

Impact of Satellite Observations on Forecasting Sudden Stratospheric Warmings

*Shunsuke Noguchi^{1,2}, Yuhji Kuroda^{2,3}, Hitoshi Mukougawa⁴, Ryo Mizuta², Chiaki Kobayashi²

1. Japan Agency for Marine-Earth Science and Technology, 2. Meteorological Research Institute, 3. Meteorological College, 4. Kyoto University

The observational impacts of satellite data assimilation on extended-range forecasts of sudden stratospheric warmings (SSWs) are investigated by conducting ensemble forecast experiments. We use two Japanese novel reanalysis products: the Japanese 55-year reanalysis (JRA-55) and its subset that assimilates conventional observations only (JRA-55C). A comparative examination on the reproducibility for SSWs between the two ensemble forecasts reveals that the impact of satellite observations is significant for forecasts starting 5 days before the SSW onset, with 20% less accuracy in the JRA-55C forecasts. Moreover, some of forecasts of vortex-splitting SSWs show a sudden appearance of deep difference, which lasts over a few months in the lower stratosphere and significantly affects the surface climate. These results highlight an important role of mesospheric and upper stratospheric circulations on the onset and development of SSWs.

Reference: <https://doi.org/10.1029/2019GL086233>

Keywords: sudden stratospheric warming, stratosphere-troposphere coupling, satellite data assimilation, predictability, sub-seasonal to seasonal prediction, reanalysis