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Paleoceanographic changes of the East Sea during the last glacial maximum

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Abstract text:

Global drop of 130m in sea level is one of the most striking phenomena during the last glacial maximum (LGM). The LGM features seem to have been synchronous around the Korean seas. The East Sea, a semi-enclosed marginal sea in the northwest Pacific, is marked by the nearly geographic isolation and the low sea surface salinity (down to about 20‰) associated with abnormally light δ^{18}O values of planktonic foraminifera during the LGM. The East Sea might have the only connection to the open ocean through the Korea (Tsushima) Strait (about 140 m in sill depths), allowing the Tsushima Current to enter the sea during the LGM. This study attempts to estimate

a volume transport of the paleo-Tsushima Current via the Korea Strait and further to elucidate its implications for the low sea surface salinity during the lowest sea level of the LGM.

The influx amount through the very narrow paleo-Korea Strait during the LGM is calculated approximately (0.5$\sim$2.1) x $10^{12}m^3$/yr on the basis of bathymetry, seismic reflection profiles and modern current data. The East Sea is characterized by cold, windy and dry climates during the LGM, further suggesting higher evaporation over precipitation. The net evaporation (0.3$\sim$0.9) x $10^{12}m^3$/yr was derived from the previous paleoclimate studies. The difference between volume transport and excess evaporation may indicate that some amounts of the paleo-Tsushima Current ultimately escaped from the East Sea surface during the LGM. This further suggests that the paleo-Tsushima Current passing through the Korea Strait was not seawater, but mixture of saline and fresh waters, subsequently decreasing sea surface salinity in the LGM East Sea. However, the paleo-Tsushima Current influx itself might have not been large enough to significantly lower the paleosalinity of about 100m-thick East Sea surface layer during the LGM, strongly implying additional freshwater supply (e.g. the Amur River) to the sea. Finally, this study may help understand a close relation between paleoclimate changes and oceanographic events in semi-isolated shallow sea which is sensitive to fluctuating sea levels.