

Investigation of the tropical atmosphere with a radiative-convective version of a comprehensive GCM

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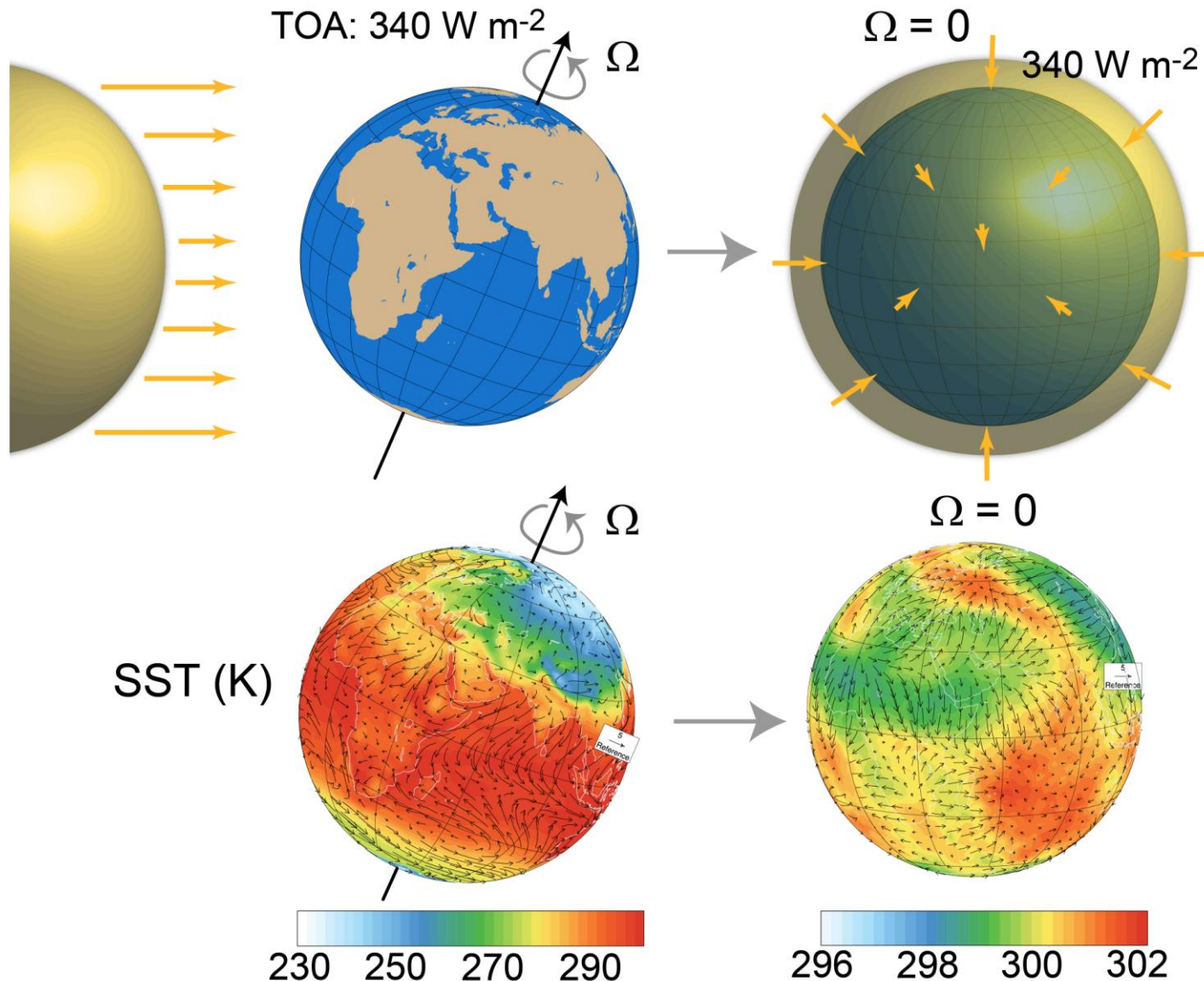


Motivation

Does the control state of the RCE model resemble the tropical atmosphere?

