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# On the importance of initial conditions for the atmospheric response to solar particle events

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In an earlier investigation, we used global NCEP/NCAR reanalysis air temperature and geopotential height data to identify the seasonal atmospheric signature to energetic solar particle events between 1978 and 2002. Although our results were supportive of earlier work, they lacked formal statistical significance in the height departures seen.

Recent studies have demonstrated that both seasonality and initial atmospheric conditions are important factors in coherency of the response to these energetic solar phenomena. The NAO and the QBO are leading modes in the northern hemisphere tropospheric and stratospheric circulation variability respectively. In addition, it is known that the response of the stratosphere to the 11-year sunspot cycle and geomagnetic activity is dependant on the phase of the QBO.

Using a similar method to our earlier analysis, we consider whether the atmospheric response to SPEs is contingent on different phases of these dominant atmospheric regimes. In addition to increasing the clarity of the response, we find the magnitude of the tropospheric and stratospheric response varies markedly depending on the phase of these two regimes.