

## Atmospheric Fe-containing particles over the North Pacific Ocean : the mixing states with water-soluble materials

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Fe is an essential element for marine phytoplankton growth. Long-range transportation of atmospheric aerosols from the continent and subsequent deposition is an important process to supply Fe to the ocean. The dry and wet depositions of aerosol particles depend on the particle size and the mixing states with water-soluble materials. In order to study the mixing states of Fe-containing particles with water-soluble materials, we collected aerosol particles on the ship over the mid-latitude western North Pacific Ocean during the KH-12-1 (EqPOS) Leg 2 cruise of the R/V Hakuho Maru, Atmosphere and Ocean Research Institute (AORI), University of Tokyo. The leg started from Hawaii on February 21, 2012, and arrived at Tokyo on March 7, 2012. We collected aerosol particles with a low pressure impactor. Collected particles were analyzed using a transmission electron microscopy (TEM) with a water dialysis method. Most of maritime aerosols are consisted of water-soluble materials such as sea-salt and sulfate particles. Water-insoluble materials such as minerals and industrial metals are main sources of Fe. This study focused on water-insoluble materials and performed an energy-dispersive X-ray (EDX) analysis.

We classified the origins of encountered air masses on the basis of backward air trajectory analysis and number concentration of aerosols measured by an optical particle counter (OPC). Particles larger than  $D = 0.5 \mu\text{m}$  during dust events and background conditions (maritime or continental origins) were analyzed using the TEM. Number fractions of particles containing water-insoluble materials were 5-20% (0.5-1.0  $\mu\text{m}$  in diameter) and 15-50% ( $>1.0 \mu\text{m}$  in diameter). Most of water-insoluble materials were mixed with water-soluble materials (mixed particles). Median values of the volume percent of the water-soluble materials in the mixed particles on a maritime sample were  $>90\%$  and those on the other samples were 60-80%. Based on EDX analyses of water-insoluble materials, number fractions of Fe-containing particles were 2% (maritime), 2% (continental) and 8% (dust event), respectively. Fe-containing water-insoluble materials were found with other mineral components (Si or Al), and mixed with water-soluble materials.

Since phytoplankton growth requires dissolved form of Fe, we performed EDX analyses for the same particles before and after extractions of water-soluble materials from particles to estimate fraction of water-soluble Fe. The amount of Fe after the extraction was smaller comparing with the amount of Fe before the extraction, indicating that the water-soluble Fe is presented with the water-insoluble Fe.

Keywords: Fe, water-soluble materials, water-insoluble materials, dust, aerosol