# Hygroscopic Properties of Antarctic Sea Salt Aerosols Collected at King George Island

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## Abstract

Antarctica, having minimal influence from cross-continental anthropogenic aerosols, is the ideal region for studying natural sea salt aerosol (SSA) processes. This study aims to present a systematic examination of the inter-dependence of hygroscopic properties and the chemical heterogeneity of natural SSAs collected at the King Sejong station (62°22′S, 58°78′W), a Korean scientific research station in the Antarctic.

Aerosol particles were collected on Al foils (Aldrich, 99.8% purity) using a three stage cascade impactor ($PM_{10}$ Impactor, Dekati Inc.). The phase transition and hygroscopic growth of sea salt particles were observed using optical microscopy. Secondary electron images and energy-dispersive X-ray elemental maps provide morphology and distribution of the elements within each particle.

Among the natural SSAs observed so far, one type showed a deliquescence RH (DRH) at ~73.7 % (lower than pure NaCl) and an efflorescence RH (ERH) at 47.6 % (comparable to pure NaCl). The organic matter observed in the particle (from elemental maps) is probably hydrophilic. On the other hand, some particles showed apparent liquid-liquid phase separation (LLPS). For example, in one particle at 48.7 % RH, two apparently separate liquid phases (NaCl-rich and organic-rich) were observed. At 74.7 % RH, the NaCl-rich part showed deliquescence. The remaining part, which is $MgCl_2$ and organic-rich, hinders absorption of water possibly due to hydrophobic surface organic layer. The NaCl-rich part appear to crystallize at once (observed ERH = 49.4 %, higher than pure NaCl ERH), whereas the $MgCl_2$ and organic-rich part gradually decreased in size with decreasing RH. The heterogeneity of effloresced particle is well demonstrated through elemental maps. Studies on the hygroscopic properties of more natural SSA particles are in progress and will be presented.

**Key words:** Atmospheric Aerosols, Hygroscopicity, Antarctica, SSAs