国際共同観測による北極成層圏突然昇温に伴う南北両半球結合の研究

An International Observation Campaign for a Study of Interhemispheric Coupling Initiated by Sudden Stratospheric Warmings in the Arctic

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Recent observational and modelling studies suggest that the Northern and Southern Hemispheres of the earth atmosphere are potentially coupled by the Lagrangian mean flow in the mesosphere modulated by waves interacting with the mean flow. However, observations of modulated wave and flow fields which are needed for quantitative understanding of the interhemispheric coupling are not sufficient. Simultaneous observations of gravity waves at various locations are most important because they are a main driver of the Lagrangian mean flow in the mesosphere.
With the start of full system observation by the PANSY radar in the Antarctic in March 2015, a global mesosphere-stratosphere-troposphere (MST) radar network extending from the Arctic to the Antarctic has been realized. The MST radars are able to observe wind vectors with fine temporal and vertical resolutions including vertical wind components in the troposphere, stratosphere and mesosphere, although an observational gap of the middle and upper stratosphere remains. Thus, the characteristics of small-scale or short-period wave motions including gravity waves and the momentum fluxes associated with these waves can be estimated with a good accuracy.
In addition, recent high-resolution general circulation models enable an explicit simulation of gravity waves under ideal and/or climatological boundary conditions and allow us to examine the momentum budget in the MST region including gravity waves, although their resolution is currently not sufficient to resolve the entire gravity wave spectrum. Real atmosphere simulations utilizing such high-resolution models are still a challenge for the MST region. However, if such real atmosphere simulations are successful, they will help quantitative interpretation of the dynamical fields observed by the MST radar network, and the observations will provide invaluable validation data for the model improvement.
Therefore we will examine the interhemispheric coupling of the earth atmosphere through a combination of simultaneous observations by networking the MST radars over the world and high-resolution model simulations of the observed atmosphere. This is an official project, ICSOM, for SCOSTEP, but it is closely related to SPARC. The first international observation campaign was successfully performed during a time period from 22 January-17 February, 2016 when two minor warming occurred in the Arctic stratosphere. Seven MST radars and many other radars and optical instruments providing complementary observational data were operated. More than 30 scientists in eight countries are participated in this project. A preliminary result from this observation campaign will be presented.

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