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A BIOMARKER BASED PALEOENVIRONMENTAL ASSESSMENT FOR LAKE VALENCIA, VENEZUELA

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Lipid biomarkers in a sediment core from Lake Valencia, a hypereutrophic freshwater lake in Venezuela, are examined to understand environmental changes over the last ~12600 years. From the late Pleistocene to the early Holocene, total organic carbon (TOC) substantially increased from 2.2% to 10%, while total organic carbon over total nitrogen (TOC/TN) decreased from as high as 34 to as low as 10. Correspondingly, the concentration of terrestrially derived triterpenoids markedly decreased, and the dominant *n*-alkane shifted from C_{31} to C_{23} or C_{25}. During the same period, algal biomarkers such as botrycoccenes, dinosterol, isoarborinol, C_{20} HBIs and 1,15C_{32} keto-ol markedly increased in abundance. These changes suggested a greater contribution of algal organic matter as the Holocene began, which was concurrent with increasing rainfall and the formation of a permanent lake in the Lake Valencia area. Depth profiles of *Paq*, a *n*-alkane based proxy, showed large oscillations (0.20-0.81), reflecting historical variations in the source strength of submerged/floating vs. terrestrial/emergent OM inputs. An abrupt increase in tetrahymanol abundance at ~8200 years BP suggested the establishment of an oxic-anoxic boundary of lake's water column. After reaching its maximum abundance at ~2000 year BP, botryococcenes, a biomarker of *Botryococcus braunii*, gradually decreased to levels below the detection limit in the uppermost sediments, while diploptene, dinosterol and isoarborinol substantially increased. These different age profile patterns of algal biomarkers reflected different responses of source organisms to recently environmental changes, especially the anthropogenically induced hypereutrophic conditions of the lake. The $\delta^{13}C$ data presented exceptionally enriched values for botryococcene isomers (-9.62‰ to -14.43‰), indicating the utilization of bicarbonate as an alternative carbon source under this extremely high primary productivity condition.

This work represents the first detailed investigation on the application of lipid biomarkers to reconstruct environment changes of Lake Valencia over approximately last 12600 years. Our biomarker data not only unambiguously confirmed previous results such as the existence of a marsh like environment during the latest Pleistocene and the formation of a permanent lake at the beginning of the Holocene, but also provided new insights into the historical lake conditions.

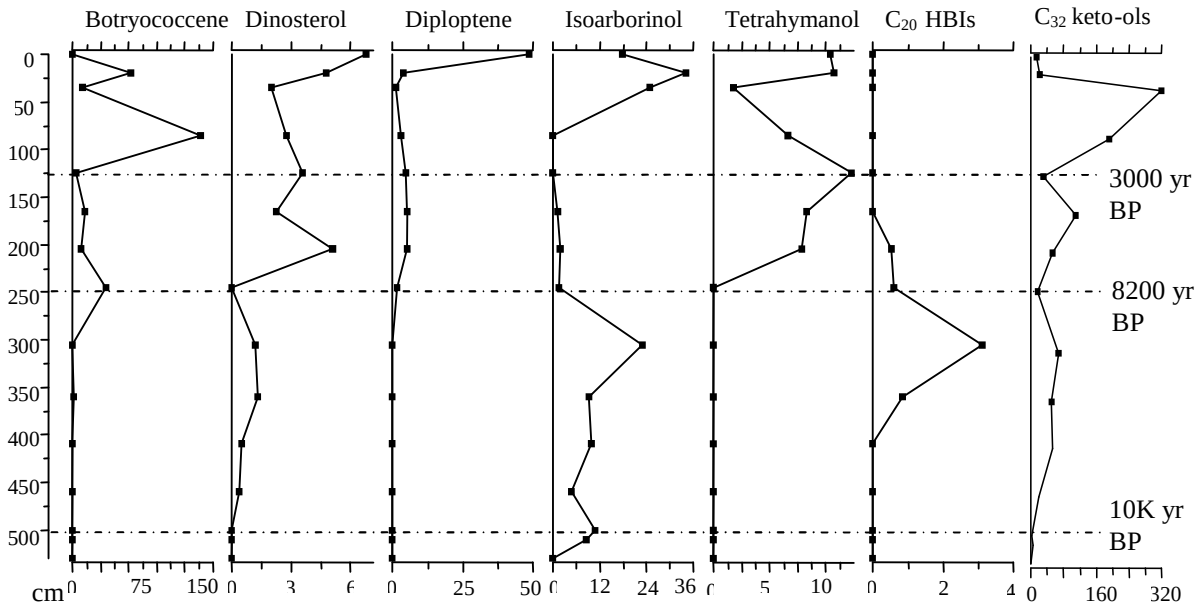

Figure 1. Depth profiles of selected microbial biomarkers in the Lake Valencia sediment core. All concentrations are expressed in μg/gTOC

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