

Interactive comment on “A global perspective on atmospheric blocking using GPS radio occultation – one decade of observations” by Lukas Brunner and Andrea K. Steiner

Anonymous Referee #1

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General comments: The paper is well-structured, making it easy for the reader to follow. Title and abstract are excellent as they reflect the content of the paper quite well. Figures have a high quality. The results are represented well, however, a detailed comparison to results of previous studies is missing, especially in the summary and conclusion part. In addition, there are some statements that should be clarified. The paper is written in a clear and comprehensible wording, however, some technical corrections are necessary.

Specific comments:

1. Page 4, section 2.2: Please comment your choice. Why did you use those three

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reanalyses?

2. Page 5, line 24-27: Why did you define blocked days only for selected regions? Please add a comment (pointing to Sect. 4.2).

3. Page 6, line 30: Do you have a possible explanation why the differences are larger near the maximum in the Euro-Atlantic blocking region?

4. Page 7, line 1-7: Please make clearer that the underestimation of the RO data (mentioned in the previous paragraph) is also visible in the time series of the SH blocking frequency.

5. Page 7, line 8-14: There were blocking events which lasted more than 30 days. One important example is the blocking event in summer 2010 which caused a mega heat wave in Russia and floods in Pakistan (e.g. Trenberth and Fasullo, 2012; Barriopedro et al., 2011; Hong et al., 2011). Since blockings show fluctuations in intensity during their life-cycle, you do not always get a continuous blocking signal with the common blocking indices. Thus, you are right, since you talk about “continuous” blocked days. However, you should try to make this point clearer. Some readers could wonder why such high impact blockings like the Russia heat wave block do not appear in your ranking.

6. Page 7, line 10-12: Are these blockings related to high impact weather events?

7. Page 10, line 5: This is of high relevance and points to the limit of the used data set/method. Emphasize this more strongly and point to possible consequences. This could be added somewhere in the next paragraph (line 8-12). Once again, the Euro-Russian summer block (2010) could be mentioned here (see comment 5.).

8. Page 13, line 35: Could you explain why?

9. Page 16, line 10: What about the signals at 850 hPa?

10. Page 16, line 29: Do you have an explanation why the largest anomalies are found at lower levels in the North Pacific region?

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11. Page 18, section 5: Please compare your results with existing literature. It is not clear to the reader if your findings about the vertical structure of temperature and moisture anomalies are completely new. Does your findings (dis)agree with results from other studies?

Technical corrections:

12. Page 1, line 1: "high pressure" instead of "high-pressure".
13. Page 1, line 11: "equatorward" instead of "equator-ward".
14. Page 1, line 12: "anticyclonic" instead of "anti-cyclonic".
15. Page 2, line 1: Comma after "(NH)".
16. Page 2, line 7: Comma after "(SH)".
17. Page 2, line 7: Delete "about".
18. Page 2, line 9: Replace "Also" with (e.g.) "Furthermore".
19. Page 2, line 14: Please rephrase the sentence. Maybe replace one of the "and"s with "as well as".
20. Page 2, line 17: Comma after "Hence".
21. Page 2, line 24: Replace "Also" with "In addition".
22. Page 2, line 32: Comma after "Sect. 2".
23. Page 2, line 33: "Sect. 3" instead of "Section 3".
24. Page 5, line 9: Comma after "summer".
25. Page 5, line 9: "poleward" instead of "pole-ward".
26. Page 5, line 10: "equatorward" instead of "equator-ward".
27. Page 5, line 14: Replace "Simply speaking,..." with (e.g.) "To put it simple,...".

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28. Page 5, line 21: Replace "too small" with "smaller".
29. Page 5, line 21: Comma after "step".
30. Page 6, line 22: Comma after "In the Euro-Atlantic region".
31. Page 6, line 27: Comma after "In the North Pacific region".
32. Page 7, line 4: Comma after "Pacific region".
33. Page 7, line 6: Comma after "150°W".
34. Page 7, line 12: Comma after "SH".
35. Page 7, line 13: Comma after "There".
36. Page 7, line 18: Reference after "ERA-Interim" to Figure 1.
37. Page 10, line 1: Comma after "analysis".
38. Page 10, line 6: Comma after "winter".
39. Page 10, line 17: Comma after "SH".
40. Page 10, line 21: "anticyclone" instead of "anti-cyclones".
41. Page 10, line 23: Comma after "SH".
42. Page 13, line 6: Add "(Fig. 5, left)" after "300 K".
43. Page 13, line 6: Delete "about" before "300 K".
44. Page 13, line 7: Delete "about" before "500 K".
45. Page 13, line 7: Replace "At lower pressures..." with "At upper levels,...".
46. Page 13, line 8: Delete "about" before "300 K" and add a comma.
47. Page 13, line 9: Delete "Higher up" and add comma after "stratosphere".
48. Page 13, line 10: Replace "Further up,..." with (e.g.) "At higher altitudes,...".

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49. Page 13, line 14: Comma after “In the troposphere”.
50. Page 13, line: 15: Add “left” after “Fig. 6”.
51. Page 13, line 16: “anticyclonic” instead of “anti-cyclonic”.
52. Page 13, line 16: “high pressure” instead of “high-pressure”.
53. Page 13, line 26: Delete commas around “generally” and add one after “stratosphere”.
54. Page 13, line 27: Replace “signal” with (e.g.) “influence”.
55. Page 13, line 30: Add “(Fig. 6, left) after “summer”.
56. Page 13, line 33: Add “(Fig. 6, right)” after “troposphere”.
57. Page 13, line 35: Reduce “they appear higher up at about 200 hPa in summer” to “they appear at 200 hPa in summer”.
58. Page 16, line 1: Add “left” after “Fig. 7”.
59. Page 16, line 5: Comma after “stratosphere”.
60. Page 16, line 7: Delete “about” before “500 hPa”.
61. Page 16, line 8: Add “(Fig. 7, right)” after “lower pressures”.
62. Page 16, line 8: Comma after “At 270 hPa and 200 hPa”.
63. Page 16, line 9: Comma after “Above 200 hPa”.
64. Page 16, line 11: Delete comma after “both”.
65. Page 16, line 13: Add “(Fig. 8, left)” after “part of the troposphere”.
66. Page 16, line 14: Comma after “tropopause”.
67. Page 16, line 15: Delete “about” before “200 hPa”.

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68. Page 16, line 18: Add “regions” before “downstream”.
69. Page 16, line 20: Add “(Fig. 8, right)” after “NH”.
70. Page 16, line 20: Comma after “troposphere”.
71. Page 16, line 22: Comma after “stratosphere”.
72. Page 16, line 27: Delete “about” before “200 hPa”.
73. Page 16, line 28: Delete “higher up”.
74. Page 18, line 6: Comma after “(SH)”.
75. Page 18, line 9: Comma after “During extended winter”.
76. Page 18, line 10: Replace “Above about 500 hPa...” with “Above 500 hPa,...”.
77. Page 18, line 11: Delete “about” before “270 hPa”.
78. Page 18, line 12: Delete “about” before “200 hPa”.
79. Page 18, line 12: Replace “Higher up...” with “Above 200 hPa,...”.
80. Page 18, line 13: Comma after “troposphere”.
81. Page 18, line 14: “anticyclonic” instead of “anti-cyclonic”.
82. Page 18, line 14: Comma after “stratosphere”.
83. Page 18, line 15: “equatorward” instead of “equator-ward”.
84. Page 18, line 19: “equatorward” instead of “equator-ward”.
85. Page 18, line 21: Delete “about” before “200 hPa”.