Update on SNAP activities for the S2S SG/LG telecon

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SNAP – Stratospheric Network for the Assessment of Predictability

Team

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Recent activity: book chapter

Joint work by the international stratosphere community on the topic of S2S prediction.

Summary of our current knowledge on S2S prediction relating to the stratosphere.

Published results

Book chapters:

Butler, A.H., A. Charlton-Perez, D.I.V. Domeisen, C. Garfinkel, E.P. Gerber, P. Hitchcock, A.-Y. Karpechko, A.C. Maycock, M. Sigmond, I. Simpson, S.-W. Son, Sub-seasonal Predictability and the Stratosphere- Chapter 11, The Gap Between Weather and Climate Forecasting, p. 223-241, Elsevier, https://doi.org/10.1016/B978-0-12-811714-9.00011-5, 2019.

Recent activity: S2S overview papers

Main results:

Part I:
- High-top models have more skill in the stratosphere and the troposphere compared to low-top models
- Extreme stratospheric events are predictable at 1- to 2-week lead times in S2S models
- SSW events tend to be less predictable than strong vortex events or final warming events

Part II:
- Tropospheric precursors of SSW events are better represented for the North Pacific than for Eurasia
- Teleconnections from the tropics add probabilistic skill but are only represented by a few models
- Weak and strong vortex events in the NH stratosphere can contribute to surface skill 3–4 weeks later

Joint work by the international stratosphere community working with S2S models.

Journal publications:

Domeisen, D. et al. (2019): The role of the stratosphere in subseasonal to seasonal prediction Part I: Predictability of the stratosphere. *Journal of Geophysical Research: Atmospheres*, 124. DOI: 10.1029/2019JD030920.

Domeisen, D. I. V., Butler, A. H., Charlton-Perez, A. J., Ayarzagüena, B., Baldwin, M. P., Dunn-Sigouin, E., et al (2019). The role of the stratosphere in subseasonal to seasonal prediction Part II: Predictability arising from stratosphere - troposphere coupling. *Journal of Geophysical Research: Atmospheres*, 124. DOI: 0.1029/2019JD030923.

Current activity: nudging protocols I

- Activity (led by Peter Hitchcock) for investigating the role of the stratosphere in sub-seasonal forecasts using nudging experiments. The basic experimental design proposes to focus on the evolution of several specific events as case studies.
- The project is a collaboration with modelling centers
- Current status: draft / experimental protocol. The aim is to share the around S2S modelling groups prior to submission in GMD.

Current activity: nudging protocols II

- Goal: nudging of several events (e.g. 2018 and 2019 SSW events in NH and 2019 minor warming in SH) and comparison against runs nudged to climatology in order to quantify the contribution of the stratosphere to surface impact.

- Focus on extratropical / polar stratospheric events, but hoping to work with QBOi/MJO community to pick events to examine the tropical stratospheric influence on the MJO.

Planned future activities

- Michael Sigmond has agreed to lead an effort to address the use of different skill scores (in particular the anomaly correlation coefficient) in S2S studies.

- Zachary Lawrence will lead an effort to quantify stratospheric biases in the S2S models and their relationship to skill.