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The controversial Snowball events are believed to occur sometimes earlier than 650 Mya during the Neoproterozoic era. On one hand, energy balance models eg. by Budyko and Seller, assert that if ice cover extends to lower latitudes, then ice albedo runaway feedback happens, and Earth will be eternally covered by ice. On the other hand, based on geologic, geochemical and paleomagnetic evidences, geoscientists eg. Kirschvink, Hoffman and Schrag conclude that ice sheets have extended to the equatorial regions with snowball termination due to the CO₂ accumulation. It is no wonder that how a snowball happened and terminated is still a current and lively debate.

In this talk, I will explore a dynamical system based on Budyko's energy balance model, that is consistent with Kirschvink's theory of the snowball onset and termination. The system is obtained by adding dynamics to ice line as well as the greenhouse gas parameter closely related to the atmospheric CO₂ level in the Budyko's model, thereby treating them as state variables. The vector field governing this system is piecewise continuous at the boundary, with interesting dynamics in the interior (Received September 25, 2012)