

Interactive comment on “Origin and transport of Mediterranean moisture and air” by I. Schicker et al.

Anonymous Referee #1

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Review of "Origin and transport of Mediterranean moisture and air" by Schicker et al., 2009

This paper deals with a climatological study of water export from the Mediterranean on the basis of a Lagrangian data set. In addition, air transport across the Mediterranean is considered. The paper addresses an interesting subject, but the work is so far mainly descriptive and lacks a more detailed analysis and interpretation. Furthermore, the aims are not clearly laid out, and the figures need improvement, as detailed below:

Major issues:

1. The Introduction goes back and forth between a discussion of aspects of the water cycle and air quality issues. However, the relevance of the topic air quality for this paper

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remains unclear. The problem is probably that the aims and focus of the paper are not clearly defined. It appears that the paper is intended as a climatological reference for a number of upcoming field campaigns, but this is nowhere explicitly stated. Somehow as seen from the title moisture and air transport are both in the focus, but as it is now, the double focus does not help readability. It would probably help if you use the overall air transport as a backdrop for the atmospheric water vapour transport throughout.

2. Similarly, it is not clearly stated what exactly motivates this study. The only clear motivation statement is on pg. 21427 l. 17: "Therefore, we found it interesting...". It would also be motivating for the reader to know more about your motivation and what some of the expected outcomes are upfront.

3. So far, the results from this study remain mainly descriptive and qualitative, which means the paper lacks a detailed quantitative interpretation of the results and the implications thereof. One question to this end is for example: What is the relevance of the Mediterranean for the seasonal water cycle in its surroundings, e.g. the Middle East or Northern Africa? This could be addressed in quantitative terms with your data set.

4. In Fig. 2, there are large areas in the northern hemisphere where your method shows a 1-5% contribution of Mediterranean moisture to the total, in particular at polar latitudes. There are a number of questions related to this:

- What is the significance of these small water contributions? After how many days do you stop tracing the water transport? How realistic is the transport simulation after this time?

- Is it possible that you have a latitude bias in your method? Maybe the convergence of the meridians is not taken into account, which overly emphasizes high latitude fractions.

- The lower two categories in some of the color bars, e.g. in Fig. 2, are labeled 0.00, while this is obviously not the case. Also, some color bars, e.g. in Fig. 3, do not print correctly.

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5. It would be good to do a simple consistency test of your method. If you integrate all marked water vapour from the Mediterranean according to the results from your method in mass units for a season or month, this should equal the total accumulated evaporative flux from the Mediterranean during that period. Such a test would also tell you about the representativeness of your method.
6. Fig. 15 presents the "air flow crossroads" that the authors identify in their paper. In my view, however, it is best not to show such a simplified figure at all, because it leads people not working in atmospheric science to believe this sort of transport pattern is occurring steadily all the time throughout the atmosphere in the Mediterranean. Your new Fig. 12b already shows the point you want to make, and includes an impression of the uncertainty associated with it, so why make that additional (over)simplification?
7. A number of times, the precipitation or moisture fraction maps are interpreted as flux, but no actual flux is depicted. Also, transport patterns are implied from these maps, while the fraction does not tell about the actual transport pathway. For this you would have to look at an actual flux vector such as velocity times specific humidity (see detailed comments).
8. I have not seen the term "Etesian Basin" used for the Aegean sea anywhere else before. This seems confusing, why not call it the Aegean? The different local wind systems, if necessary, could be indicated in Fig. 1.
9. Some discussion of the limitations of the method, results, and data set are needed.
10. It is confusing when you show your results on a latitude-longitude projection while including part of the Arctic (e.g. Fig. 2). I suggest using a stereographic projection that shows the complete northern hemispheric transport plume.
11. It is not clear why the results for some regions of interest are depicted in detail and not for others. A quantitative comparison of all regions is desirable, also to help evaluate if the subdivision you made in Fig. 1 was meaningful and not arbitrary. Also,

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what is the role of local moisture recycling in each of your regions of interest? Is it a function of the ROI size?

Detailed comments

pg. 21427, l. 2: You mention these large-scale circulation patterns here, but it remains unclear why they are relevant for this study

pg. 21428, l. 15: How is the Tibetan high pressure system influencing the Mediterranean? A reference is needed, also for the following sentence.

pg. 21429, l. 10: This paragraph does not really seem relevant for this study and is mainly distracting, since completely different geographical regions are addressed (maybe with the exception of Nieto et al., 2006, and I believe they examined the Sahel), and the main references for this kind of analysis appear already in an earlier paragraph.

pg. 21437, l. 5: This statement appears as a speculation, from the results you show it is not clear what the dynamical cause of this maximum is.

pg. 21437, l. 22: "effects on Africa are large" - this statement is very unclear. What do you mean by effects? Which part of Africa?

pg. 21437, l. 27: "highest impact" - impact seems to be misleading, as you are not talking about consequences. Do you mean "influence"?

pg. 21439, l. 16: This paragraph talks mainly about airflow patterns, but without showing actual wind velocities or pressure patterns. It would be useful to either overlay or add in separate figure panels wind velocity and vectors or geopotential/pressure plots to show how residence time and air transport are related.

pg. 21440, l. 4: How meaningful is it to interpret your residence time analysis on a 30 to 90 day time scale? Clearly, you would not expect a 90-day trajectory in the troposphere to be realistic any more, this needs to be justified.

pg. 21441, l. 5: Why is this interesting? Is this "spot" significant?

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