

The Zipf's law as an explanation of long-term variability on paleoclimatic events

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The glaciations do not have either a simple explanation or agreement in the scientific community about their causes and magnitude.

A scenario of low global temperature has been related with a strong variability of Earth's obliquity (Williams, 1975; 1993; Williams et al., 1998). On the other hand Laskar et al. (1993) proposed through numerical studies that the Earth is in a large zone of regular motion and its obliquity would not undergo large chaotic variations. Levrard and Laskar (2001; 2002; 2003a,b) have revisited the climate friction scenario and concluded that the obliquity could not change by more than 3-4 degrees over the past 800 Myr.

We propose the global glaciations as a 'cold' event which follows a power-law (Zipf's law: $P_n \sim 1/n^a$, where P_n is the frequency of occurrence of the n^{th} ranked item and a is close to 1).

The Earth climate system (as many others) may have the tendency to achieve a critical stage which could depend on greenhouse components as CH₄, H₂O and CO₂ leading to a runaway icehouse effect and a global cooling off. It is possible to calculate the frequency from its range.

We use comparative planetology, particularly Mars atmosphere, and radiative forcing scenario as tools to explain some paleoclimatic events.

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