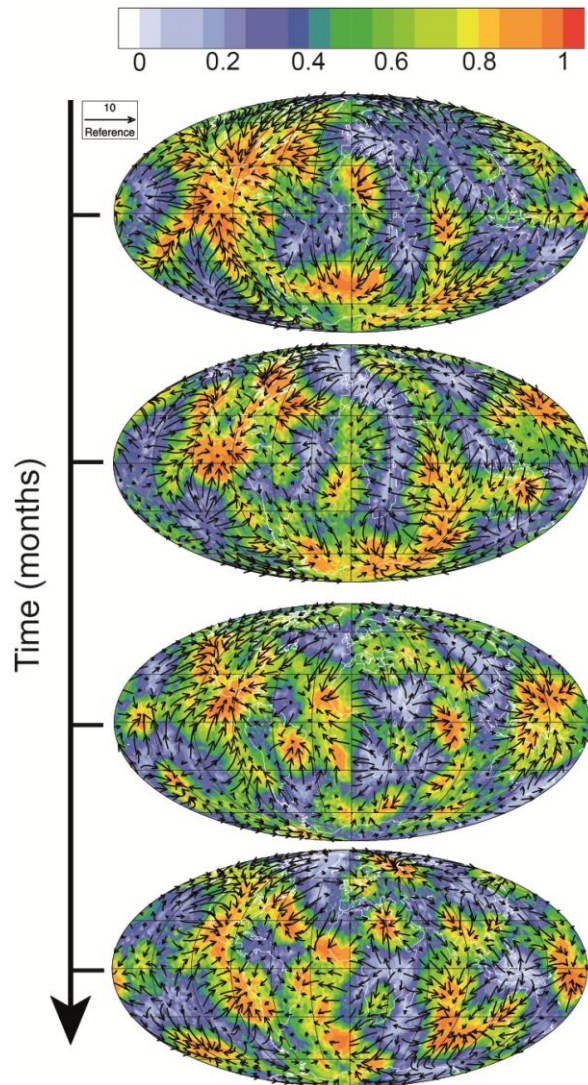
Is the RCE model a useful framework in climate change experiments?

