

Ann. Geophys. Discuss., author comment AC1 https://doi.org/10.5194/angeo-2021-64-AC1, 2022 © Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.

Reply on RC1

Etienne Behar et al.

Author comment on "*Menura*: a code for simulating the interaction between a turbulent solar wind and solar system bodies" by Etienne Behar et al., Ann. Geophys. Discuss., https://doi.org/10.5194/angeo-2021-64-AC1, 2022

We thank the referee for the encouraging feedback and for the time spent on the draft. We try to tackle the comments in the following answer.

1 – Readability of the introduction : We have shortened and tried to fix some language issues, though we can iterate once more if needed.

2 – References formatting : that is our mistake, \cite were replaced by \citep everywhere.

3 – Figure reference: fixed.

4 – The polytropic index k is now tackled with the following sentence "In all the results presented below, an index of 1 was used, corresponding to an isothermal process." when introducing equation 6. The change of index when discussing the magnetosonic mode now reads

"The magnetosonic modes were also tested using a different polytropic index of 5/3 instead of 1, resulting in a shift of the dispersion relation along the \$\omega\$-axis. Changing the polytropic index in both \emph{Menura} and \emph{WHAMP} resulted in the same agreement."

Additionally, at the beginning of the physical test, it is now stated "A polytropic index of 1 is used here, with no resistivity."

5 – The paragraph tackling the hyper-resitivity has been expanded to introduce the corresponding dissipative scale. The value of 0 was mentioned above for the physical tests, and the value and corresponding scale for the turbulent run also given.

", introducing the Laplacian of the total current and the hyper-resistivity coefficient, Δ_{1}^{1} , The dissipative scale L_{text} of such a term is characterised by the physical time of the simulation T = text. iterations} times dt and the hyper-resistivity, such as L_{text} of C and the hyper-resistivity, such as L_{text} ."

"The polytropic index is 1 and a normalised hyper-resistivity of $\frac{10^{-3}}{s}$ is used, corresponding to a dissipative scale at time t=500\omega_{ci0}^{-1}\$ of 0.93 \$d_i\$, i.e. the scale of the smallest fluctuations simulated with a node spacing of $\frac{15}{2}$."

As stated previously, all parameters including the polytropic index and eta_h are kept unchanged for step 2 of the simulation.

6 – Test done on a 2D domain with one main direction x: it is indeed a cut taken for one precise index y.

"(saving one cut, given by one single index along the \$y\$-direction)"

7 – The number of particle per node is added for the ion acoustic Landau damping.

"This low amplitude, allowing for comparison with the linear solver, further increase the need for a high number of particle per node, so the 1% oscillation in number density can be resolved by the finite number of particles. For this run, 32768 ($2^{15}\$) particles per grid node were used."

8 - k in units of di0 $^{-1}$, rather than di0: absolutely.

9 – Scalability: a fairly complete study of scalability was motivated by the comment, which is now given in paragraph 5.4.2 and Figure 7 (attached to this answer).

10 & 11 – Table A1 was removed, and was indeed an old copy of Table 1. The caption now reads

"Background values used to normalise all variables in the solver (cf. Eq. \ref{eq:norm})"

All typos were addressed with the exception of one, we kept "to go further in the in situ space data analysis, further in their understanding \dots "

Please also note the supplement to this comment: https://angeo.copernicus.org/preprints/angeo-2021-64/angeo-2021-64-AC1-supplement. pdf