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Atmospheric Chemistry and Physics Discussions

ACPD

11, C5889–C5892, 2011

Interactive Comment

Interactive comment on "Global precipitation response to changing external forcings since 1870" *by* A. Bichet et al.

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We would like to thank the reviewer for his in depth reading and understanding of the manuscript. All the comment have been considered and will be change to improve the manuscript. We also thank the review for raising important questions in the discussion part of the manuscript (points 6-8), that led to the reformulation of a paragraph. See replies to all comments below.

Major comments:

1. (Fourth paragraph of section 2.1): Description of sensitivity experiments. In the CTRL runs, all the forcings (solar irradiance, GHGs, AEs, and SSTs) are time varying. However, in the sensitivity experiments, there is no description about how to treat

the solar irradiance. The authors should exactly describe the details of the sensitivity experiment settings. The referee is correct, see reply to Referee 1, points 1 and 2.

2. (Section 2.3): When comparing observed against simulated precipitation, how the authors handled the simulated data? The authors should explain this. The referee is correct, see reply to Referee 1, point 4.

3. (page 9383, lines 22-23): It' not clear whether the "surface temperature" in the model is the surface air temperature at the lowest model level or the surface skin temperature at the model land surface. Please clarify. In the former case, the authors should mention rough height of the level. In the model, surface temperatures correspond to the surface "skin" temperatures, not 2 meters temperatures. It will be precised in the revised manuscript.

4. (page 9386, line 9): We cannot see that "up to 0.4 degree warmer in 2000" from the current version of Fig.6. The authors should re-draw the figure with the ordinate ranging from -0.5 to 1.0, for example. The referee is correct, the axis on Fig. 6 will be changed to -0.5 to 1.0

5. (page 9386, lines 24-27): Could you explain why the authors think so? Are there any reference papers about this? The referee is correct, see reply to Referee 1, point 8.

6. (Page 9388, lines 9-12): I don't agree with this explanation: the global land net surface radiation is affected by the air advected from the oceans, because the advected moisture influences the atmospheric radiation. We agree, the global land net surface radiation is affected by the air advected from the oceans. therefore, this sentence will be reformulated in the revised manuscript as follow: "This suggests that the remaining 24% are explained by changes in the Bowen ratio. A change in the Bowen ratio can be caused by a change in the net surface radiation, and/or soil moisture, and/or air moisture holding capacity (Gu et al., 2006)."

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7. (page 9389, lines 19-25): Could you explain the reason why "warmer transient SSTs no longer enhance the net advection of moisture from the oceans" despite of the fact that the SSTs are still warming? We think that the relation between global SSTs and land precipitation is not straightforward, and that changes in the atmospheric circulation are partly responsible. The paragraph from p.9389, line 9 to p. 9389, line 25 will be reformulated as follow:

"While we see that the decadal variation of the global land precipitation is forced by SSTs (Fig. 4), the relation is not straightforward. The red curve from Fig. 7 shows that SSTs increase the global land precipitation before 1960, decrease it between 1960 and 1990, and increase it after 1990 (aerosols emission are kept constant in AEC, and TSI, combined with greenhouse gases have a small increasing impact on the global land precipitation (green curve)). Nevertheless, Fig. 1e shows that global SSTs increase from 1910 to 1940, stabilize from 1940 to 1980, and increase after 1980. On the other hand, the El Nino Southern Oscillation (ENSO) index is low between 1940 to 1960, and increases after 1960 (not shown). In line with previous studies (Gu et al., 2007; Trenberth et al., 2007), Fig. 5 suggests that low (high) ENSO index are associated with high (low) global land precipitation. Therefore, we suggest that after 1960, the increasing frequency of El NINO events may have reduced the global land precipitation via their associated changes in atmospheric circulation, as suggested by the evolution of P-E (Fig. 8b). Note that changes in air moisture holding capacity can also influence the impact of SSTs on global land precipitation and P-E. Finally, Fig. 9a shows that the SSTs affect mostly the tropical precipitation."

8. (page 9390, lines 14-19): The authors should mention this more carefully. If the absorbing aerosols exist in the lower altitude, then it can cause convection. I suspect that increases in convective precipitation in the tropical Africa are the case of this situation. We agree with the referee, this sentenced will be reformulated in the revised manuscript as follow: "Especially absorbing aerosols, higher up in the troposphere (Koch and Genio, 2010) can reduce convection ...".

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Interactive Discussion

Discussion Paper

9. (page 9393, line 15): ICCP -> IPCC The referee is correct, it will be changed in the revised manuscript

References: Gu L, Meyers, T., Pallardy, S.G., Hanson, P. J., Yang, B., Heuer, M. Hosman, K.P., Riggs, J.S., Sluss, D., Wullschleger, S.D.: Direct and indirect effects of atmospheric conditions and soil moisture on surface energy partitioning revealed by a prolonged drought at a temperate forest site, J. Geophys. Res., 111, D16102, doi: 10.1029/2006JD007161, 2006.

Gu, G., Adler, R.F., Huffman, G.J., Curtis, S.: Tropical Rainfall Variability on Interannual-to-Interdecadal and Longer Time Scales Derived from the GPCP Monthly Product, J. Climate., 20, 4033-4046, 2007.

Koch, D. and Del Genio, A.D.: Black carbon semi-direct effects on cloud cover: review and synthesis, Atmos. Chem. Phys., 10, 7685-7696, 2010.

Trenberth, K.E. And Dai, A.: Effects of Mount Pinatubo volcanic eruption on the hydrological cycle as an analog of geoengineering. Geophys. Res. Let., 34, L15702, doi:10.1029/2007GL030524, 2007.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 9375, 2011.

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