

Galactic Environment History of the Sun and Paleoclimate

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It is well established that glaciations exhibit a very long period of around 140 Myrs. However, the origin of such a long period is not well understood. One possibility is the encounter with galactic spiral arms, which has been studied under the assumption of stationary spiral pattern (stationary density waves). We have performed fully self-consistent simulation of the galactic disk, which mimics the present-day structure of the Milky Way galaxy, and traced back the orbits of Sun-like stars. We found that local gas density and the local supernova rate around the Sun show large variations, and that the primary cause of these variations is the epicycle motion of the Sun itself. When the Sun is near the perigalacticon, it generally hits the spiral arm, which roughly stays there at least for the last half billion years. These time variations of the local Galactic environments in our model agrees rather well with the periodic glaciation of the Earth in the las 0.5 Gyr.

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