We would like to thank the anonymous referee #2 for reviewing our study and her/his constructive comments. Please find below the referee's comments in black font and the authors' response in blue font.

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.

The purpose of this paper was to describe the creation and the features of the full FYRE Climate reanalysis. Hence, the paper included multiple comparison to other datasets (Safran, SMR and EPC) which are products mainly based on observation. However, as we can see in the Fig. 1 the observations are rather scarce and sparse before 1930. Note that this is particularly the case in mountainous areas. Thus, it is not possible to remove a third of the observations over the entire period and at the same time to have a strong network in validation. For example, in 1900 this would lead to a set of validation of ~300 stations for precipitation and ~25 for temperature without any station in the north or in the Alps (the main mountainous area in France). Moreover, it would be impossible to withhold the same set of stations for the whole period given the large changes in the network.

For all these reasons, and as we shared with the referee the need for a proper validation with independent observations, we therefore dedicated a full article (Devers et al., 2020a) where the DA scheme (identical to the one used in this article) is tested on a short and recent period (2009-2012). The amount of observations during this period allowed to remove a large amount of stationd to simulate the observation network as seen specifically in 1871, 1900, 1930 and 1950, both in terms of number and spatial coverage. Furthermore, this method allowed validating the DA scheme on numerous independent stations (783 for precipitation and 1500 for temperature) with a good coverage of mountainous area.

The validation procedure of the DA scheme included the use of the CRPS (Continuous Rank Probability Score) decomposition into Reliability (representative of the ensemble calibration) and Potential CRPS (representative of the accuracy). The results showed that the ensemble produced is well calibrated with a low Reliability component (close to the background Reliability) as well as a low Potential CRPS. Of course, this study showed that the performance of the reanalysis (mainly through the potential CRPS) decreases when the density of assimilated observations decreases, i.e. when one go further back in time (cf. Fig. 7 and Fig. 10 in Devers et al., 2020a).

We will therefore emphasize the added value of this preliminary but nevertheless required validation experiments in the introduction (line 57). The reader will thus be referred to more information on this crucial and difficult validation point shared by all reanalysis studies that precisely aim at using all available data at hand.

Minor comments and Technical corrections:

line 21: what are "discharge observations?"

The discharge observations are the amount of water going through the river section in a certain amount of time. For the sake of clarity, we will replace it by "streamflow observations".

line 59: SCOPE has not yet been defined

The acronym of SCOPE (Spatially COherent Probabilistic Extension Method) will be added before (line 47) and the corresponding reference (Caillouet et al., 2019) will be recalled here (line 59).

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.

We will try and simplify this paragraph as follows: "The SCOPE (Spatially COherent Probabilistic Extension Method, Caillouet et al., 2016, 2017) climate downscaling method is based on the analogue approach, which assumes that similar large-scale patterns of atmospheric circulation lead to similar local meteorological conditions of e.g. temperature and precipitation (Lorenz, 1969). SCOPE uses an ensemble analogue approach to reconstruct high-resolution climate fields from large-scale information on atmospheric circulation. SCOPE draws on several works on climate downscaling with analogues (Radanovics et al., 2013; Ben Daoud et al. 2016; Caillouet et al., 2016, 2017), and the reader is referred to these for more details. In short, based on information on large-scale atmospheric circulation from e.g. a global reanalysis, SCOPE generates an ensemble of high-resolution daily meteorological fields through a resampling of an archive of high-resolution meteorological fields. Note that the resulting fields from each ensemble member are coherent spatially as well as across variables, thanks to the use of the Schaake Shuffle (Clark et al., 2004)."

References

Caillouet, L., Vidal, J.-P., Sauquet, E., Graff, B. & Soubeyroux, J.-M. (2019) SCOPE Climate: a 142-year daily high-resolution ensemble meteorological reconstruction dataset over France. Earth System Science Data, 11, 241-260, https://doi.org/10.5194/essd-11-241-2019

Devers, A., Vidal, J.-P., Lauvernet, C., Graff, B. & Vannier, O. (2020a) A framework for high-resolution meteorological surface reanalysis through offline data assimilation in an ensemble of downscaled reconstructions. Quarterly Journal of the Royal Meteorological Society, 146, 153-173, https://doi.org/10.1002/qj.3663