2003 年から 11 年間のアイスランドと日本の大気中宇宙線生成核種 Be-7 濃度変動と太陽活動

櫻井敬久 [1]，紅林泰 [2]、菊地聡 [2]，乾恵美子 [2]，増田公明 [3]，門倉昭 [4]，佐藤夏雄 [4]，B. Gunnlaugur[5]
[1] *山形大学企画部*
[2] *山形大学理学部*、[3] *名古屋大学太陽地球環境研究所,* [4] *国立極地研究所,* [5] *アイスランド大学*

Yearly variations in Be-7 concentrations in the atmosphere in Iceland and Japan during 11 years from 2003 compared with the solar activity

H. Sakurai[1],Y. Kurebayashi[2], S. Kikuchi[2], E. Inui[2], K. Masuda[3] , A. Kadokura[4], N. Sato[4], and B. Gunnlaugur [5]
[1]*Planning and Research support Department, Yamagata University*
[2]*Faculty of Science, Yamagata University,* [3]*The Solar-Terrestrial Environment Laboratory Nagoya University,*
[4]*National Institute of Polar Research,* [4]*Science Institute,* [5]*Iceland University*

Be-7 is produced by interactions between cosmic rays and nitrogen and/or oxygen in the atmosphere. The Be-7 concentration (BEC) should be correlated to the cosmic-ray intensity. 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 the surface air have been observed at Yamagata (38° N), Japan since 2000 to study the relationship between cosmogenic nuclide and solar activity. To investigate the latitude effect of the periodic variation of BEC related to the rotation of the sun and 11-year solar cycle, we set up the same daily observation system of Be-7 concentration at Husafell in Iceland located at high latitude (64° N) and have been observed BEC since September 2003. Figure 1 shows the yearly variations in the BEC at Iceland and at Yamagata, the neutrons, and the sunspot number (SSN), respectively. Both the BECs and the cosmic ray neutrons produced in the atmosphere inversely vary according to the sunspot number, because the energy spectrum of cosmic rays changes with the variation of the solar magnetic fields. Both the increasing rate and the decreasing rate of the BEC at Yamagata are approximately three times greater than the ones of the neutrons during 11 years from 2002, indicating the production due to low energy cosmic rays below the cut-off energy for the neutron production and hence implying air-mass intrusion from the polar region to .the mid latitudes. Meanwhile the BEC in Iceland is approximately two fifths of that at Yamagata, also, with an indication that the air-mass with thick BEC flow upward from the troposphere to the stratosphere. However, the increasing rate of the BEC in Iceland from 2004 to 2007 is approximately 5.7 times as large as the one of neutrons corresponding to the variation in production rate of Be-7 in the polar region. Moreover, it is interesting that the feature of the BEC after 2008 is different from those of the BEC at Yamagata and the neutrons, because it shows one year earlier depletion of the BEC compared with the rising of the solar activity to the 24th solar cycle.

We describe comparison of the Be-7 concentrations between at Yamagata and in Iceland relating to the SSN and neutron monitor data for the solar modulation, involving the response of the BECs to the unusual 24th solar maximum around 2014.

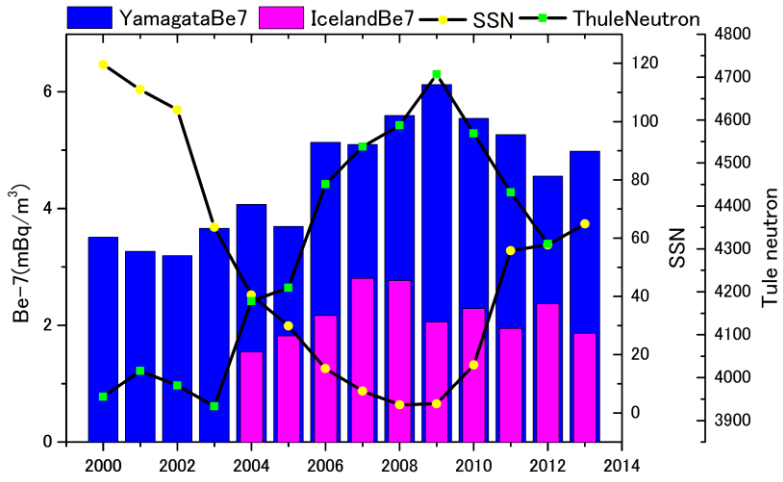

Figure 1. Yearly profiles of the Be-7 concentrations, the sunspot numbers, and the cosmic ray neutrons.