

## Second revision of "The Lagrangian moisture source and transport diagnostic WaterSip V3.2", submitted to GMD

Dear Penelope Maher,

I have now revised my manuscript according to the comments from the second round of reviews. All comments could be addressed positively in the revised submission. I want to express my sincere gratitude to the reviewer for very carefully reading through the manuscript, helping to identify a number of remaining errors. I hope that the revised manuscript will be acceptable for publication in GMD.

With best regards,  
Harald Sodemann

### **Reviewer #1 (Marina Dütsch)**

*I thank the author for the revised version of the manuscript. All reviewer comments have been addressed and points of confusion have been resolved. The paper is now very clear and comprehensive. I have also run the test case with the updated source code and data, and it worked (almost) without problems this time. The paper, and the software it describes, will be a very valuable contribution to the field of moisture tracking. I only have few remaining minor comments.*

### **General comments**

1) *A small technical detail: I still think the NETCDFINC path should be added to the COMPILE variable (not FLINK) in the makefile, because the header files are needed in the compilation step (not the linking). For me it worked only after I changed this.*

**Reply:** The NETCDFINC path has been added to the COMPILE variable to enable out-of-the-box compilation for all users.

2) *I think it would be nice (in the future) to provide a script for converting FLEXPART11 netcdf output to binary or extend WaterSip to directly read netcdf output. In FLEXPART11 there is now also the option of a local domainfilling release (currently in branch domainfill\_release) which allows to compute only trajectories that are needed for the study and save storage space and computational time.*

**Reply:** Yes, I agree and will work on such a conversion script, which will be available on the WaterSip repository once completed. A note to that effect has been added to the revised manuscript.

### **Specific comments (mainly typos)**

L40: *develloped -> developed*

L56: *Some references have brackets but shouldn't, others don't have them but should.*

L72: *Bracket missing after Sec. 3.*

**Reply:** These corrections have been implemented.

L121: *This is a bit confusing because  $f_n$  in these two sentences refer to different things (the second one accounts for moisture losses, the first one doesn't).*

**Reply:** This section has been shortened and rephrased for clarity, as indeed some of the description was repetitive and unclear.

L127: *„for of“*

L150: *„see below“: Where below? I don't see it.*

**Reply:** A sentence mentioning the difference between the Sodemann et al. (2008) and Dütsch et al. (2018) algorithms in terms of  $f_{\text{tot}} > 1$  has been added to the revised manuscript (Sec. 2.3).

L154:  $s_z$  is later called  $s_h$ .

**Reply:** renamed to  $s_h$  throughout.

Eq. 11: What is  $\Delta p_k$  here? If it is the pressure interval, you would also have to divide by the number of particles per pressure level.

**Reply:** Since the discretisation when using trajectory models is described below, this equation has been deleted in the revised manuscript.

Fig. 1, caption: Something went wrong here: „identified by with  $RH_{above}$  threshold value  $RH_c$  (shading)“. Also this actually describes (d), not (c).

**Reply:** Corrected, and added descriptive text for panel (c).

L179:  $M$  should be  $U$ .

Eq. 14:  $\Delta q_k$  should be the absolute value.

L197: „is has“

L243: thresholds -> threshold

L392: that -> than

L498: „is are“

**Reply:** These corrections have been implemented.

Table 1: In my case (running the test case), I got files called  $\langle \text{CASE} \rangle_{grid}$  and  $\langle \text{CASE} \rangle_{secs}$ , not  $grid$  and  $ser$ .

**Reply:** Names in the table have been corrected.

L510: high pressure system?

**Reply:** Changed as suggested.

L521: I don't see the output files.

**Reply:** The output files are provided as a tar archive in the repository, not as individual files.

L540: are -> area

L559: „dominate in further away“

L616: „are be gridded“

**Reply:** These errors have been corrected.

L630: The weighting for water vapor diagnostics is also relevant in Section 5.3 and could be mentioned earlier.

**Reply:** The weighting is now also mentioned in Section 5.3.

L684: Hypothetically there could be situations where the transport distance is smaller than the source distance, if the air parcels take up moisture far away and then have constant or decreasing specific humidity after that. Is this correct? From the sentence it seems like it should always be larger.

**Reply:** I don't understand how the transport distance could be shorter than the source distance. The source distance is the shortest possible transport distance (great circle distance).

*L762: „moisture moisture“*

*L768: raises -> rises*

*Table 5: Add units for  $\Delta q_c$  and  $T_{step}$ .*

*L855: „about new 3000“*

*L858: 0.6 and 0.4 should be swapped?*

*L876: Something is missing in this sentence.*

**Reply:** These errors have been corrected. Thank you for the very careful review of the revised manuscript.