Blocking in a perturbed physics ensemble of HadGEM3

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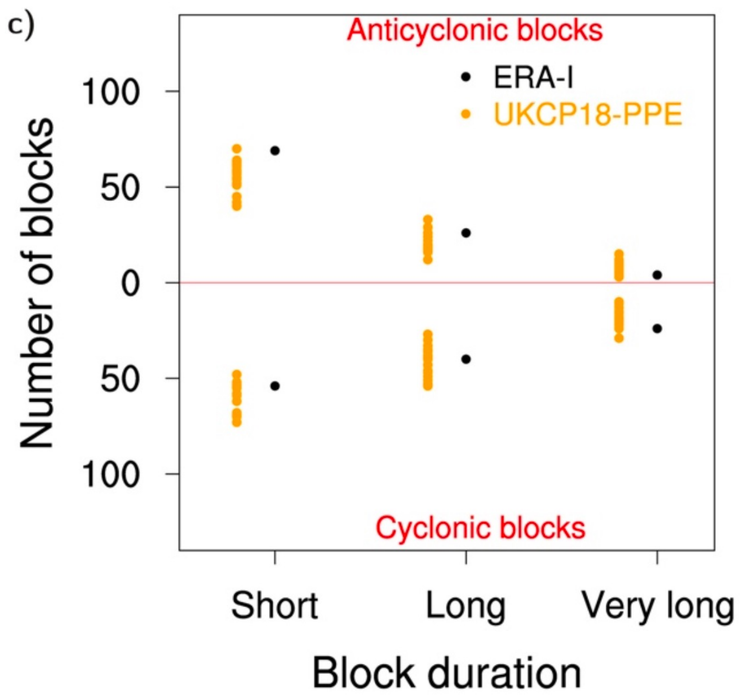
Cyclonic Rossby wave breaking favours long blocks

	All blocks	Short blocks	Long blocks	Very long blocks
$\frac{Number\ of\ cyclonic\ blocks}{Number\ of\ anticyclonic\ blocks}$	$\frac{908}{690} = 1.32$	$\frac{199}{232} = 0.86$	$\frac{151}{91} = 1.66$	$\frac{61}{29} = 2.10$

Masato Z500 blocking index; NH only; all months



HadGEM3 captures this mechanism for very persistent blocks well

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RESEARCH ARTICLE
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Dynamical Differences Between Short and Long Blocks in the Northern Hemisphere

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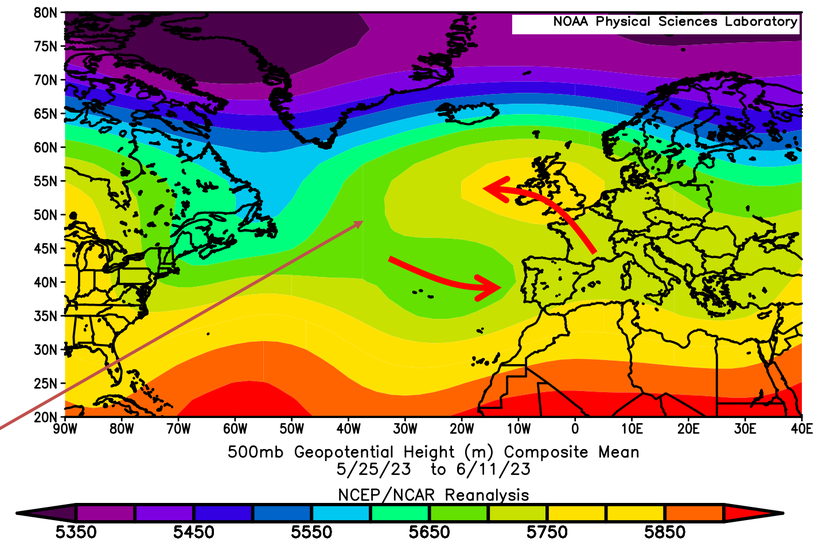
Key Points:

- Very persistent blocks are favored by cyclonic rather than anticyclonic Rossby wave breaking
- This difference in duration observed

Cyclonic

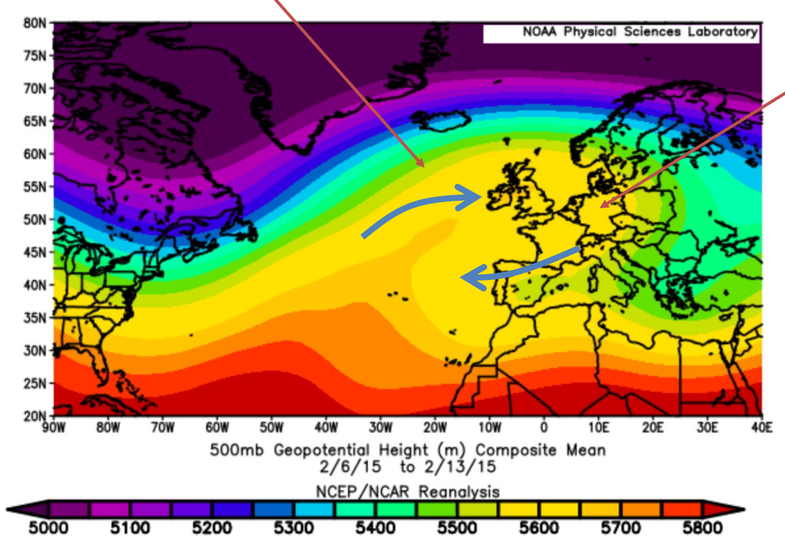


Diffluent jet encourages further wave-breaking here

-> well positioned to maintain the anticyclone on its upstream side, against the mean flow

