

Ozone vs GHGs

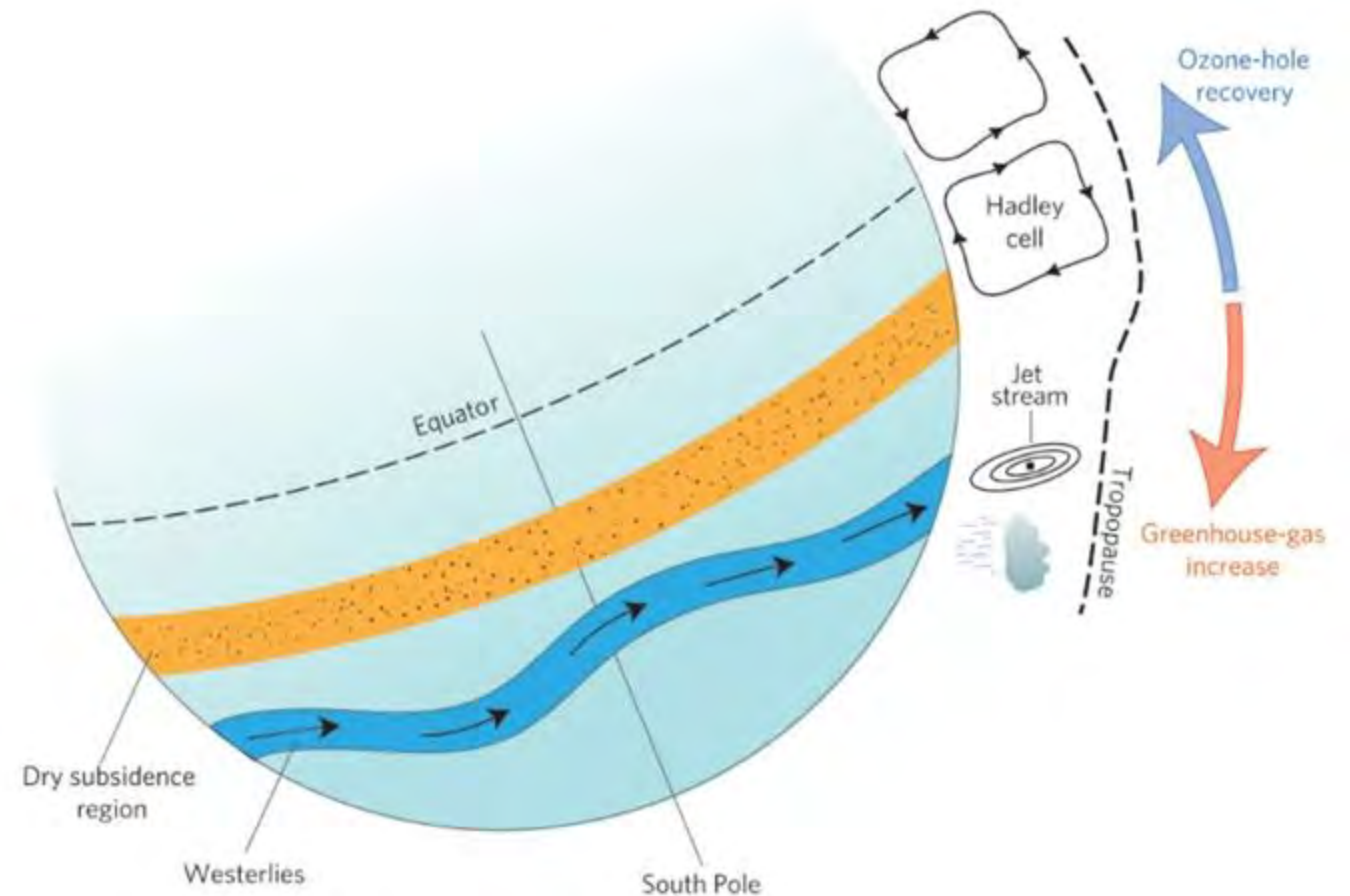
Greenhouse gases ☐ tropical warming
☐ increased meridional T gradient
☐ poleward shift

Ozone hole ☐ cooling
☐ increased meridional T gradient
☐ poleward shift

How strong are the signals?

