

Tracing the formation of marine authigenic alumino-silicate clays using silicon isotopes of coretop marine sediments

ZHEWEN XU^{1,2}, PATRICK J. FRINGS² AND GAOJUN LI¹

¹Nanjing University

²GFZ Helmholtz Centre for Geosciences

The formation of marine authigenic alumino-silicate clays (MAAC) in marine sediments plays a critical role in Earth's elemental cycles and serves as a carbon source to the surficial environment. However, the factors that control MAAC formation remain poorly understood. A key challenge is that in deltaic regions, where MAAC formation is believed to be most intense, the MAAC are often diluted by substantial amounts of terrestrial material. Regarding the controlling factors of MAAC formation, some studies suggest that the reaction rate is limited by dissolved Si concentration in seawater [1, 2], while others propose that the supply of terrestrial materials could control MAAC formation [3, 4].

Silicon isotopes ($\delta^{30}\text{Si}$) offer a promising approach to quantitatively distinguish MAAC from terrestrial detrital material in sediments. This is because that MAAC generally have different $\delta^{30}\text{Si}$ values with terrestrial material. Here, we investigate the $\delta^{30}\text{Si}$ values of clay-size offshore coretop sediments from three short cores along the Chilean coast, along with fluvial sediments of nearby rivers. By combining the mass fraction of clays and sedimentation rates, we estimate the precipitation rates of MAAC at the three sites. Furthermore, we discuss the regional and global factors controlling MAAC formation and explore its potential variations in the geologic past.

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[4] Van Cappellen, P. and L. Qiu (1997), *Deep Sea Research Part II: Topical Studies in Oceanography* 44, 1129-1149.