Radiocarbon (^{14}C) analysis of hydrothermal CO_2 and CH_4 at Okinawa Trough

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Radiocarbon (^{14}C) content in CO_2 and CH_4 from hydrothermal fluids collected at 5 vent sites in the Okinawa Trough was quantified. The ^{14}C data obtained using MICADAS, a gas ion source AMS at the ETH-PSI laboratory [Ruff et al., 2010; Wacker et al., 2016], is carefully interpreted particularly by taking into consideration all potential modern caron contaminations during sample processing and analysis. The interpretation provides preliminary insights on how different carbon sources and circulation processes contribute to vent fluids. For CO_2, ^{14}C-dead values observed in fluids of most sites demonstrate the complete removal of the inorganic carbon in the seawater recharged into sediment/crust as initial stage of subseafloor fluid circulation. Conversely, the significantly positive $^{14}CO_2$ are detected in fluids from the Daiyon-Yonaguni site, which implies the persistence of the recharged seawater-derived inorganic carbon and/or a contribution from thermal degradation of sedimentary ^{14}C-containing carbon during fluid upwelling. The CH_4 in these fluids were predominantly ^{14}C-dead or nearly ^{14}C-dead, suggesting a source of deep-buried, ^{14}C-dead sedimentary carbon.

Reference

Ruff et al. (2010) Gaseous radiocarbon measurements of small samples. ***Nuclear Inst. and Methods in Physics Research, B*** 268, 790–794.

Wacker et al. (2016) MICADAS: Routine and High-Precision Radiocarbon Dating. ***Radiocarbon*** 52, 252–262.