Summary

This is a review of “FYRE Climate: A high-resolution reanalysis of daily precipitation and temperature in France from 1871 to 2012” by Alexandre Devers, Jean-Philippe Vidal, Claire Lauvernet, and Olivier Vannier. The authors have generated a new high-resolution dataset for daily precipitation and temperature over France. The authors used a method from their other work—an offline data assimilation framework in which station observations are assimilated to the background given by the downscaling of lower-resolution reanalysis using the ensemble Kalman filter (EnKF). The authors comprehensively assessed the new high-resolution reanalysis and found that it largely improves over the lower-resolution reanalysis. I will first give some general comments that I would like to discuss with the authors and then give specific ones.

General comments

- In the offline data assimilation procedure, the background is given by the downscaling of a low-resolution reanalysis. Assimilating observations can reduce the error due to downscaling and thus, one can expect that FYRE climate improves over the SCOPE climate. An interesting result to me is that the FYRE climate is found to be better than the Safran reanalysis (Fig. 6 and 7), which has the same resolution to the FYRE climate and is also created using observations. What is the main reason?
- If Safran is used as background, should we expect a product that is better than FYRE?
- How is the performance of FYRE in comparison with other datasets with similar resolution, including gridded observational dataset such as E-OBS?

Specific comments

1) Line 57: Without checking the other paper, it is unclear to me what has been done in this work and what has been in that.
2) Eq. (1): the dimension of X prime is incorrect.
3) Eq. (2): the left-hand side should be Y_i
4) Line 173: dimension of \epsilon_i incorrect, should be \epsilon_i in R^{m}
5) Line 178: dimension of K is wrong and if H is written in this way, it should be a matrix and the dimension should be m \times n.
6) Line 180: This is misleading. R is given as you said in section 3.2. Because \epsilon follows a given distribution, you won’t need the expectation equation of Evensen (2003).
7) Eq. (7): \rho is m \times m, the product of PH^T is n \times m, we can only compute Schur product for two matrices with same dimension.
8) Line 255: what is the inverse error function?
9) Line 266: null precipitation? Do you mean zero total annual precipitation?
10) Eq. (12): Does P_daily[y,c] mean the sum of P_daily[d,c]?
11) Line 320-322: So? You give a reason but have not well explained it.
12) Fig. 5: Are the results averaged over time? The bias has negative and positive values, does this have an influence on the averaged results?
13) Fig. 5: why use median rather than ensemble mean?
14) Line 341 and line 346-349: no plots for the correlation of FYRE daily in Fig. 6.
15) Fig. 5 and Fig. 6: Fig. 5 shows that FYRE climate is better than FYRE daily if Safran is used as reference, whilst Fig. 6 shows that FYRE daily is better than FYRE climate if SMR is used as reference. Fig. 6 also indicates that if SMR is used as reference, then FYRE daily and climate are better than Safran. Therefore, I am not convinced that FYRE climate is generally better than FYRE daily. It is reasonable that FYRE climate performs better than FYRE daily in terms of annual variation (because FYRE climate is constructed using FYRE yearly, which is created using annual observations). But for daily and monthly data FYRE daily can be better. Also, for extreme events.

16) Fig. 7 and line 364-366: It is interesting that the SCOPE climate also performs worse during this period.
17) Line 415: Does analysis always have a smaller ensemble spread than background?
18) Fig. 10: I don't understand why there is a large separation of FYRE daily precipitation ensembles (also Fig. 7). EnKF gives an analysis whose error is (approximately) Gaussian. Here, the separation of analysis ensemble indicates that analysis error follows a bimodal distribution.
19) Line 431: how large is the difference between ensemble members? Should say more on ensemble uncertainty.
20) Regarding extreme events: observations are vital for the representation of extreme events. Authors have shown that even the observational data from a small number of stations can make a large contribution. Additionally, a high resolution is essential for an accurate description of extreme events. The gridded data products give a value for a cell, which is averaged over a small domain. If the temporal scale of an extreme event is much smaller than the grid size, then the event will be naturally underestimated. In contrast, station observation is a point measure, which can accurately measure the weather condition at a single point. The authors may want to have a look at Hu and Franzke (2020; https://doi.org/10.1029/2020GL089624), which shows that gridded observational datasets perform better than reanalysis products in terms of extreme daily precipitation.
21) Line 506-509: I don't really understand this paragraph.

Technical corrections

- Line 222: than -> that