

## ***Interactive comment on “STEFLUX, a tool for investigating stratospheric intrusions: application to two WMO/GAW global stations” by Davide Putero et al.***

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Received and published: 6 October 2016

General Comments: This paper presents STEFLUX, a new tool that detects stratospheric intrusions affecting a specific location during a specific time period. STEFLUX is well described and the results are thoroughly discussed revealing the benefits and restrictions of the tool. As the transport of stratospheric air masses into the troposphere is of great importance, STEFLUX can be used in conjunction with observations for several scientific purposes. Therefore, I consider the paper to be an interesting study and recommend its publication in ACP, but only after addressing the following comments.

*We thank the Reviewer for his/her valuable suggestions and his/her encouraging evaluation. In the following, we report our point-to-point replies to each of the raised points.*

C1

*Modifications to the text are performed in the revised version of the manuscript and are marked in red and blue colors in the track-changes manuscript version.*

Main comments: It seems that there are inconsistencies between the skill scores values (False Alarm Rate, ORSS) presented in the manuscript (Page 7 line 27 – Page 8 line 5, Table 1) and the contingency tables presented in Table 1. Moreover, the presentation of the results in Table 1 needs to be more reader-friendly. I suggest the following:

1. Include (in Section 4.1.2) the formulas used to calculate all skill scores along with the corresponding references, i.e.  $ORSS = (AD - BC) / (AD + BC)$  (Thornes and Stephenson, 2001), explaining what A, B, C and D stands for in your case.
2. Assign A, B, C and D to the respective values in Table 1.
3. Check calculations for the skill scores. It is likely that your results are better (higher ORSS values and lower False Alarm Rate values).
4. Add a label for each table in Table 1, in order to be clear which approach is the “reference” and which is the “predictor”. i.e for Table 1a,c “SIO vs STEFLUX” and for Table 1b,d “STEFLUX vs SIO”.
5. Revise the discussion (for skill scores) in the manuscript if needed.

*We thank the Reviewer for this important comment, and we apologize for the inconsistencies between the wrong values given in the text and those reported in Table 1. Our new results are indeed better than those presented in the first version of the manuscript, with a lower false alarm rate (equal to 0.45), and higher ORSS (see the updated Table 1) for all comparisons. These values have been updated in the text (Page 8, Lines 24–25) and in Table 1.*

*Moreover, as suggested by the Reviewer, we made the description of the skill scores and the layout of Table 1 clearer. Formulas for the accuracy, false alarm rate and ORSS have been inserted (following Thornes and Stephenson, 2001), explaining also what A, B, C and D stand for (see Sect. 4.1.2). Table 1 has been updated by specifying what these capital letters refer to and by adding labels for the “STEFLUX vs SIO” or “SIO vs STEFLUX” comparisons. The caption has also been modified accordingly.*

C2

Minor comments: Please add degree symbols for lon and lat values in the manuscript. i.e. Page 3, line 20.

*Done.*

Section 4.1.1: Please include a definition for STEFLUX SI day. i.e. threshold of at least 1 box crossing per day?

*The definition of SI day was erroneously given in Sect. 4.1.2 (Page 7, Lines 10–11): "...SI days (with a threshold of at least 2 box crossings per day for STEFLUX, in order to retain robust information only and to discharge "erratic" events)". Thus, this sentence has been moved above (Page 7, Lines 17–18).*

Page 7, lines 6-7: "(see the Supplementary Material)". Please specify exactly where in the Supplementary Material.

*Done. Since old Table S1 has been moved into the main body of the text (see our answer to Reviewer #2 comments), the sentence has been modified to: "(see Table S1 in the Supplementary Material)".*

Table 2: Add "(b)" in the second table.

*Done.*

Figure 1a: Please replace "STEFLUX [#]" with "STEFLUX [number of crossings]".

*Done.*

Figure 4: The map continents are not so clear. Please change map continents color if possible (maybe grey).

*Done.*

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Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-514, 2016.