Stratospheric Predictability and the Arctic Polar-night Jet Oscillation

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The presence of long statistical decorrelation times in the extratropical winter stratosphere, and the realization that the troposphere shows clear indications of stratospheric influence, presents a tantalizing potential source of predictability at seasonal timescales. Attempts to exploit this source of predictability, however, have met with mixed success. I will argue that one reason for this mixed success is that the predictability implied by these decorrelation timescales arises only when the stratospheric flow is in a particular configuration (a notion that is difficult to convey using a single climatological timescale). Specifically, the recovery of the Arctic polar vortex following a subset of major stratospheric sudden warmings exhibits a very robust pattern of evolution, characterized by extremely persistent anomalies in the lowermost stratosphere. The circulation during these episodes, termed Polar-night Jet Oscillation events, is governed predominantly by radiative processes as a result of the strong suppression of planetary wave activity in the polar vortex. This suppression, which can persist for as long as three months, is likely to lead to significantly enhanced predictability in the stratosphere. Given the influence of the associated stratospheric anomalies on the tropospheric circulation below, this may extend to the troposphere as well.