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Off-axis Hydrothermal Biogeochemistry

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The majority of hydrothermally-driven circulation in oceanic crust occurs in older crust, away from on-axis hydrothermal vents. Although there are only a few examples of sites where such fluids are well-characterized, fluid temperatures and geochemistry have been shown to be variable among them. In all examples, however in all examples, microbial activity drives biogeochemical processes and alteration of carbon reservoirs in the crust. Selective removal of refractory marine organic matter by subsurface microbes appears to occur at a range of fluid temperatures and oxygen concentrations and may involve specialized adaptations to access organic matter that has low bioavailability in the open ocean. Patterns in carbon isotopes and in the molecular composition of dissolved organic matter are indicators of microbial metabolic pathways and activity and allow for a more detailed view of subsurface microbial processes.