Development of new Mg/Ca paleothermometry in the northwestern Pacific by plankton and surface sediment samples

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During the last decade, planktic foraminiferal magnesium/calcium (Mg/Ca) thermometry has been applied for evaluating paleo-sea surface temperature (SST) in the Quaternary. Until now, referred areas for Mg/Ca temperature estimations are comparatively dominated by the Atlantic and low latitude areas, therefore the data from the Pacific are few. To establish the reliable equation with high precision, it is needed to collect samples from broad areas in the world ocean. We tried to develop a calibration equation of Mg/Ca thermometry suitable for the western North Pacific using plankton tow and surface sediment samples. Living planktic foraminiferal samples were collected from water columns shallower than 400 m water depths in 13 locations near Japan to know the original Mg/Ca values. Moreover, additional 22 sediment samples were obtained from sea floors shallower than 3,000 m water depths in the western Pacific. Seven species (*Globigerinoides ruber*, *Globigerinoides sacculifer*, *Pulleniatina obliquiloculata*, *Neogloboquadrina dutertrei*, *Globorotalia inflata*, *Globigerinella aequilateralis*, and *Neogloboquadrina pachy* were used for Mg/Ca evaluation. The oxygen isotope ratios of foraminiferal shells were also measured to estimate calcification temperature of each species. As a result, calcification temperature was ranged 2.4-28.9 degrees C.

The Mg/Ca values of *N. dutetrei* in sediment samples were remarkably lower than that in plankton samples in same calcification temperature ranges. This result implies a possible postdepositional dissolution of *N. dutetrei*. Other 6 species were consistent in Mg/Ca values between plankton and sediment samples. On the other hand, *Globigerinoides ruber* had slightly higher Mg/Ca values at given temperatures than the other species. Therefore we concluded that each specific calibrations of Mg/Ca are needed. Finally we proposed following two calibrations for western North Pacific:

Mg/Ca = 0.688 exp (0.064T) for general calibration (6species)

Mg/Ca = 1.341 exp (0.044T) for Globigerinoides ruber

We will also mention the comparison with previous calibration studies in other ocean basins.