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A signal and noise analysis of stratosphere-troposphere coupling in sub-seasonal prediction models

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On sub-seasonal timescales, coupling between the stratosphere and troposphere represents a significant source of skill for northern mid and high-latitudes. Previous studies have examined this skill either on a case-by-case basis or from the perspective of the additional skill present during sudden stratospheric warming (SSW) or strong polar vortex events. Here we complement these approaches by fitting a simple statistical model to the full hindcast set available from the S2S database. The statistical model used enable us to separate the predictable signal and noise in the annular mode present in each hindcast set and to compare the signal to noise ratio in the model and in observations. While all models in the S2S database exhibit some degree of stratosphere-troposphere coupling in the annular mode, there are significant differences between them. In the middle and lower stratosphere, models have high skill out to week four, with large signal to noise ratio. In the troposphere, annular mode skill is weaker in weeks three and four. In the lower stratosphere, many models have low spread and are over-confident. In the troposphere, there is similar overconfidence, particularly in week 3. The same statistical model also allows us to examine how the predictable signal varies between different events and different models.

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