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Constructing the age of Dome Fuji ice core using a dating model

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Past climate change is regarded as a key knowledge for predicting future climate changes. Milankovich theory has explained the climate changes from Glacial to Interglacial periods with variations of seasonal solar radiation caused by Earth's orbital parameters (eccentricity of orbit, obliquity and precession of rotation axis). Kawamura et al. (2007) indicated that Antarctic temperature rose during deglaciations following or at the same time of the solar radiation increase in Northern Hemisphere summer. In addition, the greenhouse gas, which facilitates the air temperature to rise, is thought as another important element for the past climate change.

To estimate the contribution of orbital and carbon dioxide forcings to the climate changes, especially at the start of the deglaciation, we have make construct the age of ice core and air occluded in it. The difference in age between the ice and gas at the same depth occurs in firn (consolidated snow) while they are compressed to become ice from snow. The gap between these ages was estimated to be about 5,000 years in glacial maxima, but the time lag between temperature and carbon dioxide is on the order of 0-1000 years. Therefore, we should make accurate adjustment of the age of the ice and the age of gas, in order to discuss the contributions of carbon dioxide for the temperature rising at the deglaciation.

In particular, the second Dome Fuji deep ice core needs accurate estimation of thinning function in the bottom part (within ˜500 m from the bed corresponding to 340-700 kyr ago). The thinning function, which expresses the horizontal stretching and vertical compression of an ice layer, would be changed for geothermal heat in the bottom of the ice sheet. We tried to adjust the parameters, thinning function, accumulation rate and the difference of age between the ice and the gas in the ice. In the presentation, we will present results from the adjusted ice age and gas age.

Keywords: ice core, dating, paleoclimate