The Relationship Between the ITCZ and the Southern Hemispheric Eddy-Driven Jet

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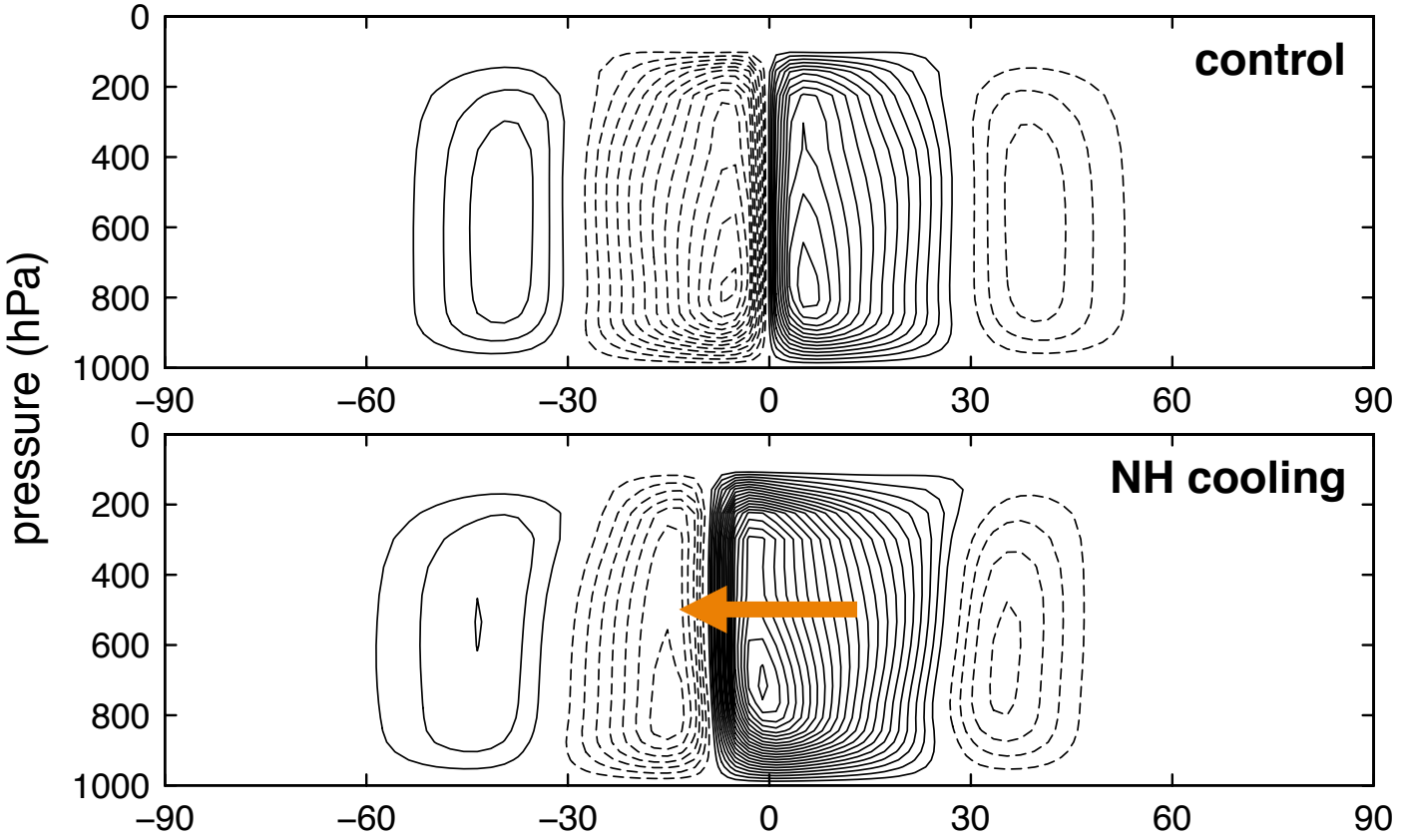
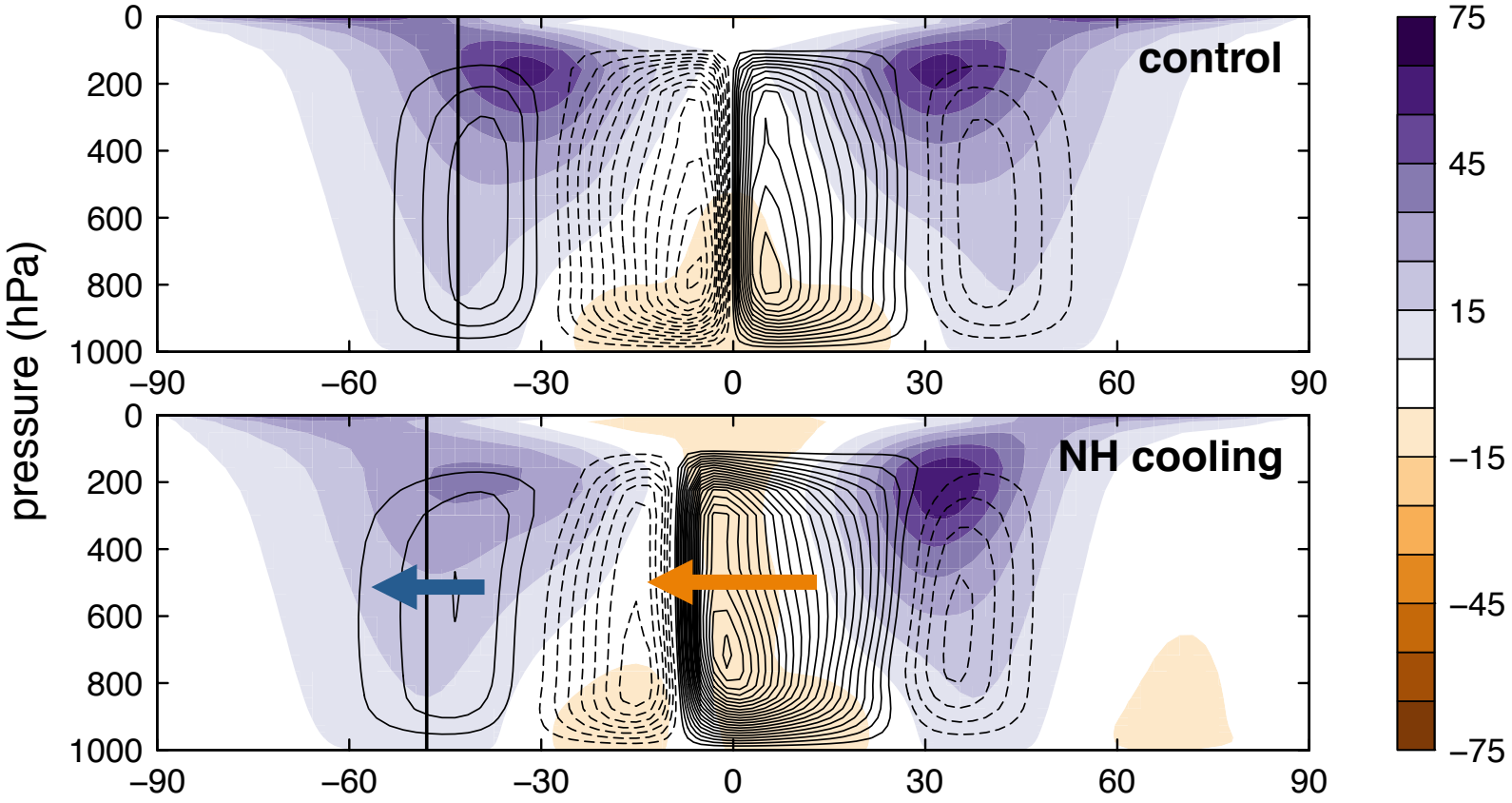
Aquaplanet GCM experiments