What will happen as ozone recovers?

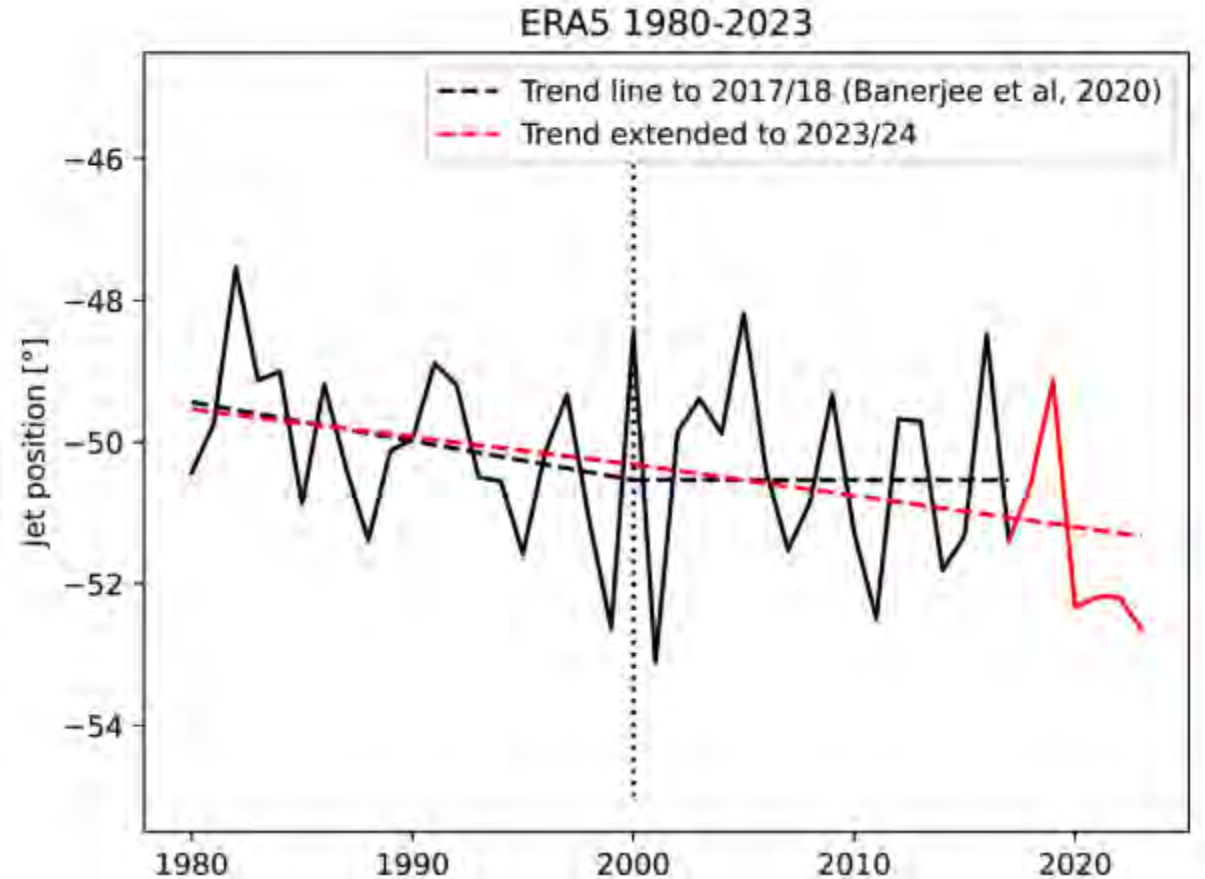
Figure 1: Impact of greenhouse-gas increase and ozone-hole recovery on climate.



