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Polar climate predictability seasonal to multi-decadal: Are the two most recent harsh Northern Hemisphere winters manifestation of anthropogenic global warming in the Arctic?

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The global climate models predict that winter will experience the greatest warming due to a positive feedback of increased greenhouse gases (GHGs) and a diminished and darker cryosphere. However, headlines on the two most recent years have been less about the extreme warmth and more about the severity of winter weather and record snowfalls. What dynamic forcings could contribute to reversing the radiative warming forced by both increased GHGs and decreased planetary albedo resultant of a shrinking cryopshere? Our analysis has already shown that the temperature trend reversal commences in the polar stratosphere where increased absorption of anomalous vertical wave activity flux reverses the polar cooling trend to a warming trend, which preferentially occurs in January. The descent of the circulation anomalies from the stratosphere to the troposphere initiates a trend reversal in lower tropospheric temperatures in the winter months. The surface temperature trend pattern is most closely associated with the negative polarity of the Northern Annular Mode (NAM), which has been linked with leading stratospheric circulation anomalies. These circulation anomalies are, in turn, linked with increasing Eurasian snow cover in the fall; an observed increasing trend in Eurasian snow cover is the most likely boundary condition for partially forcing winter hemispheric trends over the past two decades that has heretofore been identified. We will also compare the trend analysis with the NAM to trend analysis with varying sea surface temperatures associated with El Niño/Southern Oscillation, the Pacific Decadal Oscillation, the Atlantic Multidecadal Oscillation, solar variability and diminishing Arctic sea ice.