PALEOCLIMATIC VARIATIONS IN THE TERTIARY OF SOUTH AUSTRALIA; DEDUCED FROM ISOTOPIC SIGNATURES OF METEORIC CEMENTS AND MARINE FOSSILS

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Oxygen isotopic values of seawater calculated from different well-preserved marine fossils and diagenetic meteoric calcite cements of Tertiary units of St.Vincent and Murray Basins of South Australia, are employed for reconstruction of terrestrial paleotemperature and paleoclimate. The overall empirical and theoretical data on the d18O values of the meteoric cements show a negative trend versus decreasing paleolatitude. On the other hand, Australian continent has been moving northward during the Cenozoic era, thus sustaining a continuous variation in latitude during this time, which is reflected in the isotopic signatures of its marine fossils and meteoric cements.The d18O values of the meteoric cements from different units during the Tertiary (and hence, diverse paleolatitudes) exhibit a negative correlation with paleolatitude which is consistent with theoretical findings. These observations indicate that the meteoric cements, despite some inconsistencies due, for example, to evaporation and seawater mixing with groundwaters, were precipitated in near equilibrium with their parent fluids. Consequently, these cements have approximately recorded variations in the temperature of their ambient environment. These reflect variations in the d18O value of their parent meteoric waters, which in turn are mainly due to the latitudinal changes of these Tertiary basins. The paleoclimate and paleotemperature results, calculated from isotopic values of meteoric cements of marine carbonates are compatible with those derived from the different fossil samples of these units. This indicates the creditability of the data and a mutual interaction between the marine environment and the adjacent coastal area.