

Observational study of atmospheric electricity parameters(atmospheric electricity field (AEF), atmospheric ion concentration (AIC), and radon concentration) at Asahi, Boso Peninsula, Japan

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The total electron content anomaly preceding the large earthquake is one of the most promising precursory phenomena in the upper atmosphere. Lithosphere-Atmosphere-Ionosphere coupling (LAI coupling) model has been proposed to explain the earthquake-related phenomena in the atmosphere and ionosphere. We evaluate the possibility of chemical channel of LAI coupling through the monitoring of atmospheric electricity parameters such as the atmospheric electricity field (AEF), atmospheric ion concentration (AIC), and radon concentration. In this paper, we will report about the property of atmospheric electricity parameters observed at Asahi station (ASA), Boso Peninsula, Japan. AIC, AEF, atmospheric radon concentration, radon exhalation quantity from the ground, and weather elements have been observed at ASA. First, we compare seasonal variation, daily variation, and response to precipitation of atmospheric electric parameter observed at ASA and those at Kiyosumi station (KYS).

Variations of AIC and AEF before precipitations are quite similar at both stations; AIC increases quickly when a precipitation starts and AEF begins to be disturbed three hours before rain starts. But the variations after stopping precipitation have individual properties. Both parameters keep high values for a few hours at ASA and it takes longer than KYS to back to the normal level. Daily variation in each season also differs in each site. In summer, AIC takes minimum value at 15:00 LT. in the daily variation at ASA. But at KYS, it takes maximum value at 15:00 LT. In winter, AEF decreases from 09:00 LT to noon and gradually increases in daily variation. In other seasons, it takes maximum value at 20:00 LT and fluctuated in relatively large range. Daily variation of AEF in winter is mostly similar to the typical daily variation at KYS for all season.

Radon exhalation quantity variation has a clear negative correlation with 3 hours delay to the air pressure variation. Each season differs in daily pattern. AIC and AEF variations show lag correlation with radon exhalation quantity variation. To extract anomalous radon variation related to earthquakes, we should set a network of Radon monitoring and establish a model of radon variation for the future detailed analysis.

Keywords: Lithosphere-Atmosphere-Ionosphere coupling, atmospheric ion concentration, atmospheric electricity field, Radon exhalation quantity