The Complementarities of NDACC and GRUAN in Establishing Measurement Requirements for Water Vapor Trends Detection

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The international Network Detection of Atmospheric Composition Change (NDACC) provides a consistent standardized set of long-term measurements of atmospheric trace gases, particles, and physical parameters via a suite of globally distributed research stations. While the NDACC remains committed to its initial objective of monitoring changes in the stratosphere, with an emphasis on the long-term evolution of the ozone layer (its decay, likely stabilization and expected recovery). NDACC measurement and analysis priorities have broadened considerably to encompass both the stratosphere and free troposphere as well as to explore the interface between changing atmospheric composition and climate. Although NDACC is neither designed nor operated as a climate monitoring network per se, its measurement thrusts and associated activities are highly complementary to networks such as the Global Climate Observing System (GCOS) Reference Upper Air Network (GRUAN), the reference network for upper-air climate observations.

Various models agree that, during the current century, water vapor will increase throughout the troposphere and into the stratosphere as a result of anticipated increases in temperature. NDACC and GRUAN have tasked themselves with measuring atmospheric water vapor with sufficient accuracy to monitor these trends. But how long and with what accuracy will these networks have to conduct such measurements to reveal the trends with statistical confidence? This presentation will illustrate how estimates of anticipated trends in water vapor based on coupled climate models can be used to estimate the time required to measure trends in water vapor with statistical robustness. The results have additional implications in terms of measurement technology, the location of measurement sites, and the calibration requirements of the instruments.

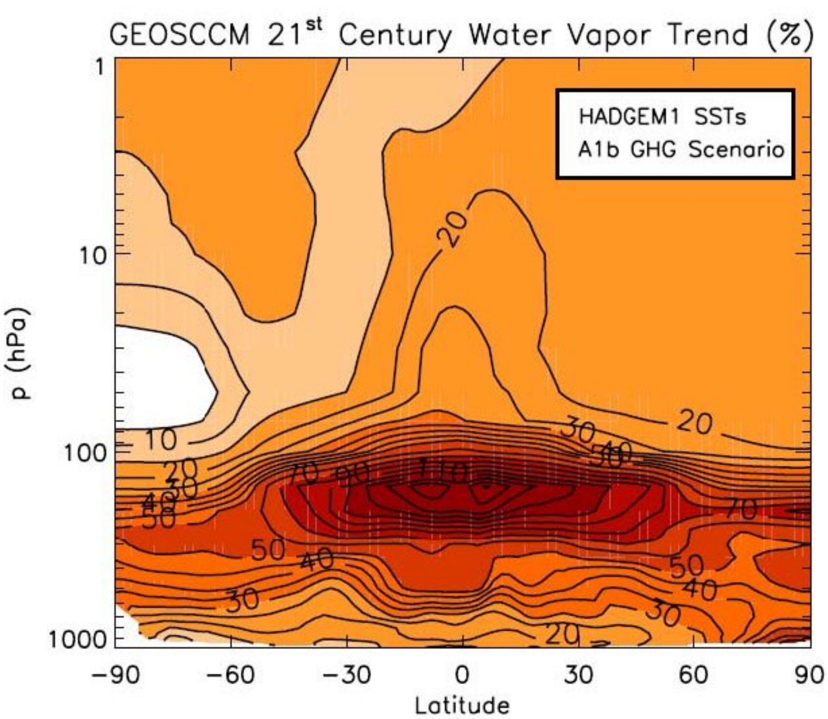

Figure 1. Simulated increases in atmospheric water vapor during the 21st Century from the Goddard Earth Observing System Chemistry Climate Model.