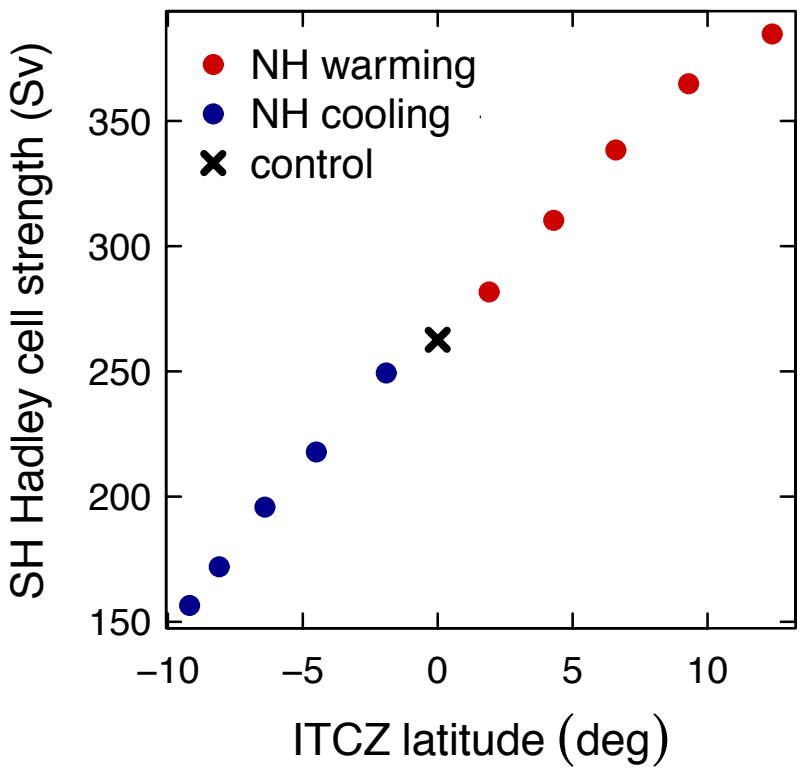
ITCZ shift (see e.g. Broccoli et al., 2006; Kang et al., 2008)

Aquaplanet GCM experiments



eddy-driven jet shift in the opposite hemisphere!

