Be-7 in Japan, Iceland and Thailand during solar cycle 24 descent phase

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Be-7 concentrations (BEC) in surface air should be correlated to cosmic rays, because Be-7 is produced by interactions between cosmic rays and nitrogen and/or oxygen in the atmosphere, and then it falls down with aerosols. Since cosmic rays which reach the earth are modulated by the solar activities when travelling the heliosphere, the variation in BEC involve some modulation profiles such as 27-day variation and 11-year solar cycle. Daily Be-7 concentrations in surface air have been continuously observed at Yamagata (38˚ N), Japan since 2000. To investigate the latitude effect of 11-year solar cycle, we set up a daily observation system of Be-7 concentration at Husafell in Iceland located (64˚ N) and have been continuously observed BEC since September 2003 as well as in Japan. Furthermore, we set up a daily observation system of Be-7 concentration at Bangkok in Thailand located (13.7˚ N) and have been continuously observed BEC since June 2014.

The BEC at Iceland, Japan, and Thailand were 2.0 mBq/m^3, 5.5 mBq/m^3, and 2.0 mBq/m^3 on average during 2015 and 2019, respectively, representing a kind of latitude effect. The increasing rates of BEC from 2019 to 2015 were 29.8%, 19.6%, and 43.5% at Iceland, Japan, and Thailand, respectively, while that of Oulu neutron monitor data was 8.8%. The larger increasing rates of BEC than the neutron monitor data is due to the much lower production threshold of Be-7 which is approximately 10MeV. Also, the latitude effects of BEC would indicate a response of cosmic ray spectral variation at lower energy band caused by solar modulation. However, as the increasing rates include a factor of air-mass advection in the atmosphere, the rates do not merely appear the solar modulation of cosmic rays. We describe the observed data of Be-7 concentrations taking account of latitudes effects of Be-7 production rates in the stratosphere and troposphere.

Keywords: Be-7, cosmogenic nuclide, solar modulation

