# Iron fertilization and atmospheric CO2 change during Heinrich event: a model study

*Akitomo Yamamoto[1], Ayako Abe-Ouchi[2,1]

1. Japan Agency for Marine-Earth Science and TechnologyAtmosphere and Ocean Research Institute, 2. Atmosphere and Ocean Research Institute, The University of Tokyo

Weakening of the Atlantic Meridional Overturning Circulation (AMOC) during Heinrich events was often accompanied by the atmospheric $CO_2$ increase of 10–20 ppm over 1000 years (Ahn and Brook, 2008). However, previous modeling studies display conflicting atmospheric $CO_2$ responses to an AMOC shut down. Recent paleoproxy records suggest that dwindling iron fertilization by dust in the Southern Ocean can also explain millennial-scale $CO_2$ oscillations (Martínez-García et al., 2014). In this study, we investigate the response of atmospheric $CO_2$ to changes in ocean circulation and dust-borne iron supply using numerical models. In associate with the AMOC weakening from 26 Sv to 6 Sv, the atmospheric $CO_2$ decreases by 0.5 ppmv over 1000 years. Combining AMOC weakening and decrease in dust-borne iron supply, the atmospheric $CO_2$ increases by 16 ppm over 1000 years. Reduction in export production associated with dwindling iron supply in the Southern Ocean release carbon from the deep sea, contributing to the rise of atmospheric $CO_2$. Reduction in export production also increases dissolved oxygen in the Antarctic Bottom Water, which is consistent with proxy records. Our results support the contribution of changes in dust-borne iron supply to the millennial $CO_2$ change in the glacial periods.

Keywords: ocean carbon cycle, glacial-interglacial cycle, iron cycle, ocean biogeochemical model

 