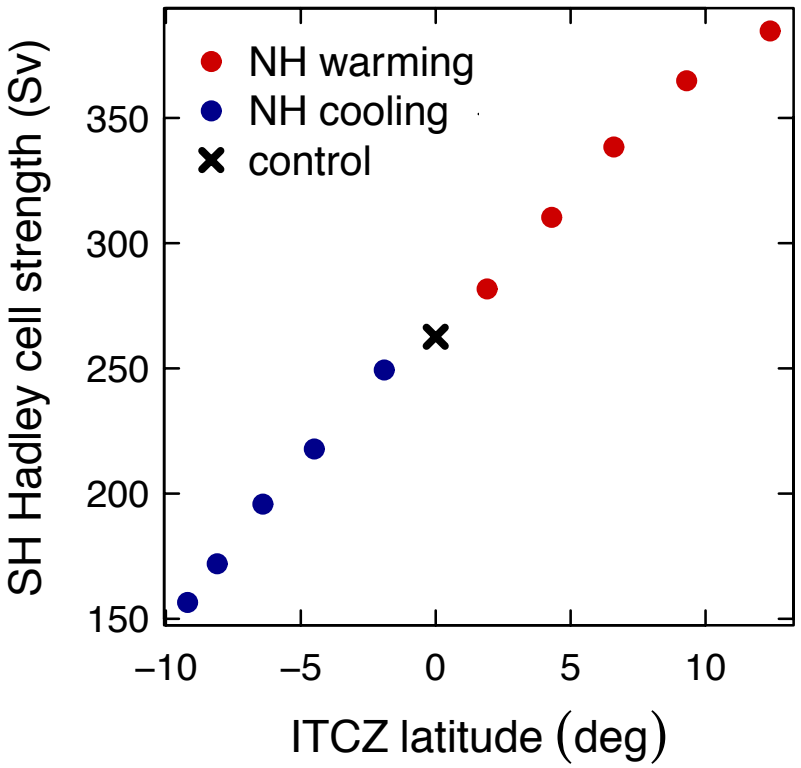
Shift of the ITCZ and SH jet

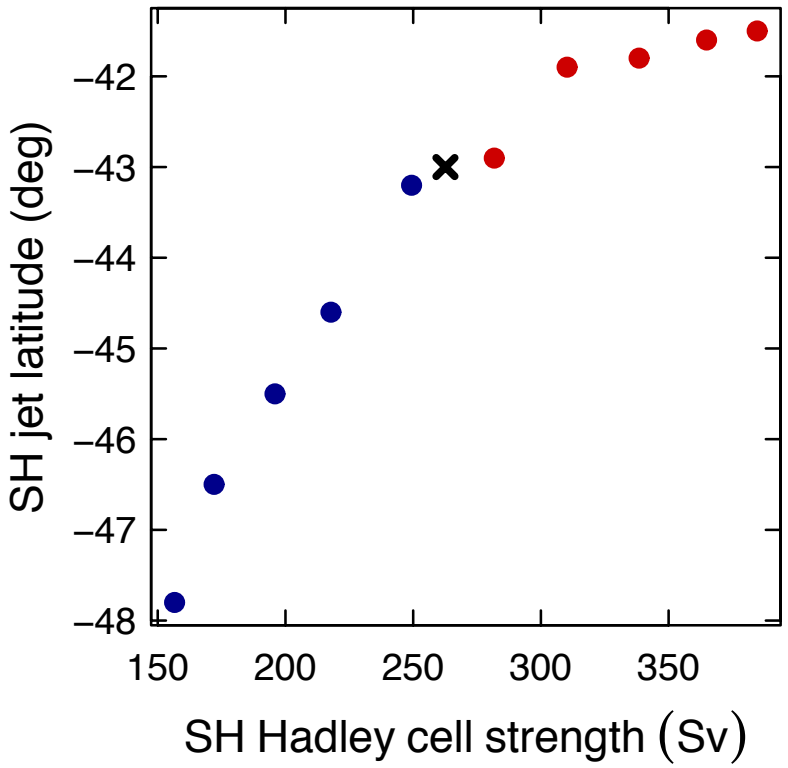


NH warming
→ **northward** ITCZ shift
→ **strengthening** of SH Hadley cell

NH cooling
→ **southward** ITCZ shift
→ **weakening** of SH HC

Shift of the ITCZ and SH jet

