令和元年度　環境科学院　修士論文内容の要旨

Estimation of freshwater discharge from the Kamchatka Peninsula to its surrounding oceans
（カムチャッカ半島から周辺海域への淡水流出量の見積もり）

北海道大学大学院　環境科学院
環境起学専攻　人間・生態システムコース
史　穆清 (Shi Muqing)

The Sea of Okhotsk is the southernmost sea in the Northern Hemisphere with considerable surface sea ice cover during cold seasons. Abundant brine that being expelled during the surface sea ice formation causes an increase of salinity and density of shelf waters, and therefore the formation of dense shelf water (DSW). DSW produced in the northern Sea of Okhotsk is later transported to the intermediate layers (300m to 1000m below sea surface) and supplies these layers with colder, fresher, and oxygenated water, which is important to the North Pacific oceanic ecosystem. The density of DSW is determined by its salinity, which was previously found to be controlled mainly by surface salinity anomaly that propagate along pathways associated with ocean currents from the Bering Sea to the Sea of Okhotsk. Freshwater discharge from the Kamchatka Peninsula (KP), of which coasts are located in the middle of those salt pathways, were therefore speculated to have impacts on the variation of DSW salinity. However, no quantitative conclusion was drawn due to limited observational data. In this study, observed discharge data of 11 major rivers in KP were obtained and first-time analyzed. Based on the discharge data, two different types of methods were applied in this study to estimate total freshwater discharge from the rivers in KP: possible correlations among several features of the 11 observed basins were analyzed by using the multiple regression analysis, then average annual freshwater discharge from the entire KP was estimated based on a statistically significant regression model ($r^2 = 0.83, p < 0.01$); monthly freshwater discharge from the western KP from 1984 to 2013 was simulated and estimated by using the Soil and Water Assessment Tool (SWAT), a numerical model. While the precise mechanism behind the correlation may be complicated, the year-to-year variation of DSW salinity was found to be statistically correlated with the year-to-year variation of annual freshwater discharge from western KP ($R = 0.60, r^2 = 0.35, p < 0.01$) after a gradually shifting time lag between the two were applied. Our results present several findings that are consistent with previous studies, and indicate that the freshwater discharge from the western KP is most probably one of the controlling factors in determining the salinity of DSW, hence its formation as well.