

Interactive comment on “pygeodyn 1.0.0: a Python package for geomagnetic data assimilation” by Loïc Huder et al.

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This manuscript by Huder, Gillet and Tholland explains the Python code for accessing and executing the code for their geodynamo data assimilation code. The scientific work based on this code has been published in previous papers (Barrois et al, 2017/2018, for example) and so it is to be applauded that they have made the great effort to allow others to reproduce their scientific research in an open manner.

The visualisation tools on the webgeodyn site are also very impressive, easy to use and simple to understand and almost deserve a paper on their own merit. I spent a long time examining the different plots and combinations of data that can be placed together. Figure 2 is particularly stunning (on the website, it can be rotated and animated).

C1

The manuscript is probably of most use to researchers interested in the details of how to recreate data assimilation within the scope of the geodynamo snapshots though the authors have made it clear that a user can access the code at the different levels of expertise required. In reality, it is a companion paper to the Barrois et al and Aubert papers of the past five years. The parameters and assumptions are well explained and the flow of the work load is clear.

⇒ **We thank the referee for his positive remarks.**

I have no major comments or suggestions to make. I would however, suggest that the authors revise their frequent use of the phrase 'allows to' which appears several times. For example on page 7, line 15, they could write: ' The fifth group allows the user to ...' or on page 8, line 1: '... states that allow an estimate of the background states ...'.

⇒ **Following the referee's suggestion, the wording was changed in the mentioned sentences and in a few others.**

Minor corrections:

- Page 1, line 9: generated by motion of the liquid
⇒ **Corrected.**
- Page 1, line 14: that DNS are not capable of reproducing changes
⇒ **Corrected.**
- Page 3, line 24: but wants to run their own data. (and again on Line 27)
⇒ **Corrected.**
- Page 4, line 11: takes as input? (rather than basis)

C2

- ⇒ **Reworded as 'The algorithm is based on the radial induction equation...'**
- Page 5, line 8: consists of time-stepping
 - ⇒ **Corrected.**
- Table 1: why is the default -m parameter equal to 10 in the Table but in the text you recommend 20?
 - ⇒ **This is an outdated value that was used for tests. We thank the referee for pointing that out. The default parameter is set to 20 in the new version (1.1.0).**
- Page 7, line 4: I'm slightly confused about the decimal representation explanation -surely the input magnetic or SV data are monthly means (or 4 monthly VO) so it hardly matters how the date is represented at 64-bit precision - we're not at the microsecond level of precision. It's OK if that is the default Python class to use.
 - ⇒ **The 64-bit precision is indeed the default NumPy way to store dates. The point of using this class was not firstly to enhance precision but rather to use a dedicated tool to store dates that leaves no ambiguity. Our previous decimal representation could lead to questioning on days and month shifts (e.g.: is 1980.16667, the 1st, the 31st of January 1980, or the 1st of February 1980?)**
- Figure 1: Is it better to have runtime on a log scale to emphasize the point?
 - ⇒ **Unfortunately, as there is a part of the runtime that does not depend on the number of cores, a log plot does not lead to a straight line and is not clearer in our opinion. Still, the units of the runtime (and of the fit) were changed from seconds to hours for readability. The text describing the graph was changed accordingly.**

C3

- Page 10, line 5: output files are directly
 - ⇒ **Corrected.**
- Acknowledgement: Perhaps add a note about the use of INTERMAGNET data (which I assume are used for the plots?)
 - ⇒ **That is indeed the case. The acknowledgement was added.**

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-82>, 2019.