

This paper concerns the equatorial basin of Congo River, immense and yet still very few studied by the scientific community. It aims essentially to describe and interpret the spatial and temporal variations of the moisture fluxes on the Congo basin and to identify their various geographic origins by a monthly time steps.

For this aim, this work deals with the period 1980-2010 and its methodologies are based on the exploitation of satellite data and the modeling of the various exchanges between land and atmosphere, thanks to the use of different models applied to virtual and field data set. According to wet and dry seasons and the latitudinal migration of the ITCZ, and using the Lagrangian model FLEXPART, the authors arrive to describe the external origins of the moisture inputs, as well as the importance of its internal recycling on the basin, where formidable convective exchanges (and storms) occur.

Other aim of this study is to determine the possible factors that inhibit or favour the transport of moisture from specific sources to the Congo River Basin.

### **Here are some questions/comments/input to improve/supply this document:**

This paper can be supplemented by a better presentation of the physiographic characteristics of the catchment, presenting in particular the specificities and originalities of the forest cover and mostly of the vast "Cuvette Centrale" which plays a decisive role in the exchanges with the atmosphere.

This paper need also to be enriched by a paragraph about the spatiotemporal variations of hydrological regimes inside the Congo basin, with particular attention on the Oubangui catchment. It is well known that the northern part of the basin, impact on the discharge cycle at Brazzaville/Kinshasa gauging station (you can complete with some appropriates references thank to the list added).

-Pa. 1 - Lig. 22: change "local evaporation or transpiration" by "local evaporation and/or transpiration"

-Pa. 2 - Lig. 28: change (also known as the Zaire) by (also known as the Zaire during at one time)

-Pa. 3 - Lig. 33: complete "Nevertheless, satellite data show a widespread decline in greenness in the northern Congolese forest over the past decade, which is generally consistent with decreases in rainfall, terrestrial water storage, and other related aspects (Zhou et al., 2014)

by,

"Nevertheless, satellite data show a widespread decline in greenness in the northern Congolese forest over the past decade, which is generally consistent with decreases in rainfall, terrestrial water storage, and other related aspects (Zhou et al., 2014, *please complete with some others appropriates references in the list added*), like hydrological regimes (*please complete with some appropriates references in the list added*)."

Pa. 6 – "The mean annual discharge of the Congo River is 38617.4 m<sup>3</sup> s<sup>-1</sup>, as calculated from the GRDC monthly streamflow values registered at the Kinshasa-Brazzaville gauging station"

→ here, it is necessary to specify during the 1980-2010 study period)

→ explain why the choose of this period and what about its representativeness on the entire secular chronic of hydro-pluviometric data ?

- pa. 5 lig. 26: You can completed and illustred your description of the evolution of the global change in the Congo basin, using the different studies and data base about the rainfall and hydrological regime during the last century (see *references list added* and the SIEREM and ORE-Hybam site) → <http://www.hydrosociences.fr/sierem/> and [www.ore-hybam.org](http://www.ore-hybam.org)

-In § 3.1 and Fig. 2: why do you not used the monthly in situ rainfall data in the Congo Basin available during one century on the link ([https://www.researchgate.net/publication/312383745\\_Monthly\\_rainfall\\_gridded\\_dataset\\_for\\_Africa\\_for\\_the\\_period\\_1970-1979\\_at\\_the\\_half\\_a\\_square\\_degree\\_interpolation\\_Inverse\\_Distance\\_Weighted](https://www.researchgate.net/publication/312383745_Monthly_rainfall_gridded_dataset_for_Africa_for_the_period_1970-1979_at_the_half_a_square_degree_interpolation_Inverse_Distance_Weighted)). This data base seems more complete than the CRU?

-Fig. 1: Given its importance in Congo basin's water balances, I suggest to place the contour of the "Cuvette Centrale".

-Fig. 15: can be enlightened and commented thanks to the study of the evolution of annual and monthly discharges of the more important right bank tributaries like Oubangui and Sangha river (in Laraque et al., 2013). The authors can also find more "field" explanations in someone of the others reference I communicate for them mainly about the special role of the "Cuvette Centrale" partially or totally flooded depending of the hydropluviometric cycle within the Congo Basin.

-Pa. 15- Lig. 26: this sentence "For 1995, the anomalies are negative in the east and north of the basin", don't seems to corresponds to the Fig 15 (year 1995). I think necessary to change "east" by "west".

-Pa. 15 - Lig. 31: It is not exact to write "river discharge in the basin", when only the discharges used come from Kinshasa gauging station, because even if this station controls almost all the catchment, its regime is not representative of the spatial variations of the hydrological cycles of every tributaries in this basin. *Please consult the references list I give to you.*

### **Others comments:**

-Why the authors don't write anything about the Hadley cells and Walker circulation?

-In the document, in many case it is necessary to change runoff by streamflow or river discharge

-I don't think the title clearly reflect the contents of the paper, which relates more with the fluxes and exchanges budget of moisture in the atmosphere of Congo basin? But this title could be preserved if the author takes more account of the hydrological characteristics and particularities of this basin, as advised in my comments.

#### **In conclusion:**

-The authors' approaches seem to converge with those of some of the works cited in the reference added list.

-It would be interesting to realize more links with the existing analyzes of some hydrological cycles and their evolutions during a century since they are the "mirror" of climate and land use changes that affect their sub-basins differently, as the author points out in § 1.1.

I invit the authors to consult these papers which can give some complementaries "in situ" explanations to their results and conclusions.

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1. Does the paper address relevant scientific questions within the scope of ESD?  
Yes
2. Does the paper present novel concepts, ideas, tools, or data?  
Yes
3. Are substantial conclusions reached?  
Yes
4. Are the scientific methods and assumptions valid and clearly outlined?  
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5. Are the results sufficient to support the interpretations and conclusions?  
Yes
6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)?
7. I don't understand the question?
8. Do the authors give proper credit to related work and clearly indicate their own new/original contribution?  
Yes
9. Does the title clearly reflect the contents of the paper?  
I don't think the title clearly reflect the contents of the paper, which relates more with the fluxes and exchanges budget of moisture in the atmosphere of Congo basin? But this title could be preserved if the author takes more account of the hydrological characteristics and particularities of this basin, as advised in my comments.
10. Does the abstract provide a concise and complete summary?  
Yes
11. Is the overall presentation well structured and clear?  
Yes
12. Is the language fluent and precise?  
I think so. It is not my language.
13. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used?  
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