

Clim. Past Discuss., referee comment RC2  
<https://doi.org/10.5194/cp-2020-156-RC2>, 2021  
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## Comment on cp-2020-156

Anonymous Referee #2

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Referee comment on "FYRE Climate: a high-resolution reanalysis of daily precipitation and temperature in France from 1871 to 2012" by Alexandre Devers et al., Clim. Past Discuss., <https://doi.org/10.5194/cp-2020-156-RC2>, 2021

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### General comments:

This paper describes a new reanalysis product over France for temperature and precipitation on an 8km grid during 1871--2012. A significant, and interesting, aspect of this work is the hybridization of results from ensemble data assimilation schemes for daily and annual timescales. This work builds upon a statistically downscaled 25-member ensemble from the 20th Century Reanalysis (SCOPE Climate). SCOPE provides the prior ensemble for both the daily and yearly reanalyses. Given such a small ensemble, covariance localization is critical, and seems to be well thought out in this study. There are many details to this work, most of which are well described. I have only one significant specific comment, and depending on how the editor chooses to guide the authors in revision, this could involve either involve minor or major revisions.

### Specific comments:

Validation is an essential aspect of reanalysis studies like this one, and the authors have done a good job comparing against a high-resolution reference dataset (SMR). The problem as I see it is that the same observations have been used repeatedly for several aspects of this study, so that there is not real independent validation. Given the likely strong influence of the terrain function (equation 6), showing the sensitivity of the results to randomly removing a significant percentage of the observations (e.g., one third) from the data assimilation would be a good way to address this issue. It would also allow for validating against the withheld observations, including an estimate of how well the ensemble is calibrated by comparing the error of the ensemble mean to the ensemble spread for these withheld observations.

### Minor comments and Technical corrections:

line 21: what are "discharge observations?"

line 59: SCOPE has not yet been defined

lines 75-80: This is meaningless jargon to most readers of CP. A clearer explanation for the general audience is needed in a background section.

line 87: I would point out here that you use the high/low average method, since many readers like me will wonder about that here before we get to the explanation later.

Figure 1: Why is there a periodic signal in the number of stations after ~1970? Also, what defines "complete series?"

line 170: some justification for why you chose a stochastic solver (perturbed observations) as compared to a deterministic solver (square root) is needed here.

section 3.2: relating back to my specific comment, there is an opportunity here with withheld observations to assess how well calibrated these observation errors are for both daily and yearly timescales in the prior ensemble.

equation 8: does this yield a true correlation matrix? For example, are all eigenvalues positive?

section 3.6.2: my impression is that you simply replace the annual-mean values in FYRE daily with those from FYRE yearly. If that's correct, it would be good to just say it. If not, more detail is needed.