

Supporting Information for "Dynamical differences between short and long blocks in the Northern Hemisphere"

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Introduction

The first section aims at describing the three indices used to quantify the importance of a strong, maintained jet to the south of blocks.

The second section describes the index developed to quantify the link between the location of the transient forcing of the blocking high and the blocking duration.

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Figure S1 compares the spatial distribution of all the detected blocks with that of short long and very long blocks in order to better understand blocking spatial distribution anomalies. Figure S2 aims at describing anticyclonic and cyclonic blocks spatial distribution.

Description of the three jet indices

Indices evaluating the impact of the location of the synoptic eddy forcing on the jet:

Two indices were constructed to show that the reinforcement of the jet to the south of the block by synoptic eddies was associated with longer blocks. The first index aims at determining the impact of a reinforcement of the jet to the northeast of blocks by synoptic eddies on the duration of blocks, as observed during anticyclonic events (see Figure 4c) the second index aims at studying the impact of the reinforcement of the jet to the south of blocks by synoptic eddies on the duration of the blocks, as observed during cyclonic events (see Figure 4d). The two indices were computed as follows:

1. all 3222 blocking events were used
2. the meridional convergence of the momentum fluxes was projected on the U300.
3. this projection was averaged over the five first days of blocks.
4. this projection was then averaged to the northeast of the block (between 12° and 22° latitude and 0° and 30° longitude) for the first index and to the south of the block (between -12° and -22° latitude and 0° and 30° longitude) for the second index.
5. therefore each block is associated with one value for the first index and one value for the second index.

6. these two indices were then correlated with the array containing the duration of blocks. No correlation appeared between the block duration and the location of the synoptic reinforcement of the jet. This means that the reinforcement of the jet to the south of the block by synoptic eddies is not associated with longer blocks and that the reinforcement of the jet to the northeast of the block by synoptic eddies is not associated with shorter blocks.

Index evaluating the impact of a strong southern jet:

A third index was constructed to determine if a double jet with a much stronger southern branch favours long blocking. This index was computed as follows:

1. all 3222 blocking events were used
2. the U300 was averaged over two areas: to the north of the block where the jet is the strongest (14° to 24° latitude; -20° to 20° longitude) and to the south of the block where the jet is the strongest (-12° to -22° latitude; -20° to 20° longitude).
3. the difference between the southern and the northern averages was computed
4. this difference was then averaged over the five first days of the jet.
5. therefore each block is associated with one value for this third index.
6. this index was then correlated with the array containing the duration of blocks. No correlation appeared between the block duration and the presence of a particularly strong southern branch of the jet.

Description of the index measuring the transient eddy forcing on the blocking high

A fourth index was constructed to determine if divergent transient PV330K fluxes on the northern half of the high favour long blocks. This index was computed as follows:

1. all 3222 blocking events were used
2. the convergence of the PV330K fluxes was averaged over the northern half of the blocking high, where it is strongly negative during LVL blocks (4° to 18° latitude; -15° to 30° longitude).
3. this index was then averaged over the five first days of the jet.
4. therefore each block is associated with one value for this fourth index.
5. this index was then correlated with the array containing the duration of blocks. No correlation appeared between the block duration and a strong divergence of the PV330K fluxes over the northern half of the jet.

