

## Development of a coupled C-S-P cycle model and reconstruction of the variations in atmosphere-ocean system over the Phanerozoic

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There have been a lot of geochemical carbon cycle models since Berner et al. (1983) developed a model known as BLAG model. Berner (1994) developed the GEOCARB model which reconstructs the atmospheric pCO<sub>2</sub> over the Phanerozoic, and is referred to as a standard geochemical carbon cycle model. This model, however, cannot calculate the variation of seawater compositions which provide information comparable to geological record.

We therefore develop a new geochemical carbon cycle model to reconstruct the variation of seawater compositions. The ocean box is separated into surface, intermediate, and deep waters and the model calculates calcium, magnesium, sulfate, phosphate, DIC, and alkalinity in the ocean. With the high resolution input data of d<sup>13</sup>C and seafloor spreading rate, we can reconstruct the high resolution atmospheric pCO<sub>2</sub> and pO<sub>2</sub> variation. While the GEOCARB model treats the atmosphere as a one box, we use a one dimensional energy balance climate model to calculate meridional temperature distribution and chemical weathering rate at each latitude.

The variation of pCO<sub>2</sub>, pO<sub>2</sub>, and seawater composition during the Phanerozoic will be investigated and compared to the previous results, and roles of the ocean anoxic events and the phosphorus cycle in the behaviors of the geochemical cycle system will be discussed.