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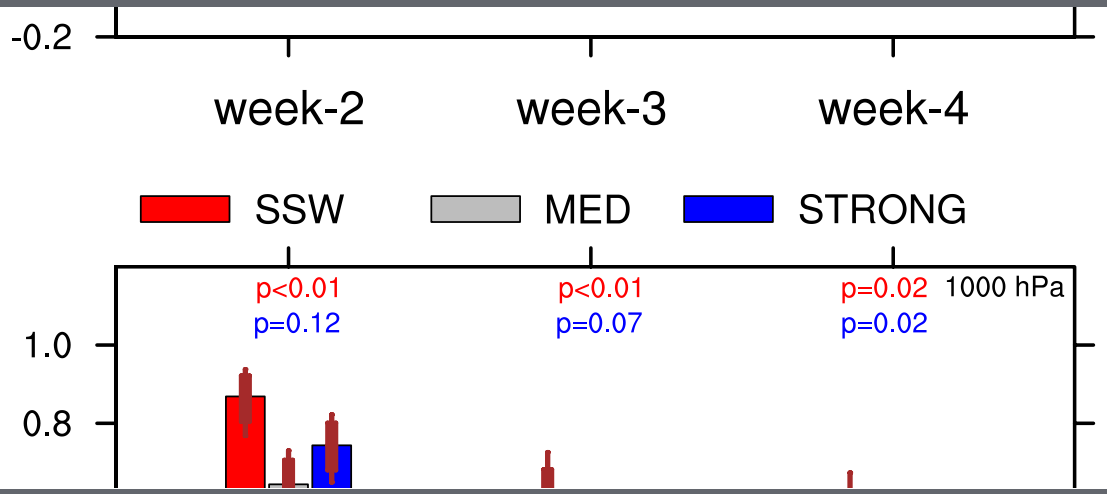
DISCUSSION: STRATOSPHERE



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KEY QUESTIONS

- How well are key dynamical processes in the stratosphere represented in S2S models (e.g. Rossby Wave propagation and breaking)?
- What is the quantitative impact of running with a low model top for tropospheric forecasts?
- How important is higher vertical resolution and the complexity of stratospheric physics (e.g. Gravity Wave parameterization)?
- Where are the ‘windows of opportunity’ for exploiting sub-seasonal skill in the stratosphere (SSW and strong vortex events, QBO) ?

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ADDITIONAL DIAGNOSTICS

- DynVarMIP is one of the officially endorsed CMIP6 MIP projects, but is focused on providing a comprehensive set of diagnostics and runs useful to scientists who wish to examine and compare stratospheric diagnostics
- Their paper is a fantastic resource which provides suggested diagnostics and recipes to calculate them interactively

Would it be possible to use this as a template to generate additional diagnostics of value to the community and store them on the S2S database?

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EXAMPLE: MOMENTUM BUDGET

waves and the actual change in the resolved flow.

While the TEM circulation approximates the Lagrangian transport of mass, trace gases with sinks and sources in the stratosphere, such as ozone, are also strongly affected by quasi-horizontal mixing along isentropic surfaces (e.g., Plumb, 2002). Breaking Rossby waves rearrange mass along isentropic surfaces: this yields no net movement of mass, but a trace gas with horizontal gradient experiences a net transport. The "age of air" can be used to assess the impact of this mixing, and provides complementary information to the

drag_project/). To understand how models arrive at
tal surface stress, we also request the component
turbulent processes, usually parameterized by the p
boundary layer (PBL) scheme, including those stres
come from subgrid orographic roughness elements.
of other processes could then be diagnosed by residu

Evaluation of the resolved and parameterized pr
that effect the circulation is essential to diagnosing
derstanding model biases in the mean state and va
of the atmosphere, and for diagnosing the processes

