

# **Authigenic carbonates from marine methane seepage sites: deciphering their geochemical archive, biosignature systematics and growth structures by U-Th geochronology, laser ablation geochemistry and stable isotope approaches.**

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It is generally recognized that destabilization of gas hydrates and the resulting release of methane may be one of the most powerful influences on past abrupt climatic changes of the earth system. However, in climate research the release of methane from gas hydrates was difficult to be appropriately considered in model calculations since little information exists concerning the geochemical cycle of methane from marine gas hydrate deposits.

The seafloor emanation of hydrocarbons at any particular locality is likely to have a geologically short life span of unknown duration because of one or more of the following factors: 1. exhaustion of the hydrocarbon sources, 2. shifts in direction of compression and/or thrusting of the accretionary plates causing the closure of old conduits and the opening of new ones, 3. clogging of the venting system due to extensive carbonate precipitation and cementation. Substantive archives for such processes (1 to 3) are the long-lasting carbonate build-ups and remnants of chemosynthetic organisms which are likely to contain a detailed chronology of the history of the venting system.

Moreover, these archives are most valuable to determine the relation between methane emission from marine gas hydrates and climate change in the geological past.

In this study large carbonate samples from very different geological settings of focused cold seep activity are compared in order to investigate and characterize signatures of controlling processes. Beside new insights into growth structures, emplacement processes and initial approaches on high resolution geochemistry and biomarker analyses, special emphasis was given to the geochronological identification of paleo-vent activity phases. The actual data set is spanning a wide range from almost recent methane related carbonate precipitates from the Black Sea throughout circum Pacific settings (South China Sea, Costa Rica & Nicaragua, New Zealand) back to more than 200 thousand years old archives from Hydrate Ridge (Cascadia Margin, off Oregon).