Predicting the Downward and Surface Influence of the February 2018 and January 2019 Sudden Stratospheric Warming events in S2S Models

**Motivations**

Only two major sudden stratospheric warming (SSW) event occurred since the initiation of the sub-seasonal to seasonal (S2S) prediction program:

1. What controls the magnitude of the downward impact of SSWs on the surface from a statistical perspective?
2. What is the difference between the two SSWs in term of their intensity, type, and the skill at which they can be forecasted?

**Data and Methods**

- Daily NCEP/NCAR reanalysis and 11 S2S models in Figs. 1a, 1b
- MWO SSW onset criterion (\(U_{500/300}\)) 11 February 2018 and 1 January 2019
- SSW hit ratio (HR) = Number of forecast members that forecast the SSW (\(2+2\)-day error is allowed)
- Anomaly correlation, ACC(\(\hat{t}\))

**Figures**

- Fig. 1(a, b) SSW hit ratio for each available initializations from each models (color filling) and the number of all members for each initialization (no initialization in white space) for the two SSWs.
- Fig. 1(c, d) NAM evolutions from 1000-10hPa in the reanalysis during the two SSWs, respectively.

**Predictability of lower stratospheric response to SSW events**

- (a) MME 2018 SSW
- (b) MME 2019 SSW

**Summary**

- The strength of the SSW is more important to determine the magnitude of the downward impact than the dominant wavenumber.
- The T2m in North Eurasia, Middle East, South China and Eastern US is more difficult to forecast for the non-downward propagating 2019 SSW.
- The rainfall anomalies in some regions are poorly forecasted both in a deterministic and probabilistic sense for (non-)downward propagating SSWs.

**Reference**