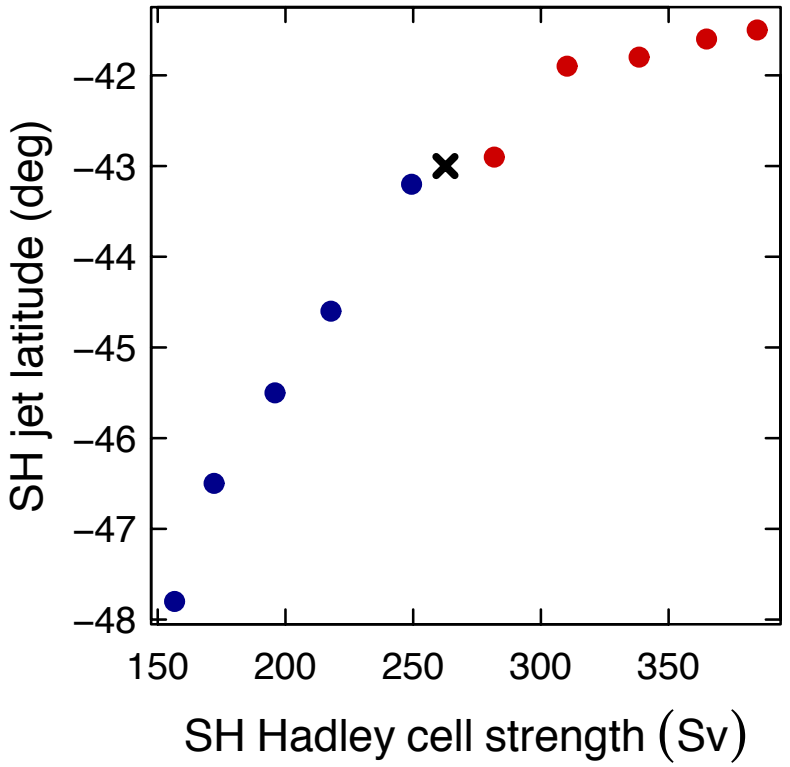




Shift of the ITCZ and SH jet

strengthening of SH Hadley cell
→ equatorward jet shift

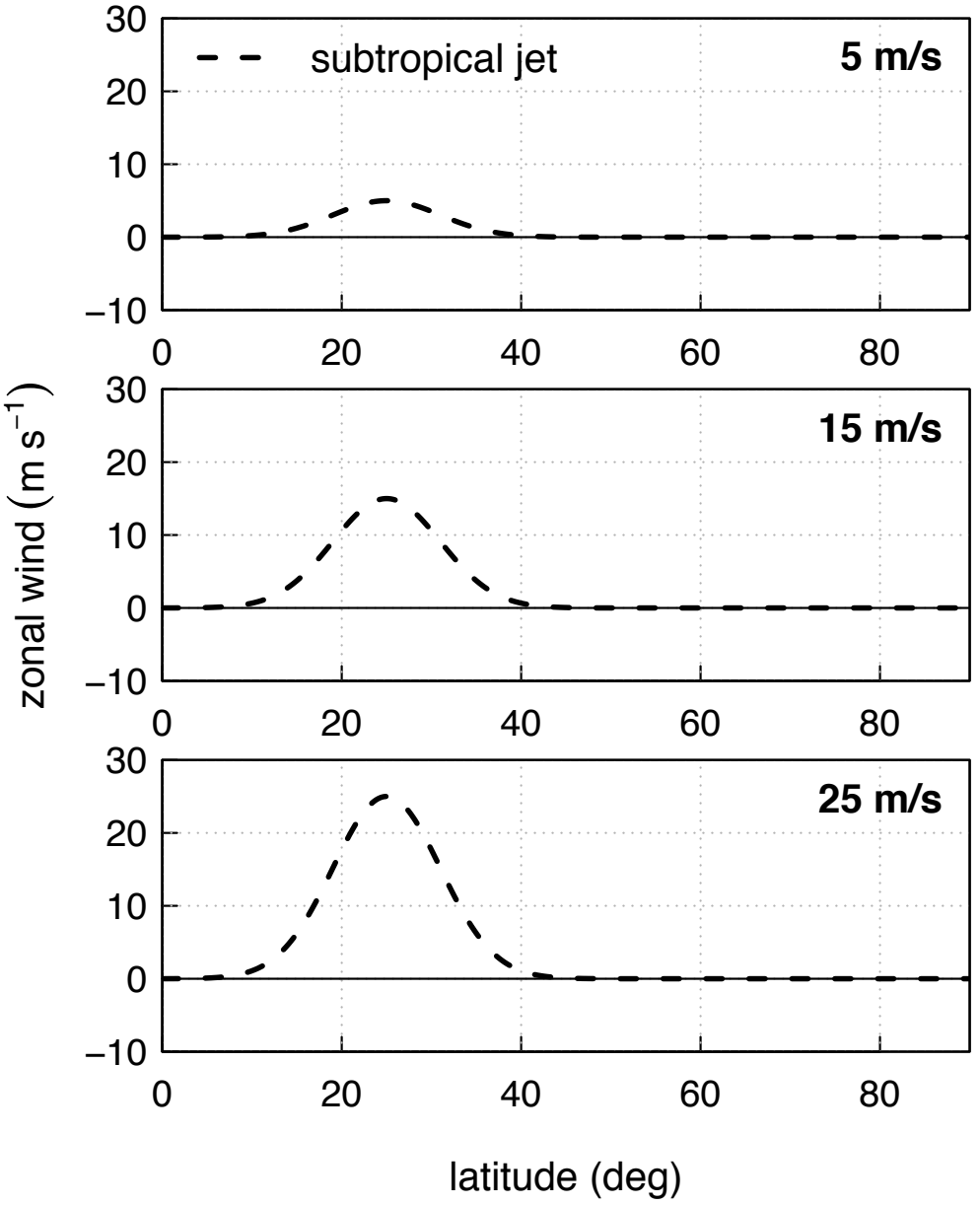
weakening of SH HC
→ poleward jet shift



what is the role of the change in **subtropical jet strength**?

