Geophysical Research Abstracts,
Vol. 11, EGU2009-3572, 2009
EGU General Assembly 2009

From an obliquity to eccentricity control on paleosol distribution in fluvial setting during the lower to middle Miocene (south-eastern France)

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The stratigraphic distribution of paleosols in fluvial successions has been investigated from the lower to middle Miocene of the Digne Valensole Foreland basin (SE France). The paleosols are present all along the sections and developed either on alluvial deposits, shallow lacustrine carbonates or shallow marine silt.
The carbon and oxygen isotopic values from the pedogenic carbonate have been directly correlated with the marine record based on the biostratigraphic data (Bialkowski et al., 2006). The numerous Aquitanian paleosols (23.4 to 19.8 Ma) provide the opportunity to identify short-term variations in the carbonoe isotope values. Most of these could be correlated with those from the marine isotope record giving a stratigraphic resolution of less than 0.2 Ma. The following interval of a high resolution correlation corresponds to the Langhian-early Serravallian (16.5 to 13.5 Ma). The heavy carbon isotope values associated to this period are interpreted as a record of the Monterey events identified in the marine domain.
A correlation of the maturity stage of the paleosols with the insolation curve is performed using the stratigraphic framework defined from the chemostratigraphy. In the fluvial environment, the largest range of astronomical periods is observed in the floodplain alluvium distant from the channel belt and in the shallow lacustrine carbonate. When getting close to the channel belt, only long periods are identified. These results show that the record of the orbital periods is influenced by the depositional environment in a fluvial setting.
During the Aquitanian, the shortest periods mainly point to obliquity with some record of precession; whereas, during Langhian to early Serravallian, paleosol distribution is dominated by eccentricity.
These results suggest that the stratigraphic distribution of paleosol in a fluvial succession was mainly controlled by allocyclic processes despite the influence of autocyclity observed in such environment.
An astronomical control is proposed with a change of the dominant period from obliquity to eccentricity during the lower to middle Miocene as observed from marine record.
Bialkowski, A., Châteauneuf, J.-J., Cojan, I. Bauer, H. 2006. Integrated stratigraphy and paleoenvironmental reconstruction of the Miocene series of the Châteauredon Dome, SE France, Eclogae Geol. Helv., 99, 1-15.