Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

MIS01-P01 Room:Convention Hall Time:May 23 18:15-19:30

Concentration of small ions measured over the Pacific Ocean

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It has been proposed that climate could be affected by changes in cloudiness caused by variations in the intensity of galactic cosmic rays in the atmosphere. The cause of it is considered as a new particle formation with an ion induced nucleation. The ion-induced nucleation is occurred under the low concentration of particles and high concentration of ions, but there are a few reports. Then we observed small ions and aerosol size distributions over the Pacific Ocean.

Observations were performed from December 1, 2011 to March 6, 2012 on the R/V Hakuho Maru KH-11-10 and KH-12-1 (EqPOS) cruises over the Pacific Ocean. Small ions were measured with the Gerdien type meter (COM-3400). The critical mobility was set 0.7 cm2/V/s and we measured positive and negative ions alternately. Size distributions from 4.4 to 5000 nm in diameter were measured with a scanning mobility particle sizer (SMPS, TSI 3936N25 or 3936L22) and an optical particle counter (OPC, RION KR12 or KC01D). Small ions are generated with ionization of air by cosmic rays or radiation from radioactive substances. Small ions are lost by various mechanisms such as ion-ion recombination and ion-aerosol attachment. In order to estimate the contribution of the lost by ion-aerosol attachment, a coagulation sink was calculated. The coagulation sink can be deter-mined from CoagS = SUM [KijNj]. Here Kij is the coagulation coefficient and Nj is the number concentration in size class j (Kulmala et al., 2001) .

Main results are as follows:
1. There is a negative relation between ion concentration and coagulation sink over the Pacific Ocean. This suggests that concentration of small ions decreases by ion-aerosol attachment.
2. There is a positive relation between ion concentration and wind speed over the Pacific Ocean. This suggests that small ions are generated by bubble bursts of sea water.

References
Kulmala et al., Tellus, 53B, 479-490, 2001

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Keywords: small ion, aerosol, cosmic ray, radon

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Deducing Locations and Charge Moment Changes of Lightning Discharges by ELF/LF Network Observations in Japan

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The electromagnetic radiations from lightning discharges have been intensively studied for a long time in different frequency ranges. Recent observations of electromagnetic radiations from lightning in the ELF (extremely low frequency) frequency range so-called ELF transients are recognized as a powerful tool to obtain one of the most important properties of lightning discharges ; the charge moment changes (Qds). In this paper we demonstrate the spatio-temporal distributions of lightning discharges together with their a charge moment change (CMC) around Japan by using our newly developed domestic ELF observation network. This is the first time to obtain such type of distribution by using only ELF observations in the spatial scale of Japan (a few thousands km). We found that the obtained lightning source distributions both over the Pacific Ocean and the Sea of Japan are originated from the thunderstorm active regions confirmed by other measurements such as WWLLN and LF (JLDN). Statistical properties of the charge moment changes indicate that both number and CMC of positive CGs are superior to those of negative CGs. Moreover, considerably large CMC with both polarities are identified for the CGs over the Pacific Ocean as well as those with positive polarity over the Sea of Japan.

Keywords: Lightning, ELF, LF, Charge moment change