NICAMを用いたラドン高濃度イベントの解析
Analysis of high Radon-222 concentration events using NICAM

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Low pressure systems and accompanied frontal activity play important roles for transportation of atmospheric components such as air pollutants, greenhouse gases, and aerosols. In East Asian region, when cold front actively develops in the southeast of Japan over the Pacific in winter to spring, atmospheric pollutants, emitted from continental sources, are drawn along the front by the low-pressure system. During the front is passing over a monitoring station, sometimes dense pollutants trapped behind the frontal zone are detected as the high concentration value. In this study, we analyze such high concentration events of atmospheric Radon-222 (^{222}Rn) observed and simulated by a Nonhydrostatic Icosahedral Atmospheric Model (NICAM). Spatiotemporal ^{222}Rn variations in the events are compared between the observations and simulations by NICAM with three different horizontal resolutions of 223, 56, and 14 km (hereafter referred as *d223*, *d56*, *d14*, respectively). To evaluate the impact of synoptic atmospheric variability on ^{222}Rn concentration, monthly-mean emissions are used for the simulations. Frequency of the occurrence of high ^{222}Rn events at the monitoring stations on remote islands in both hemispheres are comparable between the observations and models. Seasonal changes of the frequency are also well reproduced by models, with the correlation coefficients almost exceeding 0.6. These results imply that NICAM is capable of simulating synoptic atmospheric fluctuations for ^{222}Rn transport. Temporal changes of ^{222}Rn around the event are reasonably simulated by *d56* and *d14*, but *d223* cannot reproduce the peak sharpness observed, due to the coarse horizontal resolution. Meridional distributions of ^{222}Rn and equivalent potential temperature around the stations for the event time show comparable gradients in *d56* and *d14*, especially indicating tight trapping of ^{222}Rn behind the front at a station in the southeast of Japan. On the other hand, less enhancement of ^{222}Rn, by up to 20 %, accompanied by the milder slopes on the both sides around the station are seen for *d223*. Throughout analyses of high ^{222}Rn events in this study, *d56* and *d14* show comparable performance, also mostly reproducing the observed temporal variability. Although there is no observation data to validate spatial distribution of ^{222}Rn around cold front, it is probably reasonable from our analysis that the horizontal resolution of better than 50-60km is required for simulating atmospheric ^{222}Rn variations.

キーワード：NICAM、ラドン、イベント
Keywords: NICAM, Radon-222, Event

