Geophysical Research Abstracts
Vol. 18, EGU2016-11693, 2016
EGU General Assembly 2016

Variability in magnesium, carbon and oxygen isotope compositions, and trace element contents of brachiopod shells: implications for paleoceanographic studies

Claire Rollion-Bard (1), Ségolène Saulnier (2), Nathalie Vigier (3), Aimryc Schumacher (4), Marc Chaussidon (1), and Christophe Lécuyer (5)

(1) IPGP, Géochmie et Cosmochimie, Paris, France (rollion@ipgp.fr, chaussidon@ipgp.fr), (2) Laboratoire de Géographie Physique, Meudon, France (segolene.saulnier@gmail.com), (3) Laboratoire d'Océanographie de Villefranche/Mer, Villefranche sur mer, France (nathalie.vigier@obs-vlfr.fr), (4) Centre de Recherches Pétrographiques et Géochimiques, Vandoeuvre, France (aimeryc@crpg.cnrs-nancy.fr), (5) LGL-TPE, Université Claude Bernard Lyon, Villeurbanne, France (Christophe.Lecuyer@UNIV-LYON1.fr)

Magnesium content in the ocean is $\approx$ 1290 ppm and is one of the most abundant elements. It is involved in the carbon cycle via the dissolution and precipitation of carbonates, especially Mg-rich carbonates as dolomites. The Mg/Ca ratio of the ocean is believed to have changed through time. The causes of these variations, i.e. hydrothermal activity change or enhanced precipitation of dolomite, could be constrained using the magnesium isotope composition (δ26Mg) of carbonates. Brachiopods, as marine environmental proxies, have the advantage to occur worldwide in a depth range from intertidal to abyssal, and have been found in the geological record since the Cambrian. Moreover, as their shell is in low-Mg calcite, they are quite resistant to diagenetic processes. Here we report δ26Mg, δ18O, δ13C values along with trace element contents of one modern brachiopod specimen (Terebratalia transversa) and one fossil specimen (Terebratula scillae, 2.3 Ma). We combined δ26Mg values with oxygen and carbon isotope compositions and trace element contents to look for possible shell geochemical heterogeneities in order to investigate the processes that control the Mg isotope composition of brachiopod shells. We also evaluate the potential of brachiopods as a proxy of past seawater δ26Mg values. The two investigated brachiopod shells present the same range of δ26Mg variation (up to 2 ‰). This variation cannot be ascribed to changes in environmental parameters, i.e. temperature or pH. As previously observed, the primary layer of calcite shows the largest degree of oxygen and carbon isotope disequilibrium relative to seawater. In contrast, the δ26Mg value of this layer is comparable to that of the secondary calcite layer value. In both T. scillae and T. transversa, negative trends are observable between magnesium isotopic compositions and oxygen and carbon isotopic compositions. These trends, combined to linear relationships between δ26Mg values and REE contents, are best explained by kinetic effects linked to changes in growth rate during the brachiopod life. The innermost calcite layer of T. transversa is in isotopic equilibrium for both oxygen and magnesium and could therefore be the best target for reconstructing past δ26Mg values of seawater.