SESSIONS: (A7/A8) Stratosphere/Chemistry

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Impacts of NASA's Earth Observations on Subseasonal and Seasonal Forecasts

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NASA's suite of Earth-observing satellites provides a unique view of many processes on Earth, with relevance on timescales ranging from hours to weeks and even years. NASA's observations span all parts of the Earth system: atmospheric, ocean, land and cryosphere, and include physical, chemical and biological components. This presentation explores use of NASA observations in extended-range prediction, from many days to months, using the Goddard Earth Observing System (GEOS) assimilation and predictive modeling capabilities.

The skill of a weather forecast is linked to the fidelity of the initialization process (data assimilation) and the realistic representation of "fast" physical processes in the model. At longer time horizons, the slower "feedback" processes in the Earth System begin to take a more prominent role in the accuracy of the forecast. Simultaneously, forecast-skill attribution transitions away from feature-based metrics that emphasize smaller scales (e.g., representations of fronts and vortices) to metrics that emphasize the statistical distributions of large-scale features (e.g., ENSO diagnostics and teleconnections).

This presentation will summarize studies performed using the GEOS-S2S (subseasonal to seasonal) system that explore the impacts of NASA observations on the fidelity of the forecasts. The GEOS-S2S system is configured for the atmosphere-ocean-land-ice model and is initialized using in-situ and space-based observations, including atmospheric aerosols and ozone which are not typically analyzed in such systems. The GEOS-S2S model routinely includes aerosol feedbacks, which systematically impact the realism of the forecasts, providing a first example of how suitable NASA observations impact the performance of the GEOS-S2S system. Studies in which a stratospheric chemistry module is activated in the GEOS-S2S system allow the impacts of ozone radiative feedbacks to be isolated. Space-basedobservations of sea-surface temperature and altimetry are routinely analyzed for the initialization of the GEOS-S2S system; recent advances allow the use ofNASA's sea-surface salinity data, which are shown to impact the long-range skill of the forecasts.