

IAMAS#8

Diverse response of global terrestrial vegetation to astronomical forcing and CO₂ during the MIS-11 and MIS-13 interglacials

Qianqian Su, Anqi Lyu, Zhipeng Wu, Qiuzhen Yin

Disentangling the links between terrestrial vegetation changes and astronomical forcing as well as CO₂ is of great help to understand the sensitivity of contemporary vegetation and predict future vegetation and climate changes, yet it remains challenging. Given the distinct differences in astronomical configurations and CO₂ concentration between Marine Isotope Stage (MIS) 11 and 13, here we investigate the role of astronomical forcing and CO₂ on global vegetation changes during these two interglacials based on transient simulations performed with the model LOVECLIM1.3. Our results show that during these two interglacials, astronomical forcing plays a dominant role in vegetation evolution, with the effect of CO₂ being relatively small. The effect of astronomical forcing on vegetation can be explained successively by the relationship between climate (temperature, precipitation) and the astronomical parameters and the relationship between vegetation and climate. The relative effect of precession and obliquity on vegetation strongly depends on regions and on interglacials. In general, obliquity plays a more important role in vegetation variations during MIS-11, while precession is more important during MIS-13. Our results also reveal a clear half-precession cycle (~10 ka) in the variations of temperature, precipitation and vegetation in the tropical area during MIS-13, as a direct response to the equatorial insolation. However, no obvious half-precession cycle is simulated during MIS-11 due to its weak precession variation but large obliquity variation, indicating that the half-precession cycle is not stable in time.

Affiliations:

- Qianqian Su (Uclouvain)
- Anqi Lyu (Uclouvain)
- Zhipeng Wu (Uclouvain)
- Qiuzhen Yin (Uclouvain)