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

[A-AS02]Large-scale moisture and organized cloud systems

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Tue. May 22, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
Water vapor plays a significant role in regulating the global atmospheric circulation, especially in the troposphere. The overturning circulation is directly driven by the longwave radiative cooling of water vapor and the latent heating/cooling through microphysical processes to balance it. This global circulation is composed of diverse atmospheric phenomena with various spatial and temporal scales. Developments of some significant turbulent motions such as 3D isotropic turbulence in clouds, stratocumulus and cumulus convection, squall lines and tropical cyclones, and the Madden-Julian oscillation, are essentially associated with moisture anomaly in each scale. Moisture is accumulated relatively slowly in larger horizontal scales, but is consumed relatively quickly in smaller ones. This significant scale gaps between the accumulation and consumption may be one of the causes of the long-lasting difficulty in developing the theory of the moist atmosphere. The aim of this session is to share the recent researches about the relationships between moisture and organized cloud systems in wider spatial and temporal scales to enhance collaborations between modeling, observational, and theoretical approaches in tackling this challenging task.

[AAS02-P03]Dynamical mechanisms of anomalous moisture transport towards East Antarctica

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Keywords:moisture transport, East-Antactica, evaporation-precipitation linkages

During the last decade Antarctic ice sheet accumulation patterns exhibited large regional differences. While the total ice-sheet mass of Antarctica declined, East-Antarctica experienced increases in ice mass. During 2009 and 2011, this increase was caused by only a handful of intense precipitation events. In this study, we investigate such an episodic accumulation event, thereby exploring the atmospheric linkages between oceanic evaporation in subtropical regions and Antarctic ice-sheet accumulation. As Antarctic ice-sheet accumulation, and thus sea-level change, is contingent on episodic snow events, understanding the underlying dynamical mechanisms is instrumental for assessing global sea-level changes.

We use both Eulerian and Lagrangian analysis to demonstrate that moisture transport was facilitated by several cyclones of different scales. Moisture transport towards East-Antarctica occurred in coherent air-streams, manifested initially as intense low-level jets embedded in the warm sector of the cyclone(s), followed by a transition to slantwise (pseudo-isentropic) ascent before reaching the continent. Water vapor loading of this moist-conveyor-belt was driven by low-level convergence in the warm sector along the advancing cold-front, whereas the slantwise ascent phase of the moisture transport was characterized by moisture removal (precipitation). Oceanic evaporation along the filamentary structured, anomalous moisture transport area was virtually absent, indicative for long-range moisture transport during the event. In addition to the moisture transport mechanisms we identified moisture source regions associated with the event.