# Iron flux to the northern North Pacific estimated from the ice-core of Mt.Wrangell, Alaska

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**Introduction**

The northern North Pacific Ocean is one of the High Nutrient Low Chlorophyll (HNLC) ocean areas where biological productivity is low for high nutrient. Martin (1990) hypothesized that the iron play a key role in phytoplankton growth in these areas. Kosa is the huge dust storm occurs in the East Asian Continent and includes the iron as basis. It is deposited into the northern North Pacific Ocean region while on a transporting through this area.

In the northern North Pacific, there is a climate phenomena called PDO (Pacific Decadal Oscillation) that climatic state changes significantly in a several decades period. Recent studies pointed out that PDO occurs not only in a climate but also biological productivity in the ocean. Our research group suggested that PDO in climate at the northern North Pacific and fluctuations of the ecosystem in the ocean are connected by air-borne trace metal from Asian Continent. To make out this hypothesis, we continuing analysis of ice cores drilled around the northern North Pacific region for estimating of the nutrient flux provided from atmosphere. We measured high resolution iron concentration of the ice-core drilled at Mt. Wrangell, Alaska in 2003.

**Iron concentration profile**

We measured iron concentration in the ice-core from 0 to 30 m (Sasaki 2008). Yasunari et al. (2007) estimated the age of ice core above 30 m recovered from 1997 to 2003. The profile of iron concentration shows that high concentration appeared in every spring from 1997 to 2003. Especially, remarkable high concentrations were shown in 2001 and 2002 when drastic Kosa phenomena in spring were observed in Japan. Accordingly, we suggest the iron profile of the ice core reflect on the variation of the dust flux from the Asian Continent.

**Iron flux from atmosphere**

We calculated iron flux from the iron concentration in the ice-core sample from the length and the density of the ice-core sample. The iron fluxes in spring from 1997 to 2000 ranged 2.8-9.3 mg/m$^2$. These values are comparable to the iron fluxes estimated by Duce and Tindale (1991), and Mahowald et al. (2003). We assume that one peak of iron concentration observed in 2001 and 2002 correspond to one Kosa event. The average of iron fluxes of each Kosa event in 2001 and 2002 was 10 mg/m$^2$.

**The impact to the ocean's iron concentration**

Several previous works showed that dissolved rate of air-borne iron in the ocean was 2-10 %. The depth of vertical mixing layer in winter at the northern North Pacific is approximately 30m (Nishioka personal communication). If we assumed that 2 % of airborne iron can be dissolved in surface 30 m of ocean, 0.13nM of iron can be dissolved from 10 mg/m$^2$ of air-borne iron flux, and can increase the concentration of iron in ocean twice.

**References**

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