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Geochemistry of cold vent fluids at the Central American convergent margin

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The active continental margin offshore Central America is characterized by a high number of cold vent sites associated with typical sea floor features such as mounds (mud volcano type), faults and submarine slides. Over the past couple of years a solid geochemical data base of fluid samples has been collected ranging about 500 km from offshore southern Costa Rica to Northern Nicaragua. Similar to pore fluids from other, mostly accretionary convergent margins, these fluids are typically less saline than normal seawater. There is clear evidence (using oxygen and hydrogen isotope ratios) that chloride-depleted fluids originate from clay-mineral dehydration processes at elevated temperature and pressure conditions. This interpretation is supported by a number of additional observations such as the occurrence of thermal methane and highly elevated boron concentrations. Due to the lack of suitable conditions for the presumed processes within the sedimentary sequence of the overriding plate, it has been hypothesized that the fluids may originate from mineral dehydration in subducted sediments at about 10 km depth and migrate upward along deep fault systems (Hensen et al. 2004). This is supported by mass balance estimates between input of mineral-bound water by subducting sediments and output through known vent sites. Conspicuous differences in the geochemical composition of fluids from various locations allow a general subdivision of a southern and a northern type. We will present a comprehensive description of the available data set – covering the main element composition and various isotope systems (δ18O, δD, δ13C, ^{87}Sr/^{86}Sr, δ^{44}Ca, and ^{129}I/I) – and discuss fluid sources and potential ages as well as processes of formation and overprinting.

Hensen C, Wallmann K, Schmidt M, Ranero C, Suess E (2004) Geology 32, 201-204.