Radiative-convective equilibrium model

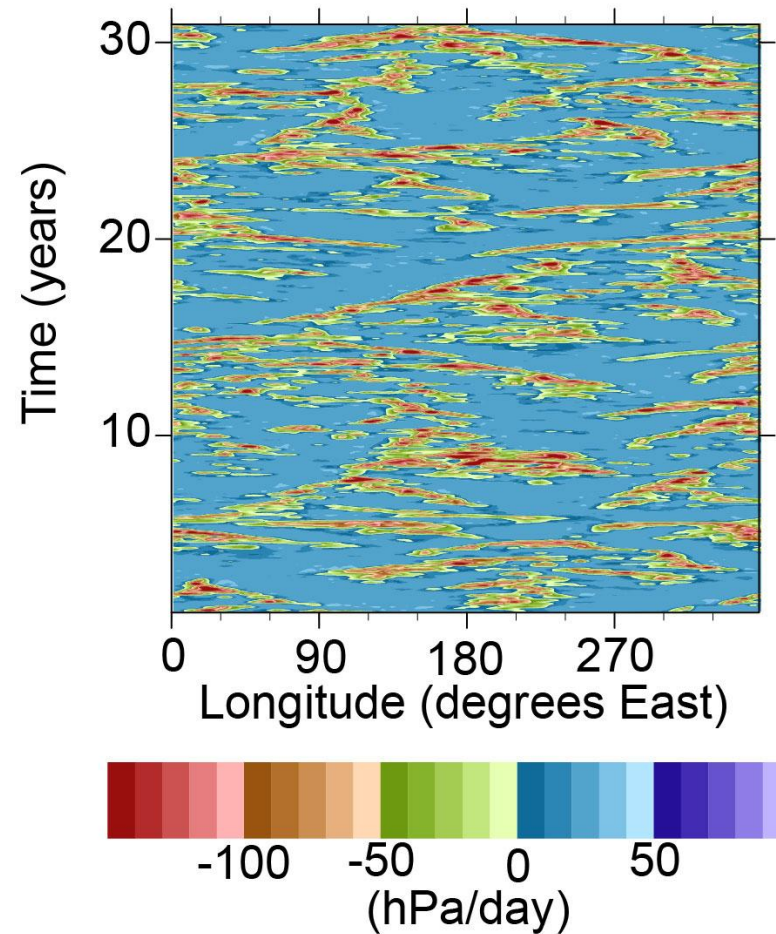


Space-time variability of convection