Barotropic model experiments

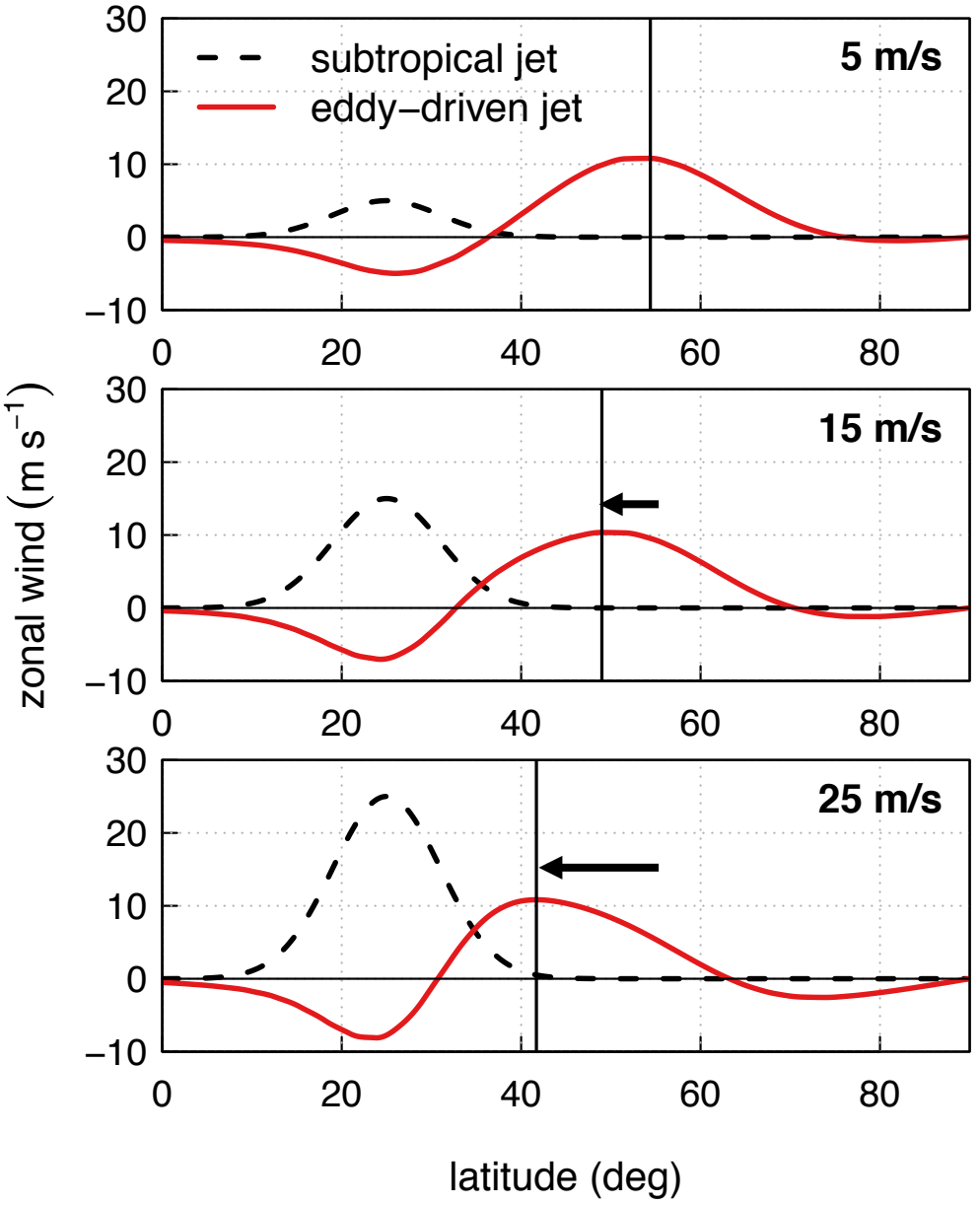
simulations with a **prescribed subtropical jet** of varying strength at **25° latitude**



Barotropic model experiments

simulations with a **prescribed subtropical jet** of varying strength at **25° latitude**

