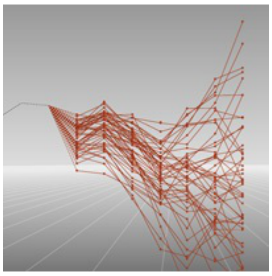

Contribution ID: **43**　　　　Type: **not specified**

Multi-Scale Impacts of Extratropical Ocean on the Atmosphere

Tuesday, 3 September 2019 10:00 (50 minutes)

Unlike in vast areas of midlatitude ocean basins, the warm midlatitude/subtropical western boundary currents and associated oceanic frontal zones can potentially impact the overlying atmosphere. Multi-scale aspects of the impacts are overviewed in this presentation. Effective moisture supply from a warm current to individual cyclones and efficient restoration of near-surface atmospheric baroclinicity across frontal sea-surface temperature (SST) gradient allow recurrent development of cyclones, contributing to the formation of a stormtrack and associated eddy-driven polar-front jet (PFJ) along the frontal zone. The presence of midlatitude oceanic fronts is thus essential for the annular mode, as a manifestation of wobble of a PFJ, especially over the Southern Ocean, where oceanic fronts are more or less circumpolar. In the North Pacific, variability of oceanic fronts accompanies persistent SST anomalies, manifested as centers of action of decadal SST variability. Caused by ocean dynamics, decadal displacement of the subarctic frontal zone can force a basin-scale atmospheric anomaly into midwinter through modulating stormtrack activity.

Furthermore, intense heat and moisture release from the warm western boundary currents leaves distinct meso-scale imprints in the atmospheric boundary layer. The most notable imprint is locally enhanced convective precipitation, as observed along the Gulf Stream and Kuroshio, in association with enhanced surface wind convergence. Frequent cold-air outbreak associated with traveling weather systems along the nearby stormtrack enhances sensible heat flux from the warm current and thereby favors formation of shallow convective clouds. In summer, high SST along the Kuroshio and East China Sea helps organize deep convective precipitation under the moist monsoonal southwesterlies toward the Baiu/Meiyu rain front. Under the monsoonal northerlies in winter, the warm Kuroshio also organizes shallow convective stratocumulus within well-developed unstable mixed layer, where strong ascent acts to augment the super-saturation level, thus leading to a substantial increase in cloud droplet density.

Primary author: NAKAMURA, Hisashi (RCAST, University of Tokyo)

Co-authors: MANDA, A (University of Tokyo); TAGUCHI, B (University of Tokyo); OGAWA, F (University of Tokyo); NISHII, K (University of Tokyo); KOIKE, M (University of Tokyo); NONAKA, M (University of Tokyo); MASUNAGA, R (University of Tokyo); IIZUKA, S (University of Tokyo); OKAJIMA, S (University of Tokyo); SEKIZAWA, S (University of Tokyo); MIYAMA, T (University of Tokyo); MIYASAKA, T (University of Tokyo)

Presenter: NAKAMURA, Hisashi (RCAST, University of Tokyo)

Session Classification: Session 2: Physical processes, modelling and initialization requirements