



## **Paleoecological interpretation of brachiopod assemblages in tectonic crevices of the Upper Triassic Dachstein Formation**

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Crevices filled with red sediment that contain high-abundance and low-diversity brachiopod assemblages were found within the Late Triassic Dachstein limestone facies in the Dachstein Formation, located in the Steinernes Meer Massif, Salzburg, Austria. The origin of the crevices, which strike similarly with a mean orientation of  $238^\circ$ , is interpreted as tectonic. The crevices and their surroundings were a habitat for brachiopod communities of the genus *Sulcirostra*, which ranges from the Norian to the Pliensbachian. The assemblages were studied regarding a possible relation to hydrocarbon seepage. The aim of this study was the testing of this working hypothesis through microfacies analysis, stable carbon and oxygen isotopes, and consideration of size-frequency distribution-related population dynamics of brachiopods. Samples were taken from four locations. Thin sections were examined with 20-fold magnification, using transmitted light microscopy. Most brachiopod shells are well preserved with many individuals being articulated, thus not showing any sign of exposure to mechanical stress and transportation. Most size-frequency distributions of brachiopods are right skewed, reflecting dominance of smaller individuals, indicating parautochthonous deposition of the assemblages. Geopetal structures inside brachiopod shells are similarly oriented. Therefore, the brachiopod assemblages are interpreted as parautochthonous deposits. Stable carbon and oxygen isotope compositions were measured from powder samples. The samples were taken from (1) brachiopod shells, (2) their internal cement, (3) the red, fission-filling background sediment and (4) the embedding Dachstein limestone facies. Cements in brachiopod shells from methane-seep paleoenvironments have been reported to inherit the extremely depleted  $\delta^{13}\text{C}$  composition of methane, which ranges as low as  $-100\text{‰}$  (V-PDB). A previous study on a limestone deposit with a mass occurrence of *Sucirostra* from eastern Oregon reported  $\delta^{13}\text{C}$  values of authigenic carbonates as low as  $-24\text{‰}$  agreeing with a chemosynthesis-based ecosystem nourished by hydrocarbon-rich fluids. With a mean value of  $2.63$  ( $\delta^{13}\text{C}$ ) and little scatter in the stable carbon isotope composition of cements, an adaption to seeps is not supported in the case of the Alpine occurrences of *Sulcirostra*. Instead, it is concluded that the shell accumulations are parautochthonous death assemblages of brachiopods that dwelled in a normal marine environment.