

長期再解析データを用いた高エネルギー粒子降り込みに 対する中層大気応答の研究

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Dynamical response of the middle atmosphere to energetic particle precipitations in the latest reanalysis data

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The latest solar cycle minimum sometime around 2009 showed unusually low solar activity and suggested the possibility of a grand solar minimum in the near future. This event caused much attention to be focused on studies regarding solar influence on the Earth's climate. The recent review by Gray et al. (2010) classified solar forcing on the Earth's climate to be of four types: galactic cosmic rays, total solar irradiance (TSI), solar ultraviolet radiation (UV), and energetic particle precipitations (EPP). Although EPP has not attracted much attention compared with TSI and UV in the past, several recent studies indicate that EPP could have a significant impact on the Earth's climate, comparable with that of TSI and UV. However, reliability of some of these studies was recently questioned (Tomikawa, 2015). In this study, the past 36 years were divided into high, medium, and low energetic particle forcing (EPF), and solar maximum, medium, and minimum conditions using Ap index and F10.7 radio flux, respectively. Then composite figures of middle atmosphere in the winter southern hemisphere were created from the latest reanalysis data and compared between medium and low EPF during the solar minimum. They showed that there was a statistically significant difference between medium and low EPF.

References

Gray et al., Solar influences on climate, *Rev. Geophys.*, 48:RG4001, doi:10.1029/2009rg000282, 2010.

Tomikawa, Y., Commentary: Energetic particle forcing of the Northern Hemisphere winter stratosphere: comparison to solar irradiance forcing, *Front. Phys.*, 3:68, doi:10.3389/fphy.2015.00068, 2015.