add **eddy stirring** at 50° latitude



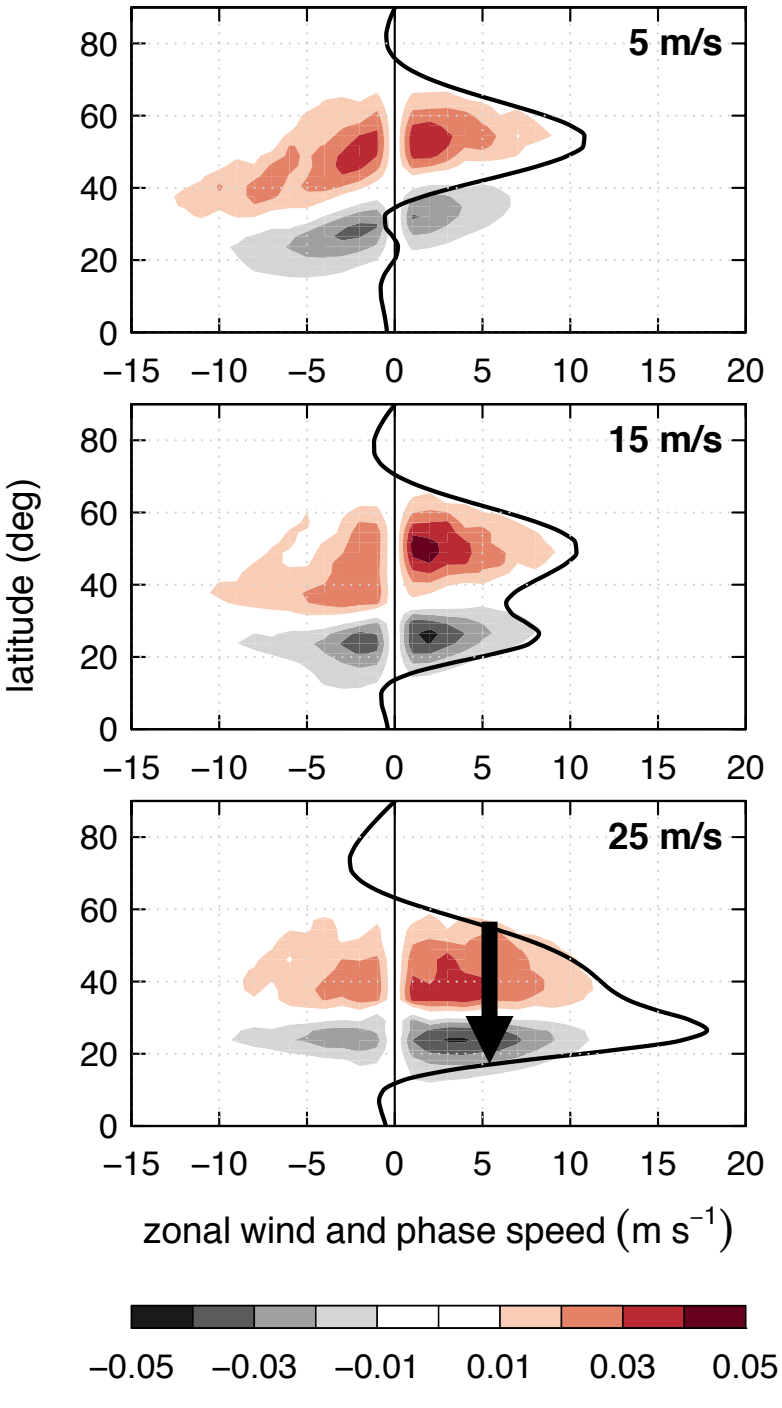
Phase speed spectra

eddy momentum flux power spectra

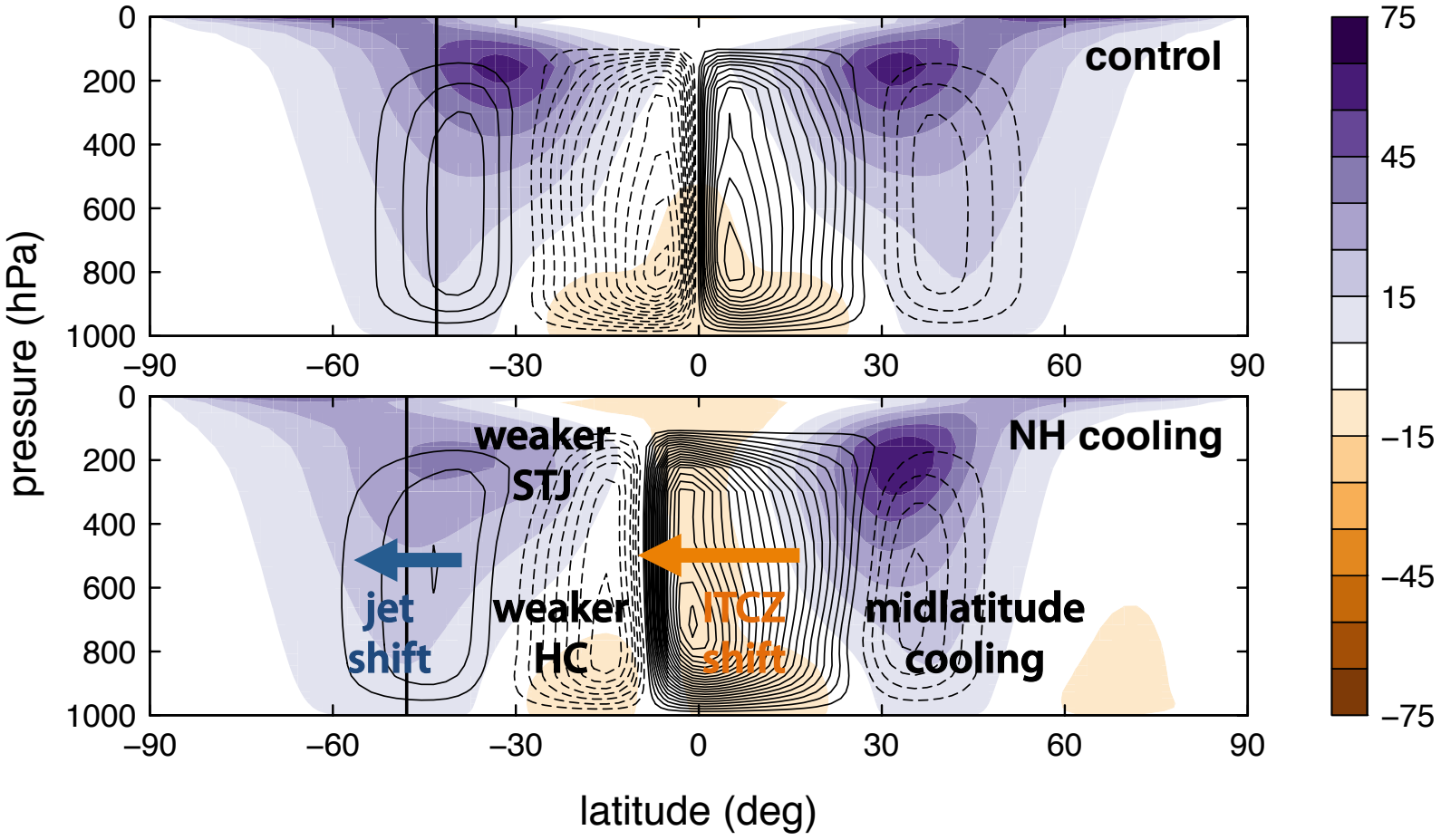
Subtropical jet strengthening

→ waves propagate deeper into tropics

→ **eddy momentum flux divergence and convergence shift equatorward** (especially for faster waves)

