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Geochemical Modeling Of Mixing Processes In Shallow Submarine Hydrothermal Vents

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Shallow gasohydrothermal vents occur in the western coast of Mexico, between the intertidal and the subtidal zone down to 30 mbsl. Here, we present the results of modeling in two different systems: Punta Mita and Bahía Concepción. Linear mixing models were used to determine the approximate chemical composition of the thermal end-member in the coastal gasohydrothermal vents. The water chemistry indicates that mixing with seawater determines the chemical composition of the thermal fluid; however, isotopic data show that there is an important meteoric component. Simple modeling assuming only the mixing of a thermal fluid with meteoric water does not allow reproduce the thermal end member composition (EMPL) calculated by the linear mixing model, and requires further input from a more saline fluid. Chemical modeling shows that frequently at least three major water components mix in different proportions before the ascending thermal fluid reaches the sea floor. These components are a) local meteoric water, b) seawater and c) high salinity (connate) water. The mixing proportions for these three components may be up to 40-20-40 % respectively. This calculated mixture is a fluid with a chemical composition similar to the extrapolated thermal end-member before mixing with seawater at the discharge area. The chemical model results agree with the analyzed water chemistry in the vent sites and explain the mineralogy of the vent precipitates.