Circulation widening
in an instantaneously forced
climate

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PROPOSED JET-SHIFTING MECHANISMS

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AN IDEAL MIDLATITUDE JET

- ▶ baroclinicity, temperature gradient
- ▶ wave source = momentum sink

INCREASING PHASE SPEEDS...

Chen et al., (2007) GRL

- $\phi_{\text{crit}}, U = c_{\text{abs}}.\ U \uparrow, \phi_{\text{crit}} \downarrow$
- equatorward bias, convergence on equatorward flank

...BUT DECREASING RELATIVE PHASE SPEEDS?

EQ

Kidston et al.,
(2010)
J. Climate

30°S

50°S

80°S

0   10   40

U/cos ø

- Wavenumber $k \downarrow, c_{rel} \uparrow, c_{abs} \downarrow, \phi_{U=c_{abs}} \uparrow$
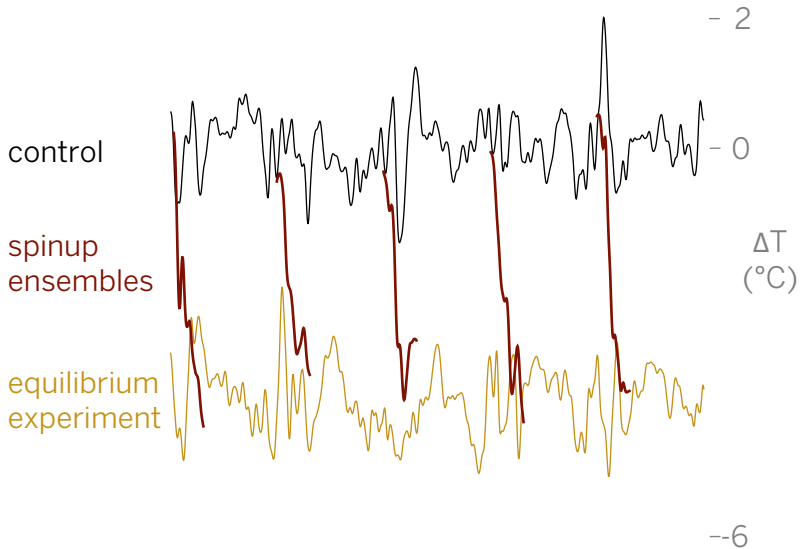- poleward bias, less convergence on equatorward flank

SMAY BE A MOOT POINTS...
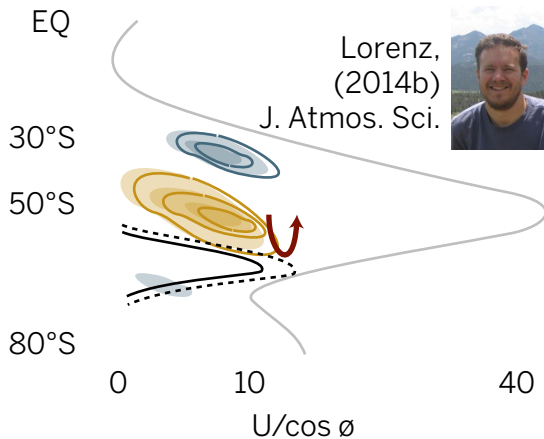
▶ Changing ϕ_{reflect} *should* dominate

- 3000 yr equilibrium control
- O(100 yr) AMIP-style experiments
    - $4\times CO_2$
    - $2\times O_3$
    - SST_{2100}
- IC's from beginning of each year

control

spinup
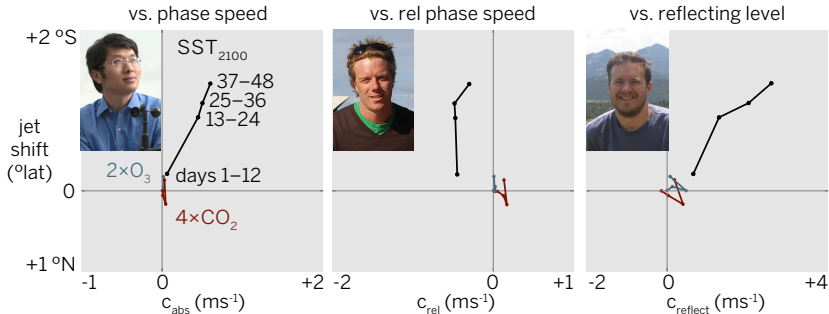ensembles

equilibrium
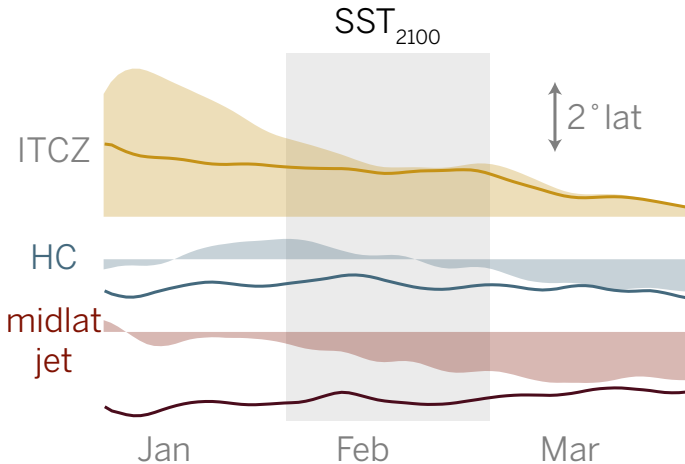experiment

– 2

– 0

ΔT
(°C)

--6

THE LITMUS TEST(S)...

- ► Correlation & sequence nice but not sufficient
- ► Chen: $\uparrow c_{\text{abs}}$ (eq side)
- ► Kidston: $\downarrow c_{\text{rel}}$ (pol side)
- ► Lorenz: $\uparrow |\text{reflect}|$ (balance)

THE LITMUS TEST(S).

equatorward momentum flux
& anomalies
SST_{2100} days 13–24

SST_{2100}

2° lat

ITCZ

HC

midlat
jet

Jan   Feb   Mar

SUMMARY

- ► Wave reflection is key
- ► Phase speed, wavenumber mechanisms may feedback
- ► May be encapsulated in wave diffusivity

Thank you.

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