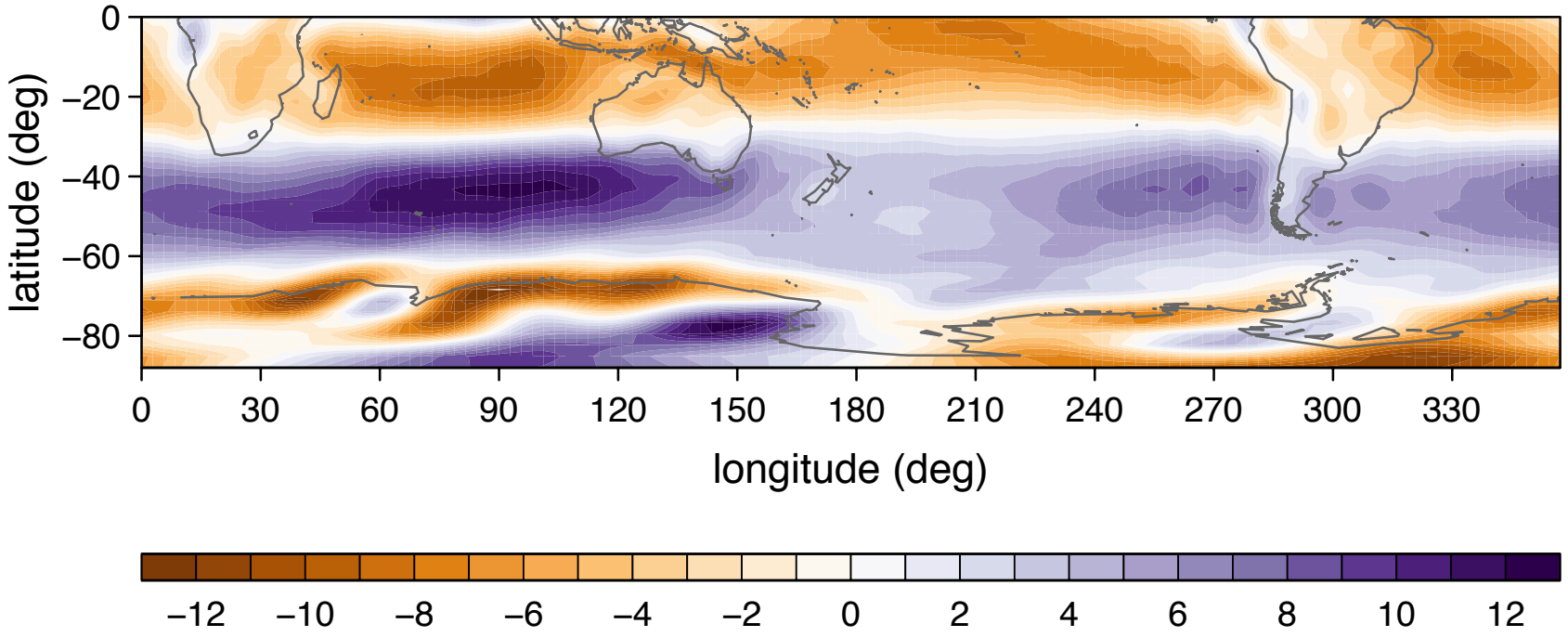


Summary of the mechanism



Full-geography ECHAM4.6 runs

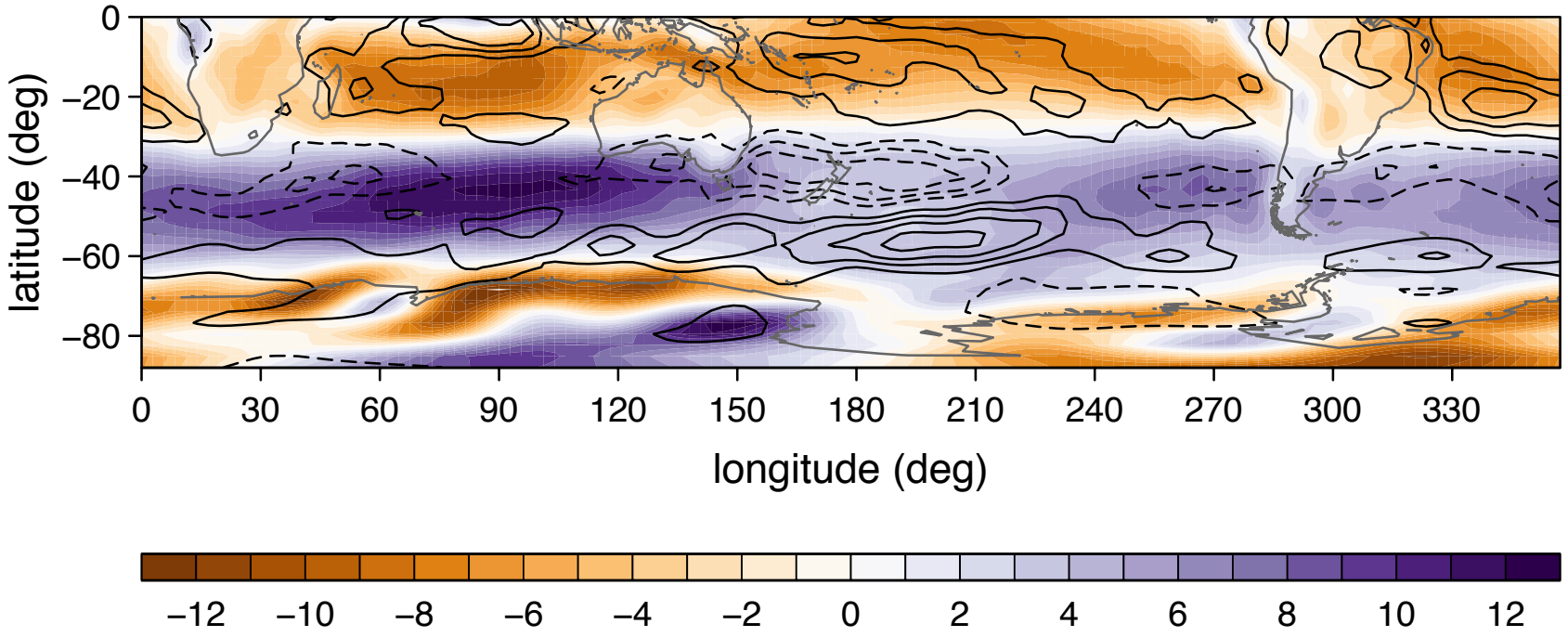
shading: **June-July-August** surface zonal wind climatology



