Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2017-162-RC1, 2017

Geoscientific Model Development Discussions
Open Access
EGU

Interactive comment on "Parametric Decadal Climate Forecast Recalibration (DeFoReSt 1.0)" *by* Alexander Pasternack et al.

Anonymous Referee #1

Received and published: 24 August 2017

1 General comments

This study proposes a probabilistic forecast recalibration scheme designed specifically to address the issues associated with decadal climate forecasts. Polynomial forms are estimated for the dependence of unconditional bias, conditional bias and ensemble spread on lead-time. The parameters of the polynomial forms are allowed to depend linearly on forecast-time, in order to account for any discrepancy between the long-term trends in the observations and the forecasts. The resulting recalibration is shown to outperform raw forecasts of surface temperature, and forecasts corrected only for lead-time dependent unconditional bias.

The extension of lead-time dependent bias correction to the conditional bias and en-

Printer-friendly version

Discussion paper

semble spread of parametric probability forecasts represents a valuable contribution to the decadal forecasting literature. Overall, the paper is clear and well written. The conclusions regarding the performance of the proposed recalibration are broadly justified by the results shown.

2 Specific comments

The review of existing recalibration methods is rather brief and would benefit from expansion, although it does cover the most relevant references. Other closely related methods for seasonal-to-decadal forecast recalibration include Eade et al. (2014, doi:10.1002/2014GL061146), Sansom et al. (2016, doi:10.1175/JCLI-D-15-0868.1) and references therein.

The DeFoReSt method addresses lead-time dependent unconditional and conditional biases in the ensemble mean, and unconditional bias in the ensemble spread. The authors cite the study by Fučkar et al. (2014) as a method specifically tailored to decadal forecasts. That study addressed corrections based on observed conditions at the time of forecast initialisation. Can the authors comment on the relevance of such corrections and why they chose to prioritise the biases addressed in DeFoReSt?

The orders of the polynomial forms used to capture lead-time dependence are fixed a priori. The authors acknowledge the need for a systematic method of selecting the order of the polynomial forms. However, it would be useful if they could provide some insight or justification for the choices they made?

A bootstrapping method is used to assess the uncertainty in the skill of the recalibrated forecasts. Can the authors clarify how the bootstrapping was performed?

In Section 5.2, the authors state that “After applying DeFoReSt, [...] the ensemble spread is fairly constant for all lead times”. This statement is broadly supported by the

results in Figures 8 and 9, but runs contrary to the intuition that our uncertainty about the future climate should increase with lead-time. Can the authors comment on this surprising result?

3 Technical corrections

Several examples: choose Var(x) or var(x), there are examples of both
Several examples: E[x] -> E(x) for consistency with var(x) and general bracket conventions
Several examples: e.g. -> e.g.,
Several examples: i.e. -> i.e.,
Page 12, Lines 4 15: yields to
Page 10, Line 26; Page 12, Line 6; Page 13, Line 23: yielding to

Page 2, Line 31: verification calibration -> verification and calibration
Page 3, Line 23: verification -> observations
Page 3, Line 26: calibration -> recalibration
Page 6, Line 11: the approach (9) -> the second term in (9)
Page 6, Line 13: It might be worth explaining in words that the dependence on lead-time is cubic, while the correction for errors in time trends is only linear.
Page 6, Line 19: Additionally, -> In addition
Page 6, Line 26: These assumption -> These assumptions
Page 6, Line 27: order selection will be topic of -> order selection will be a topic of
Page 7, Line 13: ensured -> guaranteed
Page 7, Line 21: this observations -> these observations
Page 8, Line 04: μ_x and ϵ_x -> The processes μ_x and ϵ_x
Page 8, Line 13: Remove paragraph break

Page 8, Line 13: concrete -> specific or exact
Page 8, Line 13: this variability -> state which variability exactly
Page 8, Line 14: As for the recalibration strategy -> For recalibration,
Page 8, Line 15: we use. . . -> This sentence doesn't make sense.
Page 8, Line 21: In general, ensemble mean and ensemble variance both can dependent on lead time τ and start time t. -> In general, the ensemble mean and variance can both depend on lead time τ and start time t
Equation 21: It would be helpful to explain the motivation for non-linear form chosen here and the restriction in line 26.
Page 9, Lines 4-8: I understand from this paragraph that a trend is included in only the observations or the forecasts, but I am not clear on which. This needs to be clarified and possible linked explicitly to Eqn. 17 and Page 8, Lines 13-15.
Page 9, Line 26: 10 lead years τ = 1,...,10 -> 10 lead years (τ = 1,...,10)
Page 10, Line 24: which ESS values are lower one -> whose ESS values are less than one
Page 10, Line 25: The reduced performance. . . -> The lower performance
Page 11, Lines 25: model data with a low potential predictability
Page 12, Line 01: the worse MSE performance -> the lower MSE performance
Page 12, Line 03: On the contrary -> In contrast
Page 12, Line 08: bias within the -> bias in the
Page 12, Line 09: w.r.t. -> compared to
Page 12, Line 28: applied on surface -> applied to surface
Page 12, Line 27: global mean and a spatial mean
Page 13, Line 11: On the contrary, the raw model's -> The raw model's
Page 13, Line 26: is small than -> is less than
Page 13, Line 27: DeFoReSt slightly performs better -> DeFoReSt performs slightly better
Page 13, Line 32: with the corresponding -> and the corresponding
Page 14, Line 10: is constant -> is almost constant

Page 14, Line 13: perform equally -> perform similarly
Page 14, Line 20: also outperforming -> also outperform
Page 14, Line 21: climatology is solely not significant -> climatology is not significant
Page 15, Line 05: Analog to -> Following
Page 15, Line 13: impose -> imposed
Page 15, Line 14: conditional bias and ensemble spread dispersion-> conditional bias or ensemble spread

---

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2017-162, 2017.