

## ***Interactive comment on “The role of Amazon Basin moisture on the atmospheric branch of the hydrological cycle: a Lagrangian analysis” by A. Drumond et al.***

**Anonymous Referee #1**

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### **General comments**

This paper investigates the atmospheric moisture sources for the Amazon basin and the sinks of atmospheric moisture from the Amazon basin. For this they use an existing particle tracking model (FLEXPART) and apply it to an extensively studied basin (when it comes to the atmospheric branch of the hydrological cycle). Although the presented figures are interesting, they are very similar to previously published results, and as such there is little new insight gained from this study. The novelty of the paper could lie in the study of the variability of the Amazon's moisture sources due to El Niño and La Niña events, but this remains quite superficial in my opinion. The very small

C33

advancement over previous research is my main point of criticism, and major new analyses are needed to overcome this problem. Moreover, the manuscript has several other shortcomings: not all relevant literature is (properly) cited, the figures and their legends are not very clear and the English needs major improvements.

### **Specific comments**

1024-L17 Precipitation is a flux and should be presented as indicated in the manuscript preparation guide “manuscript preparation” under the heading “Physical dimensions and units”

1024-L21 “of anthropogenic origin” can be removed as this is quite obvious with deforestation.

1025-L5-7 The Eulerian methodologies mentioned here seem to be studies that analyse wind fields without performing any type of tracking of moisture or any moisture recycling calculation. If their main conclusion is just that Amazonian moisture comes with trades winds from the Atlantic (as indicated by L8-9) it seems quite exaggerated to refer to 7 studies. Besides these studies, it would make sense to report on the findings of early studies on the Amazon that made use of an analytical framework (e.g., Brubaker et al., 1993; Eltahir and Bras, 1994; Burde et al., 2006). More recent numerical Eulerian methodologies and their results are relevant to mention as well (e.g., Yoshimura et al., 2004; van der Ent et al., 2010; Goessling and Reick, 2011; Keys et al., 2012).

1025-L20 Some other relevant literature is still missing. No reference is giving to studies that link moisture sources of the Amazon to the isotopic composition of rainfall and atmospheric moisture (Salati et al., 1979; Gat and Matsui, 1991; Risi et al., 2013). Moreover, the paper of Dirmeyer et al. (2009) published alongside the paper itself an extensive database of moisture sources and their variability for each nation and basin (<http://www.iges.org/wcr/>), which seems relevant to cite.

C34

1026-13 I am not really seeing this contrast so much. When talking about Lagrangian and Eulerian numerical moisture tracking, both can yield similar results (see van der Ent et al., 2013).

1026-25 What is an inedited way?

1027-25-27 I find the average residence time of an atmospheric particle a rather weak argument to track the particle only for 10 days, as average indicates that it can also be much longer!

1028-24 More information on the ONI is needed. Is this based on sea surface temperatures, pressures, exactly which area, and how do yielded El Niño and La Niña years compare to other standards (e.g., Trenberth, 1997)?

1029-12 What is the average  $E - P$  over the Amazon? This is important while interpreting the results.

Figure 1: These type of figures seem quite standard for publications using FLEXPART, however I think that they are not self-explanatory and need more explanation in the caption. My main concern is how to interpret the numbers of  $E - P$ . Is the area-weighted sum over the entire figure always zero? It also seems that interpretation depends very much on the chosen scale, this is the case because it does not become clear how much of Amazon's moisture all red areas together contribute. And what kind of physical meaning do the blue values over the Pacific have?

1029-17-19 incomprehensible sentence

1029-10-12 If you look at Fig. 5 in the paper by van der Ent and Savenije (2013), you will see that they got exactly the same results, which should clearly be mentioned. Moreover, that paper did relevant ENSO analysis as well which should be referred to in Section 3.2.

1029-14 Besides the study by (Bosilovich and Chern, 2006), other studies seem relevant here as well (Dirmeyer et al., 2009; Spracklen et al., 2012; van der Ent and

C35

Savenije, 2013)

1030-23-26 Incomprehensible sentence. Besides that the authors overlook again some relevant moisture tracking studies (Dirmeyer et al., 2009; van der Ent et al., 2010; Keys et al., 2012; Spracklen et al., 2012; Bagley et al., 2014).

1031-13 What is exactly meant here? The contour line of  $-0.4 \text{ mm day}^{-1}$  corresponds to how much of the Amazon's moisture?

1031-22 I completely disagree with this so-called unknown variability. According to me it is simple the ITCZ that is migrating and causes different wind patterns.

Section 3.2: Some nice plots are shown in this section, but it would be relevant to know how ENSO and its relation to moisture sources could be linked to drought as well. Now this is not investigated in depth.

1031-25-26 June/year 0 and May/year 1. This looks quite strange and I hope the authors can come up with a nicer way of expressing these periods.

1032-6 Why is Fig. 2b introduced only after Fig. 5?

1033-25-26 What is exactly the definition of the South Atlantic Convergence Zone?

Section 4 Summary: The summary says pretty much the same thing as the abstract. Why are there no discussions and conclusions sections?

1035-1-2 incomprehensible sentence

1035-20-24 I suggest the authors take that into account in their current work instead.

Fig. 2b and 4b: Is the "100 mm/day" really correct? This seems very unlikely. Why are not all indicated lines in the legend?

Fig. 1,3,5,6 Why is there some kind of technical experiment title above these figures?

## Technical corrections

C36

Only for the abstract I list all my spotted language and grammar mistakes, but there are many more throughout the rest of the paper.

- 1024-L6 Missing “the” before Amazon
- 1024-L7 Missing “The” before Northern
- 1024-L7 “Austral” and “Summer” should not be capitalized
- 1024-L9 Missing “the” before Amazon
- 1024-L10 “for” should be “to”
- 1024-L10 “over” should be “of”
- 1024-L10 “inter annual” should be “interannual”
- 1024-L9-10 “slightly” should be after “increases” instead
- 1024-L11-12 Missing “the” before NA and SA
- 1024-L14 “Austral” and “Autumn” should not be capitalized

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C37

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C38

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