Full-geography ECHAM4.6 runs

shading: **June-July-August** zonal wind climatology

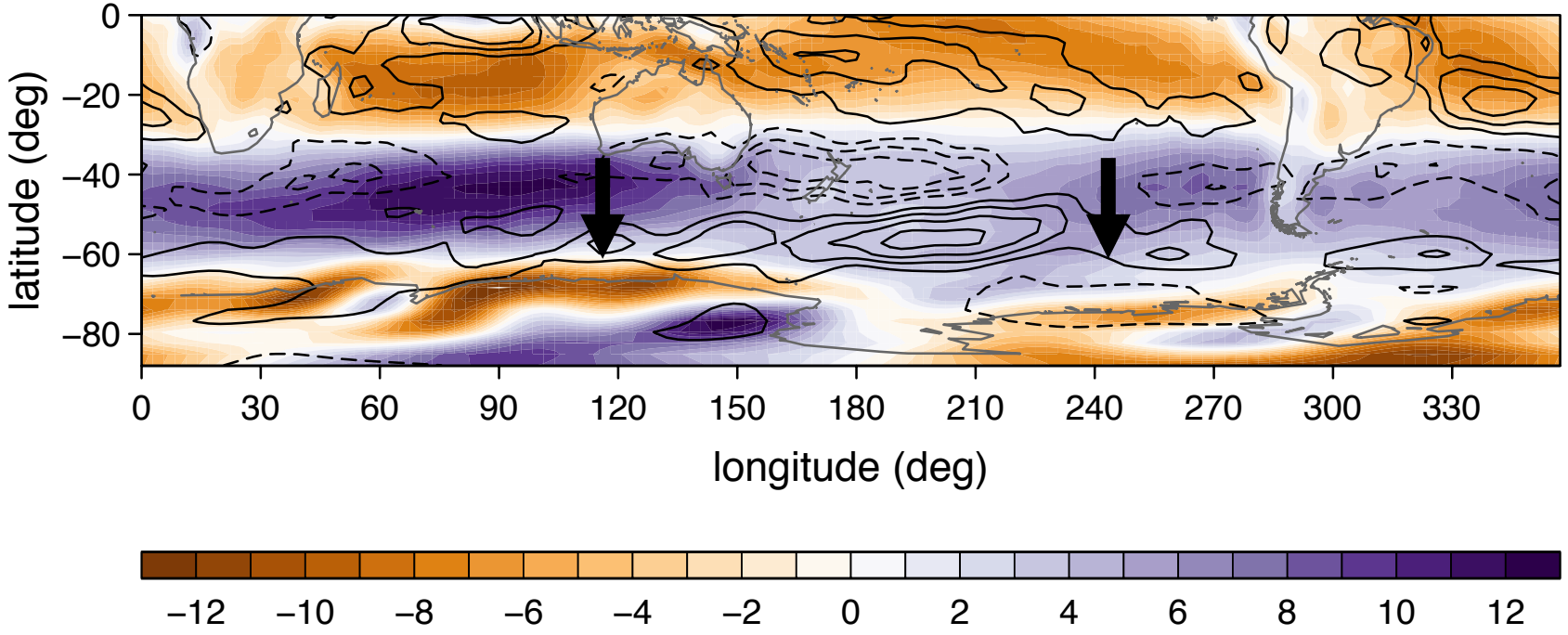
contours: JJA response to 100 W m^{-2} cooling in NH ocean basins



Full-geography ECHAM4.6 runs

poleward shift of the surface (eddy-driven) westerlies

+ weakening of the subtropical easterlies



Conclusions

- Midlatitude jet can respond to a forcing from the extratropics of opposite hemisphere

  → "**interhemispheric teleconnection**" via changes in Hadley circulation and subtropical jet strength
- ITCZ and jet tend to shift in **same direction**
- Possible implications for **paleoclimates** and **future climate change**

Thank you!

Reference:

Ceppi, P., Y.-T. Hwang, X. Liu, D. M. W. Frierson, and D. L. Hartmann (in press). **The Relationship Between the ITCZ and the Southern Hemispheric Eddy-Driven Jet**, *J. Geophys. Res.-Atmospheres.*