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Global Trends in the Occurrence and Characteristics of Block-ing Anticylones using Sen Innovative Trend Analysis

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Abstract: Atmospheric blocking plays an important role in modulating mid-latitude weather, in particular in the Northern Hemisphere (NH). Trend analysis of atmospheric blocking for both hemispheres by using Şen's Innovative Trend Analysis (ITA) is performed in this study. The blocking data archived in University of Missouri covers period of 1968 – 2019 for NH and 1970 – 2019 for Southern Hemisphere is used in the study. Block occurrence, duration and blocking intensity (BI) is analysed by classifying the NH (SH) into three groups according to the preferred blocking locations: Atlantic, Pacific and Continental (Atlantic, Pacific and Indian). In NH, blocking intensity showed mixed results. It has decreasing trend for the entire hemisphere and Atlantic Region whilst different trend for different BI clusters. For blocking numbers and duration, the entire hemisphere and regions showed increasing trends. These increasing trend values are also statistically significant. In SH, blocking intensity shows a decreasing trend for low cluster whilst medium and high cluster for the entire hemisphere. Block duration has an increasing trend for the entire SH. Block numbers have increasing trend except one point in low cluster. Blocking characteristics show different trends for different preferred blocking locations. Increasing trends of blocking numbers for overall SH and Pacific region are statistically significant at 95% level. Increasing trends of blocking duration for overall SH, Atlantic and Pacific region are statistically significant at 90%, 95% and 95% level, respectively.

Keywords: Block Intensity; block duration; blocking trends; climatology, blocking anticyclones

Author Contributions: Conceptualization, B.E; methodology, B.E. and A.R.L.; software, both; validation, both; formal analysis, B.E.; investigation, both; resources, both; data curation, both; writing—original draft preparation, A.R.L.; writing—review and editing, both; visualization, B.E.; supervision, N/A; project administration, both; funding acquisition, N/A. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest: The authors declare no conflict of interest

Appendix A

The appendix is an optional section that can contain details and data supplemental to the main text—for example, explanations of experimental details that would disrupt the flow of the main text but nonetheless remain crucial to understanding and reproducing the research shown; figures of replicates for experiments of which representative data is shown in the main text can be added here if brief, or as Supplementary data. Mathematical proofs of results not central to the paper can be added as an appendix.

Appendix B

All appendix sections must be cited in the main text. In the appendices, Figures, Tables, etc. should be labeled starting with "A"—e.g., Figure A1, Figure A2, etc.

References

References must be numbered in order of appearance in the text (including citations in tables and legends) and listed individually at the end of the manuscript. We recommend preparing the references with a bibliography software package, such as EndNote, ReferenceManager or Zotero to avoid typing mistakes and duplicated references. Include the digital object identifier (DOI) for all references where available.

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In the text, reference numbers should be placed in square brackets [ ] and placed before the punctuation; for example [1], [1–3] or [1,3]. For embedded citations in the text with pagination, use both parentheses and brackets to indicate the reference number and page numbers; for example [5] (p. 10), or [6] (pp. 101–105).

1. Author 1, A.B.; Author 2, C.D. Title of the article. *Abbreviated Journal Name* **Year**, *Volume*, page range.
2. Author 1, A.; Author 2, B. Title of the chapter. In *Book Title*, 2nd ed.; Editor 1, A., Editor 2, B., Eds.; Publisher: Publisher Location, Country, 2007; Volume 3, pp. 154–196.
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