On the hygroscopic behaviour of marine particles enriched with biogenic nanogels

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The present study investigates the effect of nanogel organic matter <0.2 μm exuded by marine biota on the organic enrichment and hygroscopic behaviour of the submicron primary marine aerosol. This investigation is based on the laboratory generation of primary aerosol from seawater enriched with biogenic organic matter released by laboratory-grown algal cultures [1].

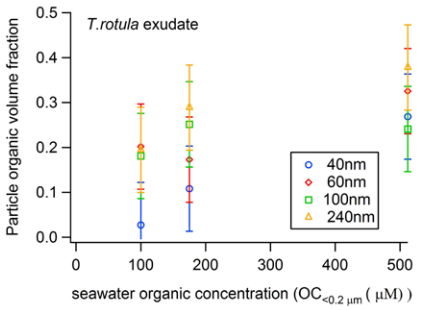

Figure 1. Particle organic volume fraction as a function of seawater organic concentration (OC<0.2 μm).

The primary particles organic fraction was found to correlate with the seawater organic concentration, with values on the order of 5–37% for seawater organic content between 175-512 μM. The particle organic fractions were found to be lower than those reported in atmospheric measurements [2] and no saturation in the particles organic composition was observed even for unrealistically high seawater organic content [3]. Because of the effect of the organic matter, the hygroscopic growth and cloud condensation nuclei activity of the organics-enriched particles were reduced in a 5–24% with respect to the organics-free primary marine aerosol.

[1] Fuentes *et al*. (2010) *Atmos. Meas. Tech.,* **3**, 141-162.
[2] O'Dowd *et al*. (2008) *Geophys. Res. Lett*., **35,** L01801.
[3] Fuentes *et al*. (2011) *Atmos. Chem. Phys.*, **11**, 2585-2602.

Prediction of coral reef calcification in Sesoko Island by ocean acidification

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Carbon dioxide has been increasing rapidly by fossil fuel combustion since industrial revolution, causing various global climate changes. Anthropogenic CO_2 induces lower pH in the ocean which is known as an "oceanic acidification". Lower pH level causes the decrease in the calcification rates of many calcifying marine organisms such as shellfish and coral. While many studies have been investigated on the influence of pH to individual marine species, the effects of oceanic acidification on the natural coral reef have not been elucidated. We present relationship between calcification rates and seawater CO_2 concentration (PCO_2) in Sesoko coral reef, Okinawa, Japan and predict the time when the calcifying environment in coral reef will turn to the dissolution with respect to $CaCO_3$.

We had continuously monitored the reef water PCO_2 (LI840A, Li-cor), total alkalinity (Alk-01, Kimoto), water current (Compact-EM, Alcec) and depth (U20, Onset) at Sesoko coral reef since October 2010. Outer reef water samples were taken about every few months to obtain the oceanic values. Alkalinity depletion method was applied to calculate the community metabolism under the natural water flow condition.

Calcification rate increased during daytime and decreased at night. However we observed no dissolution at Sesoko coral reef. Threshold of PCO_2 value at which $CaCO_3$ production turns to dissolution was calculated to be 945 ppm. This value was similar to the results derived from Molokai reef flat of Hawaii [1].

[1] Yates *et al*. (2006) *Biogeosciences* **3**, 357-369.