

Using Precursors for Statistical SSW Prediction

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This work explores current knowledge of the Sudden Stratospheric Warming (SSW) lifecycle to find factors that increase the future probability of SSW occurrence. Using a nearly ten-thousand-year integration of the CM2.1 coupled climate model, we show that anomalously strong upward wave activity in the lower stratosphere (100hPa) increases the probability of an SSW happening within the following week by almost an order of magnitude. In addition, the stratospheric meridional potential vorticity (PV) gradient impacts the probability of future SSWs in two different ways: First, if the PV gradient is anomalously weak, the SSW probability is enhanced during the following week, but diminished thereafter. Second, if the PV gradient is anomalously strong, SSWs are greatly suppressed during the following week, but enhanced over the long term (from three weeks up to the entire winter season). Finally, the study shows that considering both factors in combination further increases future SSW probabilities, and short- as well as long term probabilities of occurrence of SSWs are much larger (or lower, depending on the sign of PV gradient anomalies) than if one only uses climatological (day of year) data.

Key words: Sudden Stratospheric Warmings, Troposphere-stratosphere coupling