[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)

Sun. May 20, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

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-P07]Decadal variability of sea surface temperature around Japan

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Keywords:sea surface temperature, sea around Japan, decadal variability

Sea surface temperature (SST) around Japan shows not only long term warming trend but also variability on decadal time scale. In this study, the decadal variability of SST around Japan is investigated with focus on the relation to surface air temperature (SAT) averaged over Japan, the atmospheric circulation in the Northern Hemisphere, and their seasonal differences.

We analyzed the SST and SAT data for the period from 1958 to 2016. We found that the time series of the SST anomalies averaged around Japan is similar to that of SAT over Japan on decadal time scale, such as anomalous negative values in the mid 1980s, following increase around 1990, and enhanced seasonal contrast after the late 1990s with a cooling tendency in winter and a warming tendency in summer. The decadal variations of SST around Japan and SAT over Japan, which are derived from detrended and 5-year running mean data, are significantly correlated except for the spring SST in the east of Honshu (Fig. 1).

The dominant SST variations are derived by empirical orthogonal function (EOF) analysis, and the correlation between the obtained first EOF mode and the atmospheric circulation are investigated in winter and summer. In both seasons, the first modes explain about half of the total variance. In winter, the spatial pattern of the first EOF mode has large amplitudes west of Japan. A correlation map between the temporal coefficient and anomalies of the 500 hPa height in the Northern Hemisphere is close to the western Pacific (WP) teleconnection pattern. Comparison of the individual cold periods indicates that the East Asian winter monsoon plays important role in the winter decadal variability. As to the summer SST, the first EOF mode exhibits the spatial pattern which has large amplitude north of Japan. The temporal coefficient is highly correlated with the precipitation and the outgoing longwave radiation anomalies in the western equatorial Pacific region. It is likely that the summer variability is associated with the mid-latitude tropospheric warming affected by the tropical convective activities.

The spring SST variability in the east of Honshu which has weak correlation with that of SAT over Japan shows good correlation with the change of the area occupied by the Oyashio. We discuss their relation in terms of the ocean circulation dynamics.