

Acidic fresh submarine groundwater discharge around mud diapirs in southwestern Taiwan

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Submarine groundwater discharge (SGD) is an important source of nutrients in many coastal regions, yet little information is available on its carbonate chemistry and the controlling factors. Our SGD samples collected around the coast of southwestern Taiwan contain relatively high total alkalinity (TA) and dissolved inorganic carbon (DIC) concentrations, but low in salinity, dissolved oxygen, pH and the saturation state of calcium carbonate (Ω_{ara}). Of note is that these high-carbon but low-pH SGD samples are largely located in the coasts with mud diapir outcrops, such as in the coasts of Liukiu Island, Nanwan Bay, and Chaishan Mountain. The Ω_{ara} , however, is far below saturation, adversely affecting the marine lives with their skeletons or shells made of calcium carbonate (e.g. coral, shellfish). Meanwhile, seawater near submarine volcanoes with depths 370m and 520m off southwestern Taiwan also contain relatively low pH. Data from the Liukiu Island suggest that the acidic properties of the SGD are a result due to the physical mixing between seawater and high TA and DIC but low pH and Ω_{ara} fresh groundwater. Such a result is consistent with our data that some lake waters located nearby the mud diapir regions have distinctly high TA but low pH and Ω_{ara} values, and the reason deserves further investigation.

Keywords: submarine groundwater discharge, SGD, pH, saturation state of calcium carbonate, mud diapirs