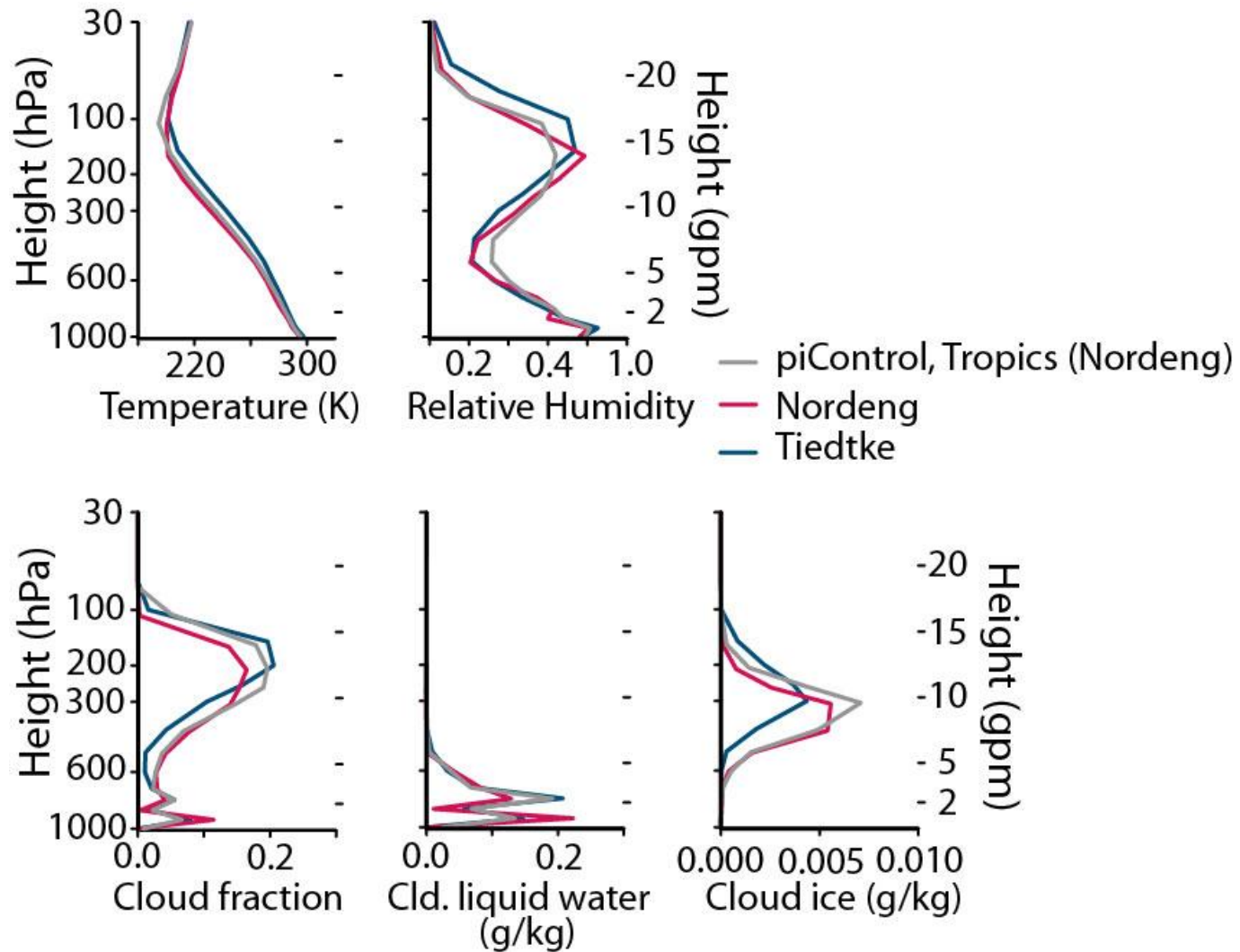
Cloud cover & surface winds



Tiedtke: integrated vertical velocity at equator

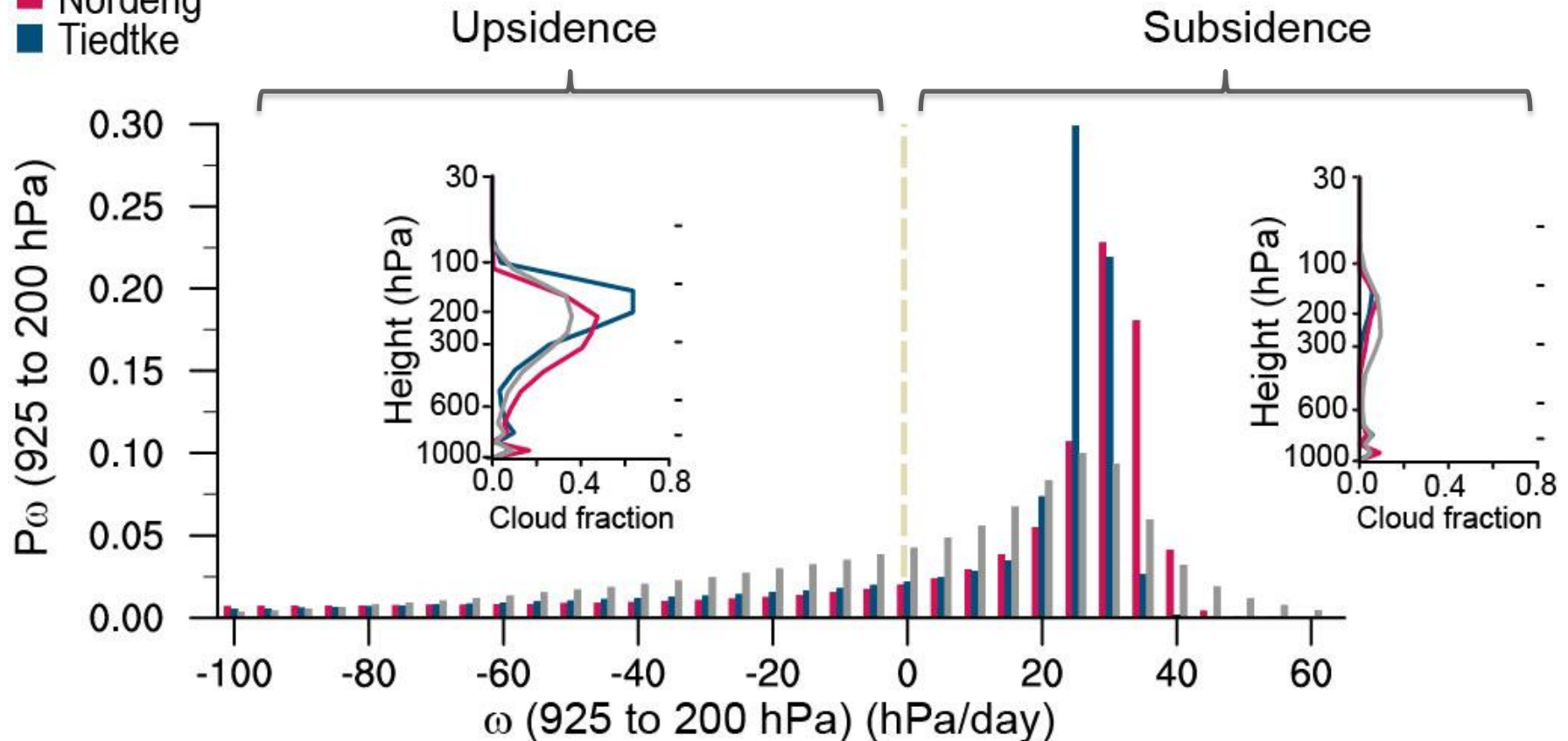