Eddies propagate to the north along strong waveguide

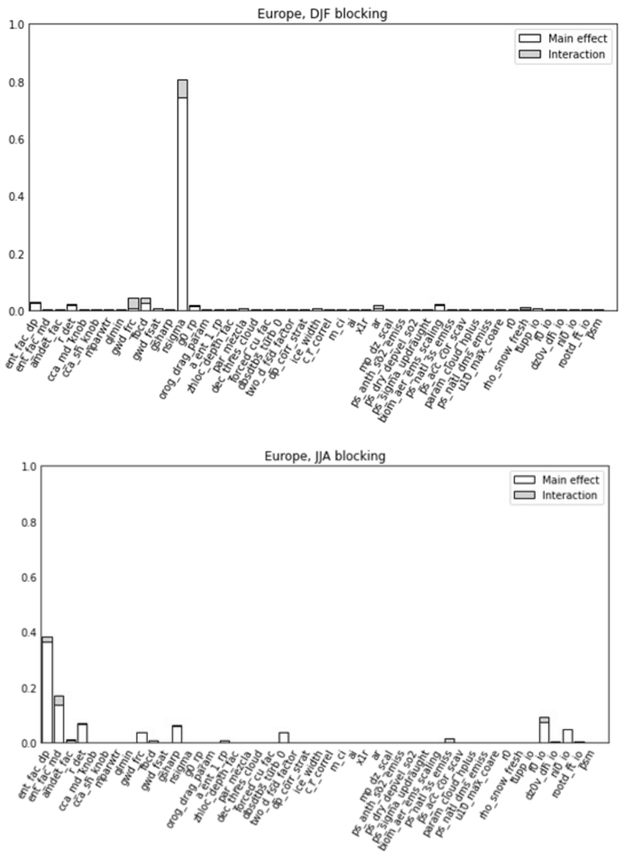
Anticyclonic



Then often break here, where it's less efficient for maintaining the high

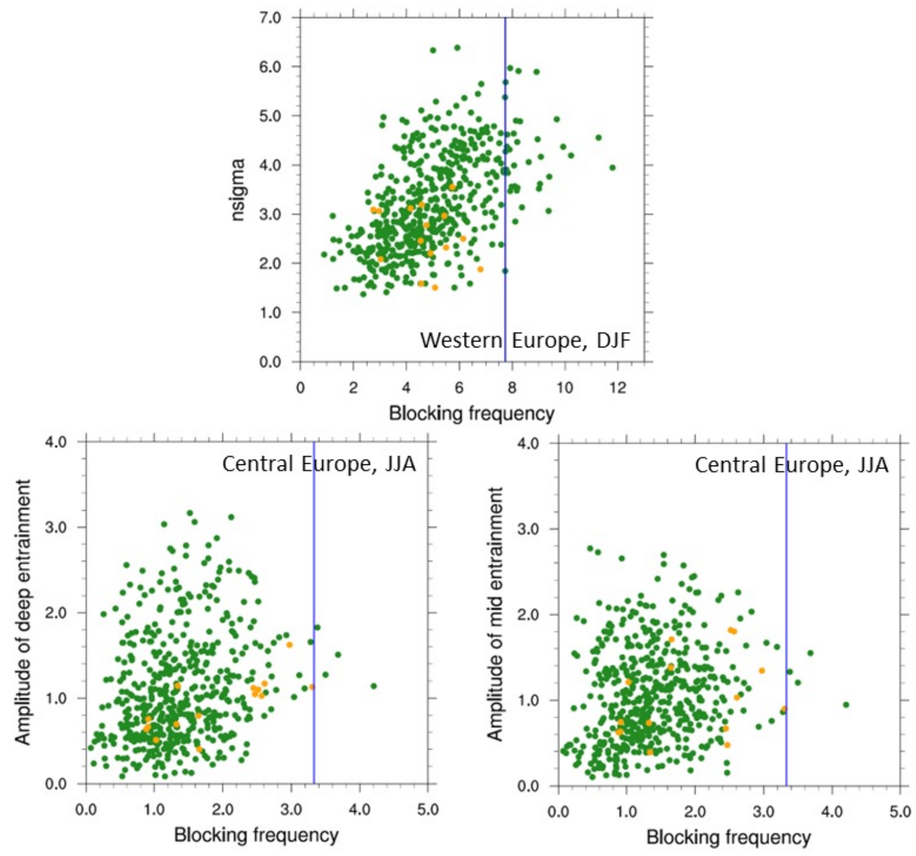
Sensitivity of European blocking to the physical parameters in the model

505 5-year atmosphere-only runs were performed varying 47 physical parameters in the model. In all these variations, only two sensitivities were found:



Winter blocking is only sensitive to *nsigma*, which controls the sensitivity of the gravity wave drag to sub-grid orographic variance.
-> No sensitivity to moist physics for example.

Summer blocking is only sensitive to convective entrainment parameters



Conclusion: The sensitivities reveal physical factors which affect blocking, but we can't fix blocking in this model just by tuning the parameters.