Geoscientific
Model Development
Discussions

Interactive comment on "The Lagrangian analysis tool LAGRANTO – version 2.0" by M. Sprenger and H. Wernli

Anonymous Referee #2

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General comments:

The manuscript describes version 2 of the Lagrangian analysis tool LAGRANTO, giving illustrative examples of its application to various atmospheric processes including air flow within extra-tropical cyclones, stratosphere-troposphere exchange and flow around orography.

The paper does not aim to give a full scientific description of the LAGRANTO modelling tool, nor is it a comprehensive user guide (these are available separately), however it does provide a clearly written and concise discussion of the new tool. There is a general emphasis on presenting model functionality from a user perspective through the use of examples to develop the basic concepts and command syntax. In this sense, the manuscript could also be considered as a useful 'tutorial' to introduce new users to

the model.

Based on the examples presented within this work, LAGRANTO appears to be a powerful and versatile tool that is capable of contributing to atmospheric modelling studies that require the description or analysis of trajectories. While the manuscript provides only a limited scientific description of the model (further information is supplied online in supplementary information), its basic formulation is based on sound scientific methods. The example results presented within the paper are only intended as illustrative of the model capabilities and functionality rather than being applied to inform conclusive results, and so the reproducibility of results is perhaps less of a concern in this instance. However, there is no reason preventing all results from being reproduced by fellow scientists provided that the input meteorological fields used for the simulations were available. The paper is well-structured and all material is presented in a clear and concise way with appropriate use of illustrative figures. The English is generally good, but improvements could be made to the grammar in some places. Specific corrections to typos, etc. are detailed below. The referenced material appears to be quite extensive and contributors to development of the modelling tool are acknowledged accordingly.

Specific comments:

It is noted that American spelling is being used throughout the manuscript (e.g., 'center', 'color', 'favored').

While generally well structured and clearly written, the abstract is perhaps rather technical in one or two places, e.g. referring to details of analysis commands such as "GT:PV:2". The extended sentence in the first paragraph should also be split to improve readability.

In the introductory discussion around eqn(1), the text suggests that all trajectory models operate in a pressure vertical coordinate, but this is not necessarily the case (height based coordinates might also be used). Suggestion to either make the text less specific here (e.g. remove the word 'pressure' on l.13) or to add a qualifier that LAGRANTO

adopts a pressure-based formulation for x and u.

I read the last sentence of the same paragraph (l. 19 – 20) to imply that LAGRANTO is the only trajectory tool of those listed that has the ability to select trajectories based on objective criteria. If this is not correct, the phrase "in contrast" should be removed from that sentence.

On page 1902, l.15 states that OMEGA is expected in hPa/s (but it is more usual for OMEGA to be in units of Pa/s in NWP model outputs?)

The use of arrow notation for vectors in Figure 3 makes the schematic look rather cluttered. Perhaps just use bold font instead (as is done in the figure caption).

Technical corrections:

1898 / l.3 Consistency in use of ° symbol when referring to geographical coordinates, e.g.,30°N to 80°N (and similarly elsewhere in the paper, e.g., on p.1911).

1901 / l.13 "northward" (i.e., missing 'h')

1904 / l.6 "only makes" (i.e., reverse order)

1905 / l.23 "... is anyway critical" (do you mean "not critical"?)

1906 / l.13 First entry should be T:-100 km (i.e. '-' not '+')

1913 / l.15 "which has been used for more than a decade"

1916 / l.9 "versatility"

1916 / l.16 Figure 5a shows the trajectory blocking. Could also add correct reference to Figure 5b in discussion on the following page.

1919 / l.20 "The forecast trajectories help predict ... or originate from ..."

1923 / l.14 "trajectory" (i.e. missing 'r')

1923 / l. 21 "have already been mentioned"

1924 / l. 4 "losing"

1925 / l. 26 Use of the phrase "partly Python"? The authors could be slightly more specific here, e.g., on the version of Python and/or any required libraries.

1926 / l. 3 "described" (i.e. missing 's')

1926 / l.6 "since" should be "for"

1927 / l.1 "trias" should be "triad"

Table 2 caption: third entry in table should be "maximum" (typo).

Figure 6 caption: "panles" should be "panels", and "1500 m" should be "3000 m"