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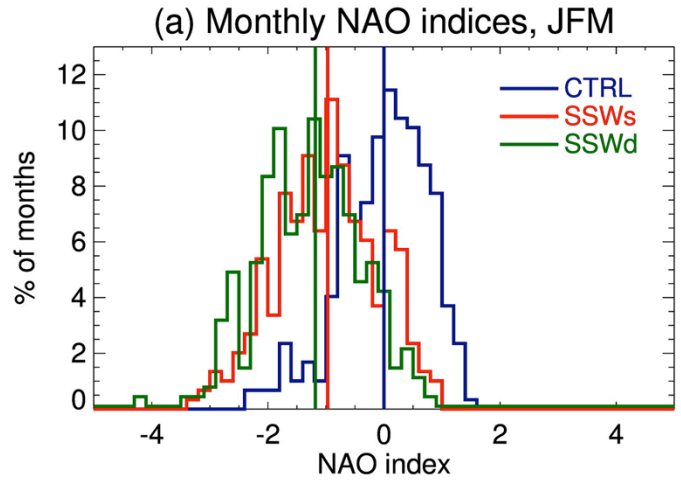
DAMPING EXPERIMENTS

- Recent studies (e.g. Simpson and Hitchcock, 2014) have been able to examine the dynamics of downward coupling in detail through the use of stratospheric damping
- Is there any possibility that similar experiments could be proposed and conducted under the S2S framework in order to better understand differences between models?



Hitchcock and Simpson, 2014
doi: 0.1175/JAS-D-14-0012.1

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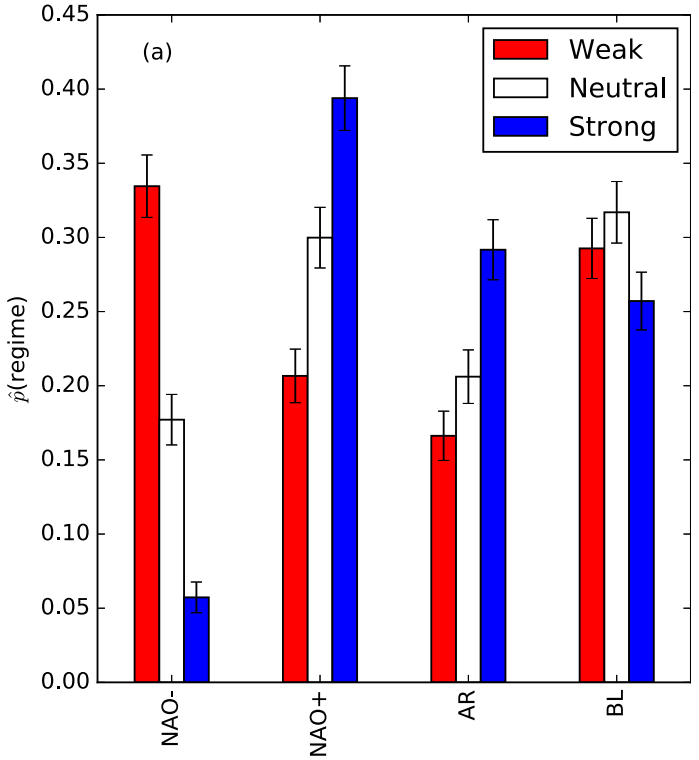
TROPOSPHERIC DYNAMICS

- Growing evidence that downward coupling is strongly dependent on underlying tropospheric state – particularly in N. Atlantic
- Need to link more strongly with tropospheric dynamics community to work on these problems – (cf Laura Ferranti's presentation)



