[EE] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-OS Ocean Sciences & Ocean Environment

[A-OS08]Seasonal-to-decadal climate variability and predictability

convener:Takashi Mochizuki(Japan Agency for Marine-Earth Science and Technology), V Ramaswamy(NOAA GFDL), Yushi Morioka(海洋研究開発機構)

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Climate variability on seasonal-to-decadal timescale (e.g. ENSO, IOD, PDO, AMO) involves processes and multiple physical interactions among atmosphere, land, ocean and sea-ice. Many efforts have been made for understanding the underlying physical processes and its predictability, but there remain large uncertainties in model simulation and prediction results of the seasonal-to-decadal climate variability. This indicates that some important gaps still exist in our current knowledge which are not fully resolved in current climate models, for example, atmosphere-ocean-ice interaction, troposphere-stratosphere coupling, initialization, and role of anthropogenic forcings. This session aims to narrow the gaps in our knowledge and identify the unresolved issues for better understanding and prediction of seasonal-to-decadal climate variability. All the observations, theoretical, process-level and modelling research on seasonal-to-decadal climate variability and its predictability are greatly welcome.

[AOS08-P09]Interdecadal Explosive Cyclone Activity Associated with the Increased Frequency of Winter Storm Events in Hokkaido, Japan

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Keywords:Explosive cyclone, Rossby wave propagation, Climate regime shift

This study examined the explosively developing extratropical cyclone activity in the vicinity of Japan in winter from 1979/80 to 2016/17 using the Japanese 55-year reanalysis data. The in situ observation and reanalysis data revealed the increased frequencies of both strong winds and heavy precipitation in Hokkaido region after the end of the last century, which was consistent with the fact that the cyclones migrating along the Kuroshio Current (KC cyclones) tend to approach the Hokkaido region in recent years. To investigate the factors controlling the cyclone track and rapid development, we made composite analyses with respect to the northward-migrating type (N-type) and eastward-migrating type (E-type) KC cyclones. At the N-type cyclone, quasi-stationary Rossby wavetrains prevailed along the polar front and subtropical jets over the Eurasian continent, thereby forming a pair of an upper-level trough (ridge) to the west (east) of the cyclone. An upper-level divergence accompanied by rapid development of the N-type cyclone excited quasi-stationary Rossby waves downstream as a Rossby wave source, leading to further reinforcement of the upper-level ridge east of the cyclone. The anomalous high with a barotropic nature is capable of forcing the cyclone track to shift more northward. Furthermore, a combination of the N-type cyclone and the anomalous high to its east facilitates moisture import into the cyclone system from lower latitudes, contributing to enhanced moisture flux convergence. In reality, the diabatic heating in the vicinity of the cyclone's center is larger in the N-type cyclone than in the E-type one. From the viewpoint of interdecadal variability, the recent La Niña-like SST pattern increased the precipitation in the vicinity of the Philippine Sea, the South China Sea and the Bay of Bengal, and its Rossby wave response strengthened the anticyclonic circulation over the subtropical jet in the southern China. It is suggested that the pronounced stationary Rossby wave propagation along the subtropical jet related to a climate regime shift in the tropics is responsible for the recent increased number of the N-type cyclone.