

Distribution and facies of methane-derived authigenic carbonates in the Panoche and Tumey Hills, Great Valley, Central California

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Methane-derived authigenic carbonates are wide present around the world under ancient or recent form. In central California, the Panoche and the Tumey Hills host an important ancient system of sandstone dikes (Panoche Giant Injection Complex, PGIC) and authigenic carbonates which have been considered as methane-derived. The outcropping authigenic carbonates belong to the Moreno Formation of early Paleocene age and can be followed for 20 km. Previous studies have been focusing on the PGIC, while the authigenic carbonates are not yet well-studied. This work focuses on the mapping and facies distribution of authigenic carbonates, and their potential link to the presence of sandstone dikes (injectites).

The totality of the study area is mapped and sampled to allow petrographic, XRD and stable isotopic analysis. The results evidence the occurrence of mounds, crusts, nodules and sparite cemented sandstone facies. The nodules and sparite cements have $\delta^{13}\text{C}$ values between -30 ‰ and 4‰ and between -25 ‰ and -12 ‰ respectively. Nodules have been classified as atypical methane-derived authigenic carbonates (MDAC). The sparite cemented sandstone facies has been interpreted as an independent facies. The mounds and crusts have $\delta^{13}\text{C}$ values of about -47 ‰ and between -32 ‰ and 0 ‰ respectively and are identified as classic MDAC. The data allow to suggest a model for the origin and formation of the studied MDAC.

This case study evidence that multi-episodic fluid migration is responsible for the formation of the MDAC and that there is a clear relation between the sandstone dikes of the PGIC and the MDAC.

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