A33a Snowball Earth Events Driven by Starbursts of the Milky Way Galaxy

Toshikazu Ebisuzaki (RIKEN), Ryuho Kataoka (Tokyo Institute of Technology), Hiroko Miyahara (ICRR, University of Tokyo), Tokuhiro Nimura (Okayama Astronomical Museum), Shigenori Maruyama (Tokyo Institute of Technology)

The trigger mechanism of the Snowball Earth events at 2.2-2.4 Ga and 0.55-0.77 Ga in the Proterozoic eon remains unknown despite intensive study over the last decade. We present the starburst model of the Snowball Earth. During a starburst of the Milky Way Galaxy, frequent and prolonged encounters with dark clouds and supernova remnants occur. The increased flux of cosmic dust particles and cosmic rays during these nebula encounters lead to a global super-cool climate, a Snowball Earth event[1,2]. The individual nebula encounters may correspond to the substructures of super-cool/super-warm cycles in a Snowball Earth event. The starburst periods deduced from the ages of stars and star clusters coincide well with the Snowball Earth events reconstructed from geological records. This new theory proposed here can explain both triggering mechanism and occurrence pattern of the Snowball Earth events. The encounters with nebulae may also explain major mass extinction events, such as "Big Five" in Phanerozoic eon. The direct evidence of nebula encounters can be obtained from deep-sea sediments deposited during the Snowball Earth events.

1) Svensmark, H., Cosmoclimatology: a new theory emerges, *Astronomy and Geophysics*, **48**, 1, 18-24 (2007).
2) Maruyama, S. and Santosh, M., Models on Snowball Earth and Cambrian explosion: A synopsis, *Gondwana Research*, **14**, 22-32 (2008).