Climate change in the Tertiary: a carbon cycle model

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We conducted a computer modeling of a carbon cycle in the Tertiary, and concluded following three possibilities. (1) We can not explain the global warming in the middle Mioene only by the spreading of back-arc basins. (2) In applying a carbon cycle model, we should reconsider about CO2 degassing flux at subduction zones. (3) In some way, we should take into account of albedo on a timescale of the Teritary, at least during the 15 million years.

It is a computer modeling that is one of the useful methods to estimate the global climate change on a geochemical timescale. The change of atmospheric CO2 is believed to be a important cause for the global climate change. Therefore, it is accepted that a computer model of the carbon cycle makes it possible to elucidate the paleoclimate.

Although such computer modelings have been constructed by several investigators (e.g. Berner et al., 1994, Tajika, 1998, the following two points have not been considered.

1. The global warming in the middle Miocene, and 2. CO2 degassing at back-arc basins brought about by the spread of them

We conducted a new computer modeling of the Tertiary climate change based on GEOCARB (Berner et al., 1994), especially considering above two points. We have taken into account of the reservoirs of the atmosphere-ocean, crust, and mantle by considering the parameters of the carbonate area on land, run off, uplift factor, weathering feedback, seafloor spreading rate, back-arc basin spreading rate, and eruption rate of volcanic rocks during the Tertiary. As a result of calculates, we suggest the following three possibilities :

1. We can not explain the global warming in the middle Miocene only by the spreading of back-arc basins.
2. In constructing a carbon cycle model, we should reconsider about CO2 degassing flux at subduction zones.
3. We should take into account of albedo on a timescale of the Tertiary, at least 15 million years from the middle Miocene to the present.