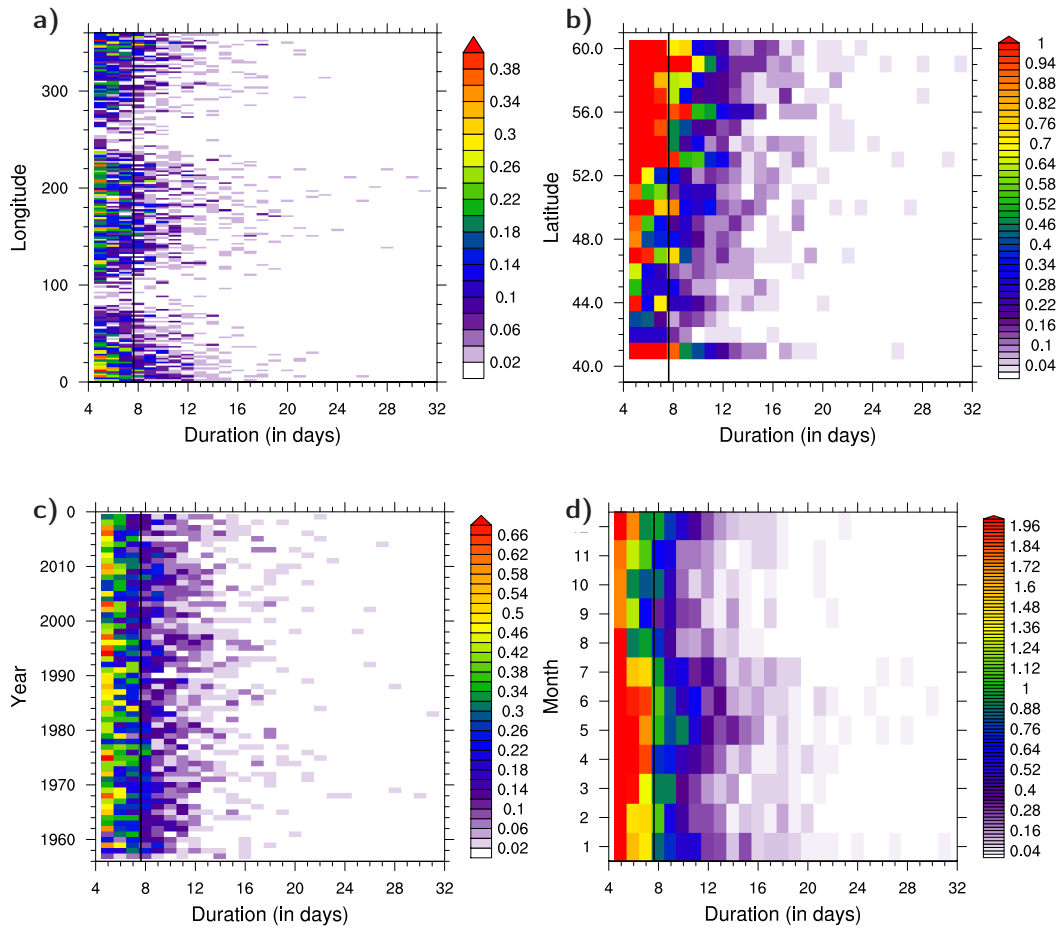


Figure S1. Two-dimensional probability density function of the number of blocks detected as a function of the duration and (a) the longitude, (b) the latitude, (c) the year, and (d) the month. Values are in percent. Combined ERA-40 and ERA-Interim data between 1957 and 2019 are used for this figure.

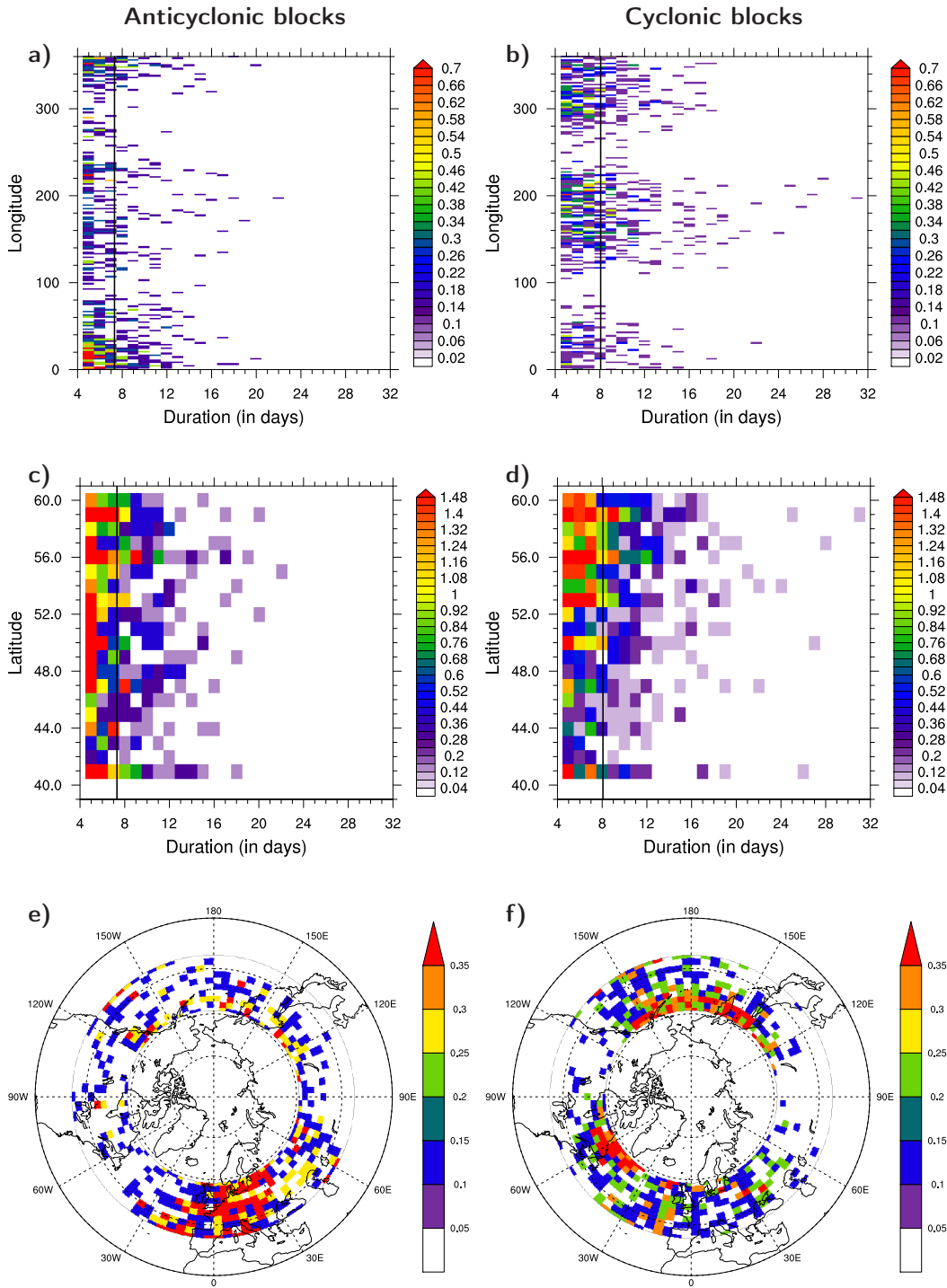


Figure S2. (a-b) Two-dimensional probability density function of (a) the number of anticyclonic blocks as a function of the longitude and the duration and (b) the number of cyclonic blocks as a function of the longitude and the duration. (c-d) As in panels (a-b) but for the latitude and the duration. (e-f) As in panels (a-b) but for the longitude and latitude. Values are in percent. Combined ERA-40 and ERA-Interim data between 1957 and 2019 are used for this figure.

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