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Foraminifera resist ocean acidification in the Wagner Basin under conditions similar to high CO_2 environments of the Cretaceous-Paleogene

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In 2007 and 2010 gas vents along the Wagner Fault (northern Gulf of California, Mexico; Canet *et al*., 2010) were investigated, recording their effects on the carbonate chemistry of the sea water and the surrounding benthos. Over 300 massive, but diffuse seafloor gas vents were discovered causing dramatic changes in the carbonate chemistry.

The pH_T decreased from 7.98 out of the fault to 7.55 near the most active vents where the lowest saturation states of aragonite (Ω_a) and calcite (Ω_c) were 0.95 and 1.47 respectively. Large areas of the fault region had pH 7.7-7.8 suggesting continuous diffuse gas emissions.

Foraminifera (unicellular protists) present in the top 2 cm of the sediment (both living and dead individuals) had a range of mainly calcareous taxa (including *Bolivina acuminata*, *B. acutula*, *Bulimina marginata*, *Nonionella basispinata* and *Psedoparella brayana*). This is a normal composition for these water depths and it was striking in the lack of dissolution features, damaged tests and the generally good preservation of the tests even when viewed at high magnification in a scanning electron microscope. With no evidence of breakage caused by transportation, as it is assumed that this composition is representative in terms of numbers of individuals and taxa represented. In sediments of similar pH around the island of Ischia (Italy), the assemblage of foraminifera in waters of comparable pH is much reduced, but carbonate saturation is different (Dias *et al*., 2010). The foraminifera of the Wagner Basin appear to be surviving in high CO_2 environments that are comparable to those that occurred during the Cretaceous–Paleogene "greenhouse" world where atmospheric pCO_2 was very much higher but with calcareous foraminifera apparently thriving (Tyrrell & Zeebe 2004; Zachos *et al*., 2005)