Profiles of mean state resemble tropical atmosphere

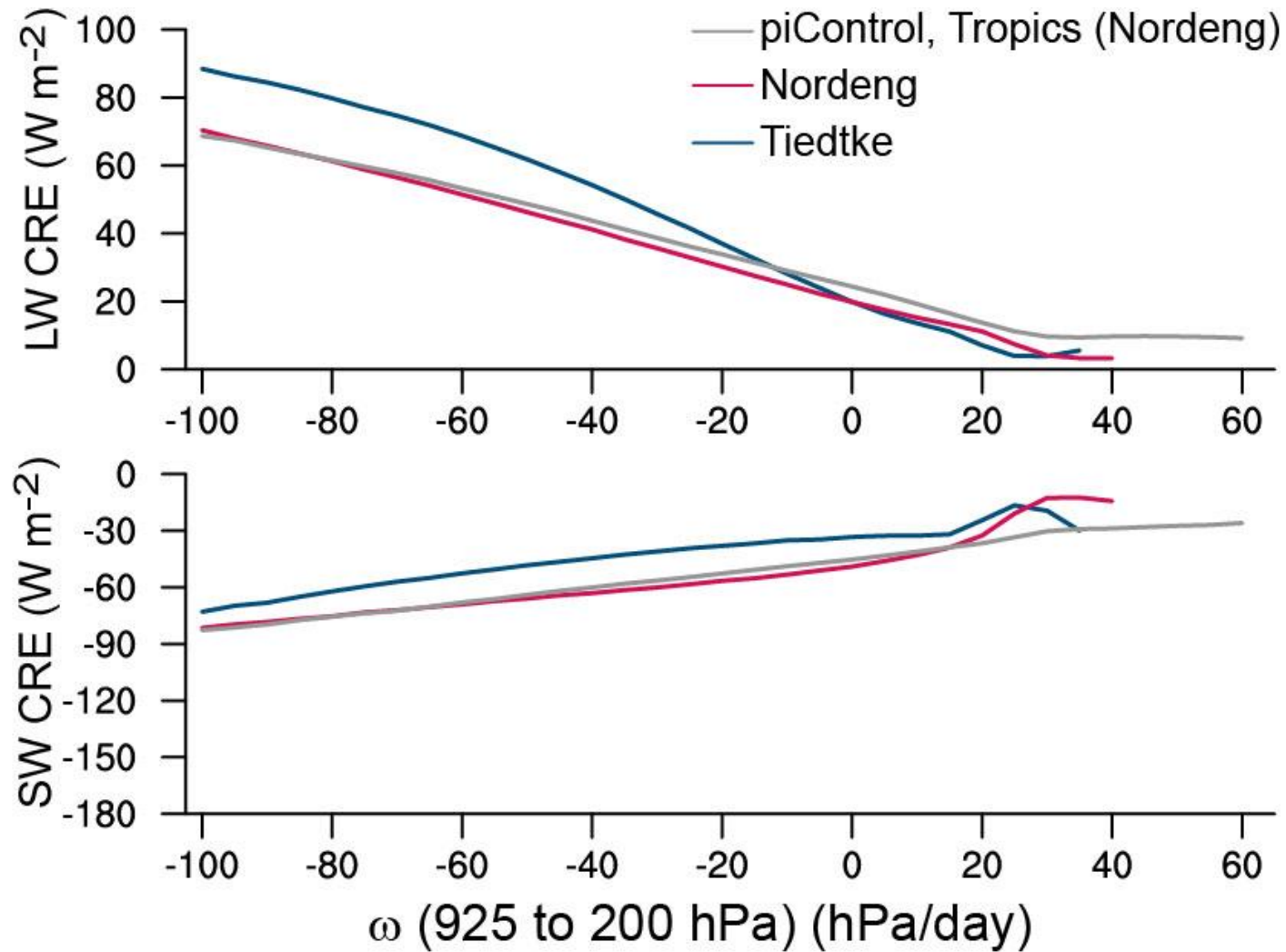


RCE model captures main