令和三年度　環境科学院　修士論文内容の要旨

Effect of sea surface temperature on precipitation variability in East Asia induced by the boreal summer intra-seasonal oscillation

（夏季の季節内振動に伴う東アジアの降水変動に対する海面水温の効果）

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The rainy season in Asia starts with the onset of Indian summer monsoon and East Asian summer monsoon. The East Asian summer monsoon migrates northward during summer, comprising with short-term variability mode referred to as Boreal Summer Intra-Seasonal Oscillation (BSISO). During active phase of BSISO, convective systems developed near the equatorial Indian Ocean gradually move north and northeast, and they decay in the western North Pacific. Recent studies focusing on the relationship between BSISO and other atmospheric and oceanic factors suggested that the high precipitation in East Asia during the active phase is attributable to the water vapor advection induced by southwesterly wind toward East Asia. Considering the effect of sea surface temperature to modulate precipitation systems, it is expected that the convective system embedded in BSISO is intensified when sea surface temperature is high. However, researches about the effect of sea surface temperature on BSISO-induced precipitation variability is limited. Therefore, this study investigated the role of sea surface temperature on the variability of East Asian precipitation induced by the BSISO. This study conducted statistical analysis using the daily time series of principal components obtained from empirical orthogonal function analysis for 25-90-day filtered outgoing longwave radiation data during 1979–2009. For each calendar day, the phase of BSISO which roughly corresponds to the location of the convective systems was determined using the principal components. Atmospheric condition for each BSISO phase was examined using atmospheric variables obtained from Japanese 55-year reanalysis. It is confirmed that positive precipitation anomaly dominates in East China Sea and western Kyushu when convection center corresponding to BSISO is located in East China, Koran peninsula, and western Japan. This precipitation anomaly is locally enhanced when sea surface temperature is higher in the Yellow Sea. This precipitation enhancement is partly maintained by southwesterly wind blowing over the Yellow Sea corresponding to the increase of latent heat flux from the ocean. When BSISO-induced convective system is located in western North Pacific near Japanese island, positive precipitation anomaly is found in Okinawa and southern Kyushu. The variation of sea surface temperature over the Yellow Sea is synchronized with that in East China Sea, Japan Sea, and western North Pacific. This feature causes strong moisture transport due to the southerly wind blowing toward East Asia when these oceans are warm. Moreover, when sea surface temperature is higher in the Yellow Sea, larger latent heat flux is found in East China Sea, Japan Sea, and western North Pacific, which is attributable to the positive precipitation anomaly in Okinawa and southern Kyushu.