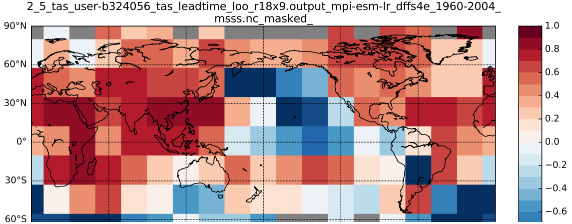

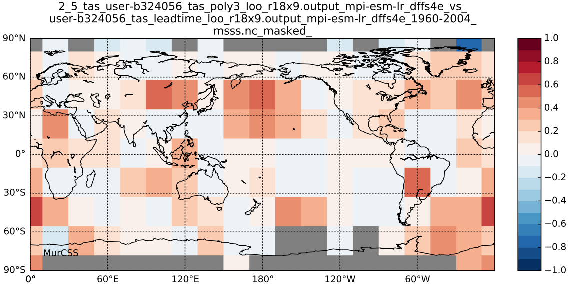

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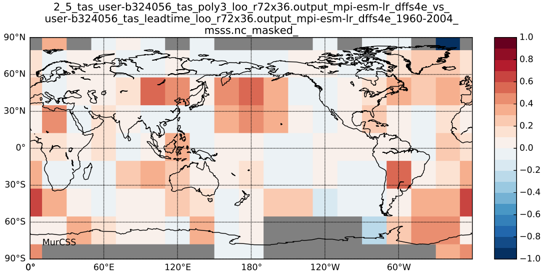
Results: 20°grid

- Can parameters estimated on small scales?

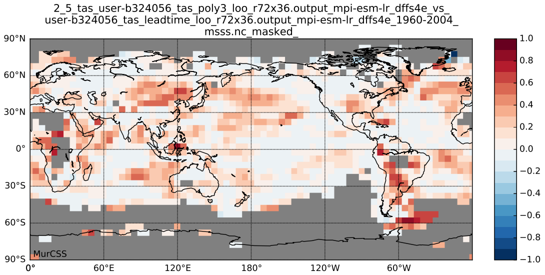


- leadyears 2-5
- FC: parametric, REF: non-parametric
- parameters are estimated on 5°grid

- Parameter estimation on different grids makes no difference

Results: 5°grid

- Adjustment and verification on small scale



- leadyears 2-5
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- data quality?
- does the forecast system has skill on the 5°grid boxes?

Results: different parametric models

which parametric model?

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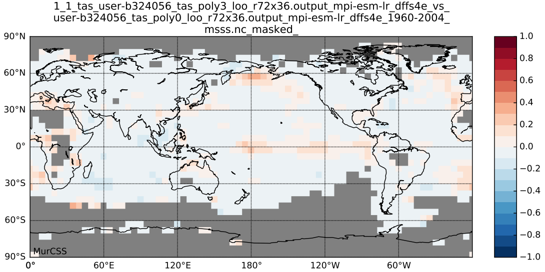

- leadyear 1
- FC: parametric D_1
- REF: parametric D_2 and non-parametric

- no difference on global scale
- small improvement on local scale

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Thank you

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