

How the orbital forcing influences vegetation from high latitudes to low latitudes?

Qianqian Su, Anqi Lyu, Qiuzhen Yin, André Berger

George Lemaitre Centre for Earth and Climate Research, Earth and Life Institute,
Université catholique de Louvain, Louvain-la-Neuve, Belgium

Abstract

It is noted that certain recurring vegetation patterns appear to be a result of climate changes linked to specific astronomical parameters. Proxy reconstructions show that the response of vegetation phases to orbital configurations is complex and varies with regions. There is limited knowledge of the links between terrestrial vegetation changes and orbital forcing. It is therefore instructive to explore systematically how the astronomical forcing controls vegetation development from high latitudes to low latitudes. By analyzing the components of vegetation in different latitudinal zones and annual precipitation and temperature, which are associated with specific orbital parameters, including obliquity, precession and eccentricity, we find that: (1) Vegetation were mainly influenced by obliquity and precession. But eccentricity also had a non-negligible effect. (2) Mostly the responses of tree and grass in a specific area to the same astronomical parameter were opposite. (3) At low latitudes, precession generally played greater important role on tree fraction than in northern high latitude area, whereas in northern high latitude area, obliquity showed greater importance on tree fraction than at low latitudes.