Deglacial productivity changes reflect XRF Br fueled by Cordilleran Ice Sheet dynamics

*Md Nurunnabi Mondal[1], Keiji Horikawa[2], Katsuya Nejigaki[3], Hideki Minami[4], Masafumi MURAYAMA[5], Osamu Seki[6], Yusuke Okazaki[7]

1. a. Graduate School of Science and Engineering for Education, University of Toyama, Japan, b. Department of Fisheries Management, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Bangladesh, 2. Graduate School of Science and Engineering for Research, University of Toyama, Japan, 3. Graduate School of Integrated Arts and Sciences, Kochi University, Japan, 4. School of Biological Science and Engineering, Tokai University, Japan, 5. Faculty of Agriculture and Marine Science, Kochi University, Japan, 6. Institute of Low Temperature Science, Hokkaido University, Japan, 7. Graduate School of Science, Kyushu University, Japan

During the last deglaciation, the Cordilleran Ice Sheet (CIS) was rapidly melted and supplied a huge amount of meltwater to the coastal areas in the northeast Pacific. The timing of decay of the CIS and its impact on productivity in adjacent coastal areas in the northeastern North Pacific is not well known and has been under investigation. Here, to further constrain the timing of decay of the CIS and its impact on productivity, we generated high-resolution XRF core scanner data together with a multiple set of destructive geochemical data, such as planktonic foraminiferal oxygen and carbon isotope, and Sr-Nd-Pb isotopes of bulk sediments from core CL14PC in the Gulf of Alaska (59˚ 33.35´N, 144˚ 09.35´W, water depth 690 m), the northeastern Pacific.

We found that δ^{18}O of both -*Neogloboquadrina pachyderma* (sinistral) and *Globigerina bulloides* gradually decreased at ~16.7 cal ka BP and then sharply decreased at 14.8 cal ka BP, corresponding to the onset of the Bølling-Allerød. Before the onset of the Bølling-Allerød, there were three pronounced IRD (ice-rafted debris) layers at ~16.49, ~16.17 and ~15.65 cal ka BP, suggesting that gradual warming conditions might have caused multistep collapses of the coastal ice lobes of the CIS. However, lower TOC, higher organic carbon/total nitrogen ratios during this period indicate lower primary productivity. Probably, lower temperatures, increased water turbidity, and increased stratification should be the key variables for suppressing primary productivity.

During the Bølling-Allerød (14.8–13.0 cal ka BP) and the early Holocene (Preboreal, 11.7–10.8 cal ka BP), both foraminiferal δ^{18}O records decreased, with exhibited prominent peaks up to 1.9 ‰and 1.88 ‰at 14.57 cal ka BP, and 1.93‰ and 1.65‰ at 14.14 cal ka BP (may reflect two discrete episodes of very high meltwater input) for *N. pachyderma* (sinistral) and *G.bulloides*, respectively, suggesting that increased temperature and low salinity, and due to the abrupt warming during this period triggered rapid decay of the CIS and discharges of meltwater. The fact that XRF Br counts are highly correlated with TOC contents in our core supports that Br counts can be used as a proxy of productivity. The high-resolution Br counts and TOC data showed high productivity at 14.8–13.0 cal ka BP and 11.7–10.8 cal ka BP corresponding to the regional expressions of Bølling-Allerød and Preboreal, respectively.

Keywords: Paleoproductivity, XRF Br, Meltwater, Cordilleran Ice Sheet, Gulf of Alaska, Deglaciation