Charlton-Perez et al., 2018
doi: 10.1002/qj.3280

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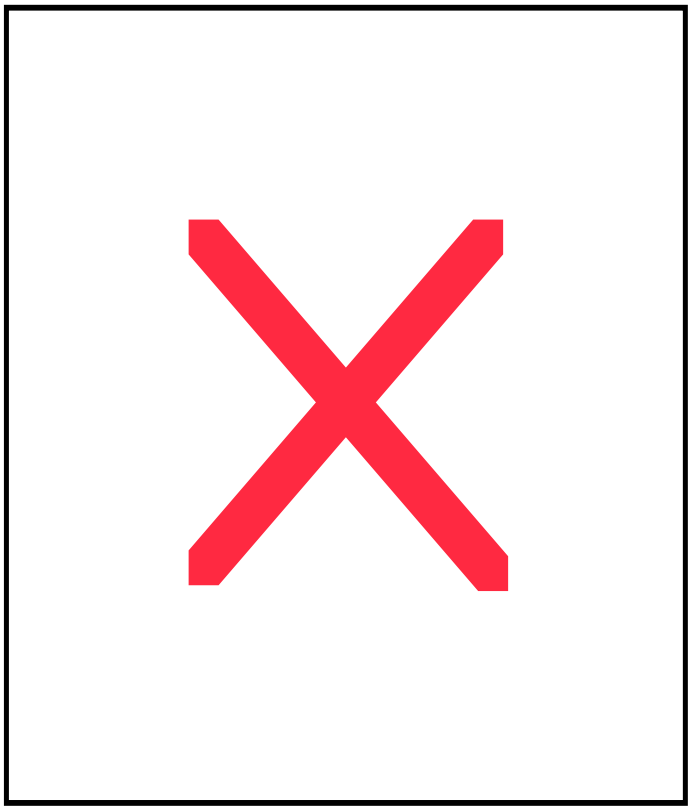
TROPICAL DYNAMICS

- Lots of work this week looking at links between the QBO, MJO and extra-tropics (both Stratosphere and Troposphere)
- Still some questions about the dynamical processes involved in the direct connection between QBO and MJO propagation and predictability
- Likely complex interactions in the UTLS region involving large-scale dynamics and cloud processes
- Which additional diagnostics/ experiments are useful for understanding these processes in models?



Nishimoto and Yoden, 2016
doi:10.1175/JAS-D-16-0205.1

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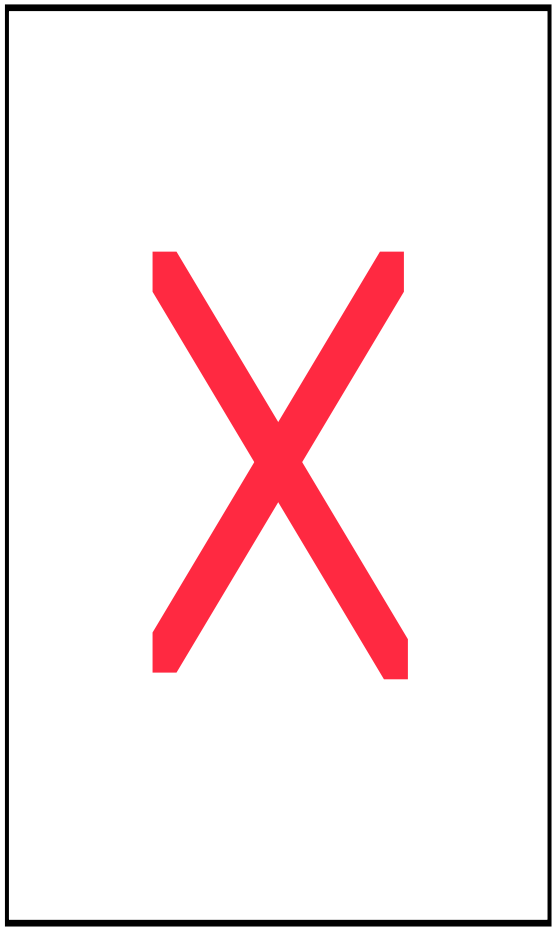
CHEMISTRY

- Almost no explicit chemistry in S2S models
- Potential sources of sub-seasonal skill associated with anomalies in e.g. Stratospheric and Tropospheric Ozone, Aerosol
- How can we better engage this community in the S2S project?



Ivy et al., 2017
doi: 10.1088/1748-9326/aa57a4