Ozone recovery

Some evidence for equatorward shift
□ consistent with ozone recovery
(Banerjee et al)

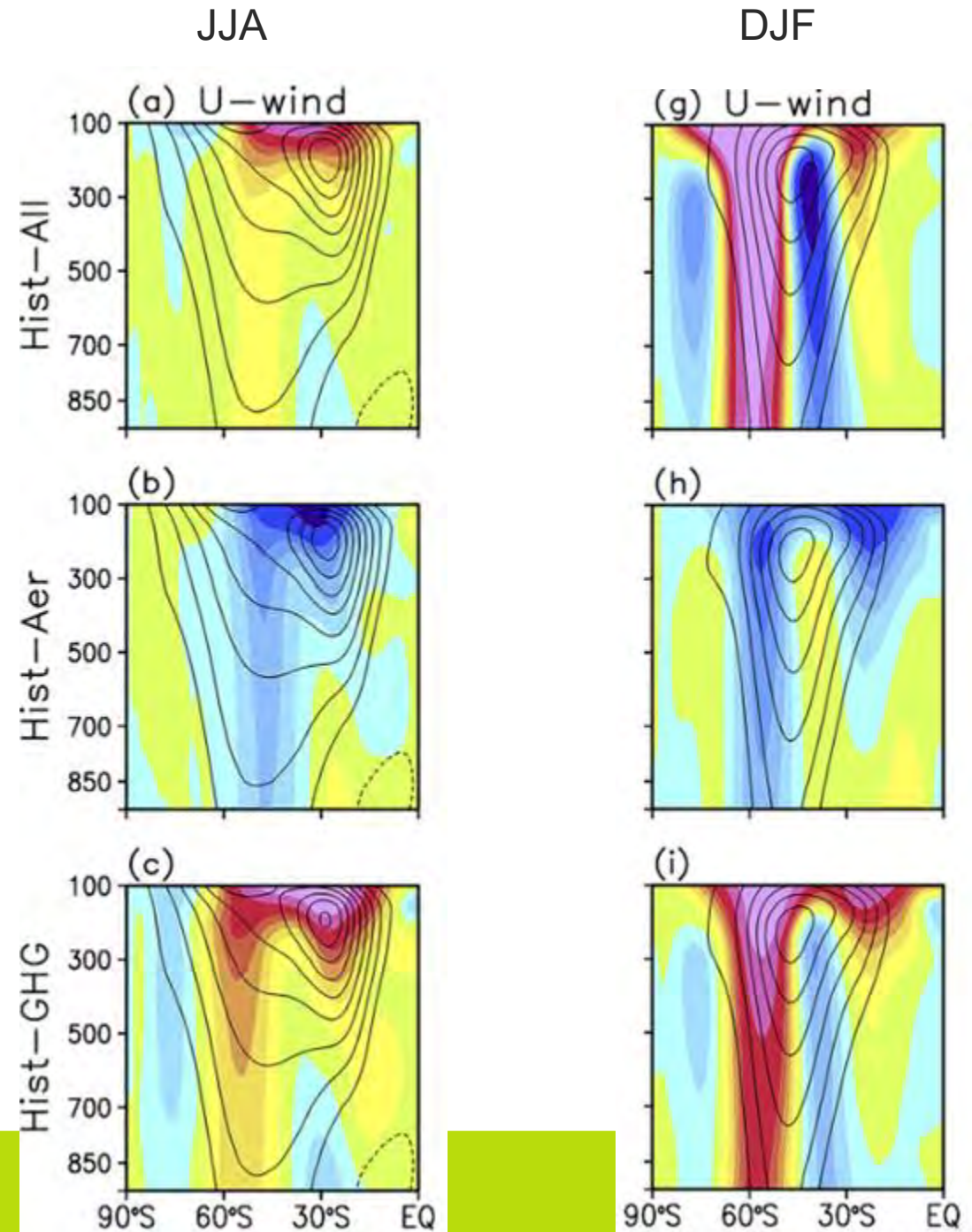
But later **obs** perhaps continue the trend



Aerosol impacts

Potential aerosol impacts in winter and summer

Tend to offset GHGs



Model – obs discrepancies

EKE trends 1979-2018

Increase in reanalyses

Missing in coupled models

Better in AMIP

But large uncertainties in reanalyses

Internal variability?