characteristics of vertical velocity PDF

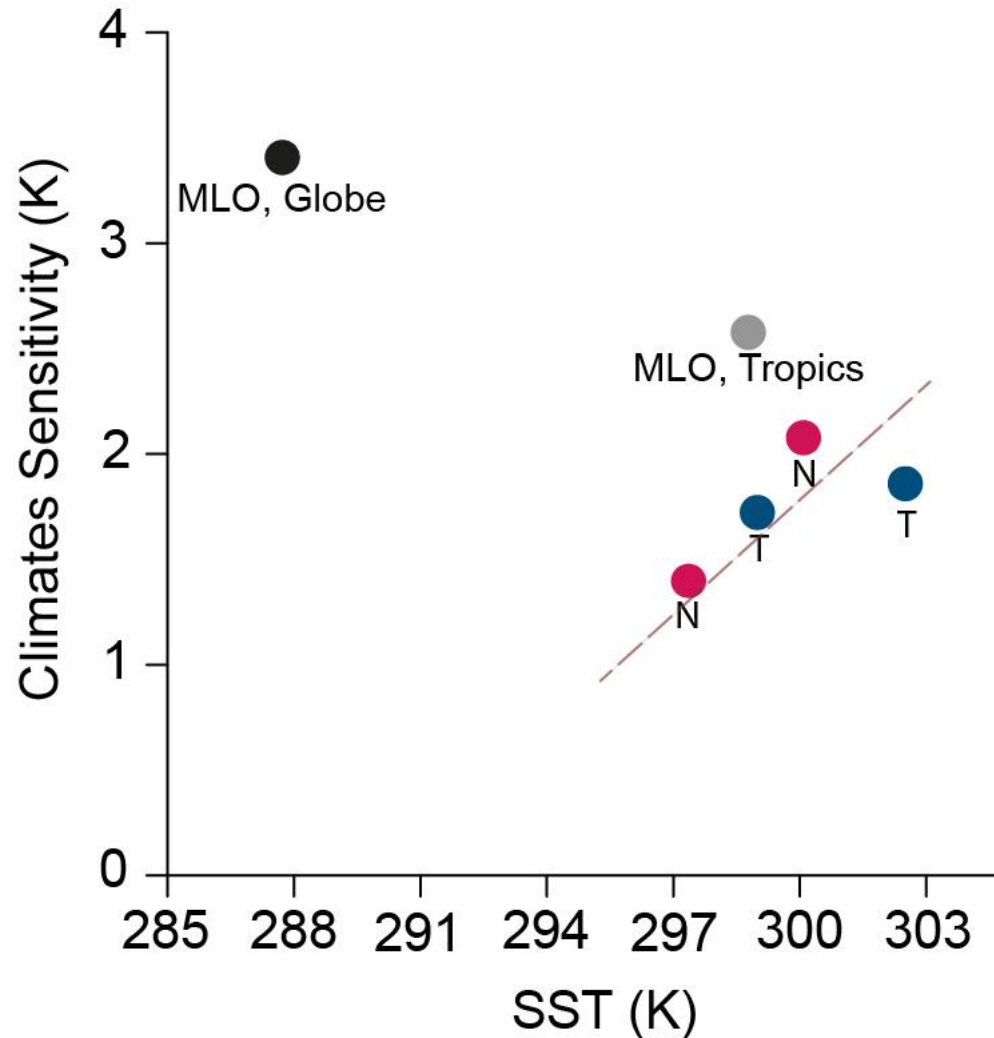
- piControl, Tropics (Nordeng)
- Nordeng
- Tiedtke



