[JJ] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-AS Atmospheric Sciences, Meteorology & Atmospheric Environment

[A-AS07]Stratosphere-troposphere Processes And their Role in Climate

convener:Shingo Watanabe(Japan Agency for Marine-Earth Science and Technology), Yoshio Kawatani(Japan Agency for Marine-Earth Science and Technology), Takashi Sekiya(国立研究開発法人　海洋研究開発機構, 共同), Kaoru Sato(Department of Earth and Planetary Science, Graduate School of Science, The University of Tokyo)

Wed. May 23, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

The Stratosphere-troposphere Processes And their Role in Climate (SPARC) is one of the major projects of the World Climate Research Programme (WCRP), and is characterized by its focus on chemical and dynamical coupling in the stratosphere and troposphere. In this session, we welcome presentations on various processes in the stratosphere and troposphere.

[AAS07-P03]Possible Influence of Elevated Stratopause Events on the Lower Atmospheric Circulation

★ Invited Papers

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Keywords:Elevated Stratopause Event, Energetic Particle Precipitation, Sudden Stratospheric Warming, Chemistry Climate Model

The reformation of a separated elevated stratopause after strong stratospheric sudden warmings is an important phenomenon in the coupling between the stratosphere and mesosphere-lower thermosphere. Since such events, called as the Elevated Stratopause Events (ESEs), are closely linked to the downward transport of NOx produced in the mesosphere and thermosphere via the Energetic Particle Precipitation (EPP), they could contribute to catalytic ozone destruction in the stratosphere. This is a notable case of the so-called EPP indirect effect. Here, we analyze the polar stratospheric ozone loss due to ESEs and its impact on the lower atmospheric circulation in the Earth System Model of Meteorological Research Institute (MRI-ESM). By introducing the energetic particle forcing in the MRI-ESM, the EPP indirect effect is examined for multiple ESEs. In simulations which are nudged toward reanalysis data in the troposphere and stratosphere while being unconstrained above, ozone reduces by up to 40% in the upper stratosphere for several weeks after ESEs due to the NOx enhancements. The reduction of stratospheric ozone causes cooling anomalies of the polar-cap temperature and westerly anomalies of the zonal-mean zonal wind during the period of sunlit. Further, it is revealed that such anomalies can propagate down to the troposphere and surface by conducting a series of ensemble simulations, without the nudging, for a case of the largest ESE accompanied by large EPP. Thus, this study presents the possible coupling between the upper-to-middle atmosphere and lower atmosphere via the ESE.