

Earth Syst. Sci. Data Discuss., referee comment RC2
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Comment on **essd-2021-182**

Anonymous Referee #2

Referee comment on "Historical reconstruction of background air pollution over France for 2000–2015" by Elsa Real et al., Earth Syst. Sci. Data Discuss.,
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The paper by Real et al. proposes a dataset of background air pollution concentrations and air quality indicators over France for the period 2000-2015. The concentrations and indicators are mainly given on an annual basis either gridded at about 4km resolution or aggregated on French administrative territories. The provided concentrations are calculated using kriging approaches merging surface measurements from air quality networks and model simulation. The evaluation of the dataset is done using a cross-validation method and shows good performances of the dataset to assess air pollution concentrations except for NO₂ at rural stations. Trends of the different pollutants (PM₁₀, PM_{2.5}, O₃, and NO₂) are discussed as well as exposure trends. The dataset covering the 2000-2015 period is available on a zenodo repository. In addition, the visualization of the maps is also available on the INERIS website with the possibility to download the data for more recent years. The presented dataset is of interest for air quality community, for example for comparison of air pollution trends in different countries, the dataset providing information for France. It is then suitable for publication, but some major issues should be addressed before publication (see point 1 and 2 of main comments):

Main comments

- The description of the kriging approaches is very limited in the paper and most of the references provided by the authors are written in French, limiting the access to non-French speaking readers. Providing a more detailed summary of the approaches would be valuable for the readers. The presented dataset is a fusion between model

simulations and surface measurements.

- The authors do not provide any evaluation or discussion of the improvements provided by the kriging approaches compared to the raw model simulations. It would be very valuable to have this information to highlight the usefulness of the dataset compared to raw simulations. Is it possible to calculate the contribution of the model vs surface measurements for each grid point?
- The authors discussed the significance of the trends at the national scale, but few information is given when trend maps are presented. Are the trends significant at each grid point?
- A proofreading by a native English speaker is recommended.

Specific comments

- Page 2, lines 2-5: the authors should refer to the Tropospheric Ozone Assessment Report (TOAR activity from IGAC) when discussing tropospheric ozone trends.
- Page 4, CHIMERE description: the meteorological fields used as input of model simulations are different depending on the period (WRF from 2000 to 2010 and IFS from 2011). Does the change of systems to constrain the meteorological fields introduce any bias or discontinuity in the simulations?
- Figure 1 and similar: the dashed lines are confusing; they may be interpreted as error bars. They are not commented in the caption.
- Please check the size of the text in figures, it is sometimes too small, especially for figures from fig. 9.
- Figure 9: the term "reanalysis" is used in the figure but never used in the text. Please use consistent terms all over the paper or define them clear (kriging, fusion, reanalysis).