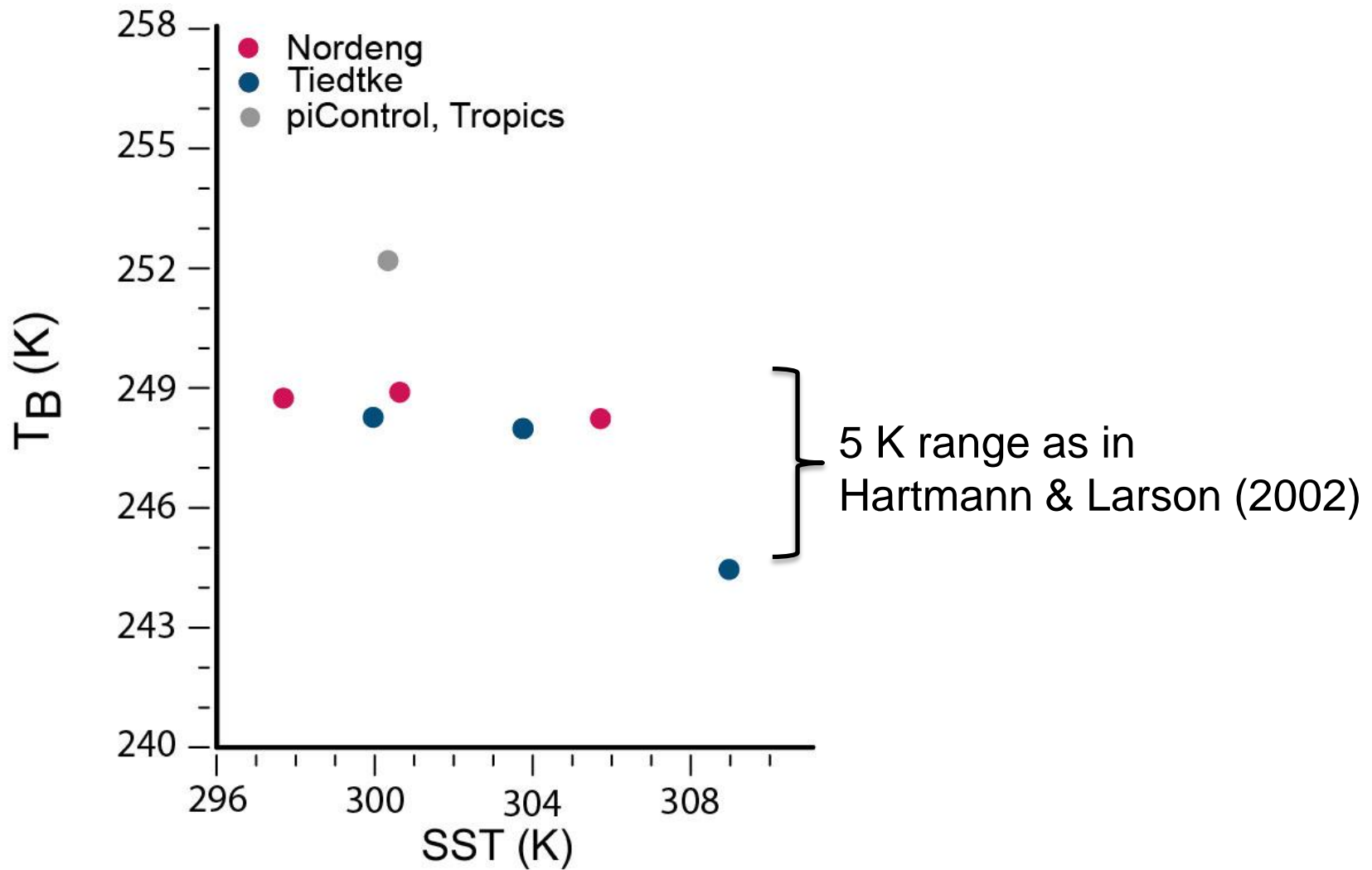
Cloud radiative effect of RCE model similar to GCM tropics



Climate sensitivity comparable to GCM tropics



RCE model exhibits fixed anvil temperatures



*data sampled from 25 % strongest upsidence regions

Summary

Does the control state of the RCE model resemble the tropical atmosphere?

→ yes, the RCE model resembles the tropical atmosphere in

- vertical profiles of the mean state
- PDF of the vertical velocity
- CRE effect in LW and SW

Is the RCE model a useful framework in climate change experiments?

→ RCE model is a promising framework in climate change experiments

- Climate sensitivity of RCE model in the range of values given by last IPCC
- Fixed anvil temperature hypothesis is a robust feature in RCE model