Linkages between the occurrence of persistent organic pollutants and biogeochemical characteristics of deep-sea trenches

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The biogeochemistry of deep-sea trenches is strongly influenced by their V-shape topography and tectonic position in the ocean, leading to a focusing effect of sediment and organic matter into the trench centre. Recent findings showed elevated mineralization rates in trench sediments, suggesting both high carbon turnover and organic matter degradation rates. As persistent organic pollutants (POPs) favourably partition to organic matter, deep-sea trenches act as a sink for these substances. Composition, source and age of the organic matter have been shown to have a significant influence on contaminant dynamics in sediment from more shallow regions. Also, the trophic status of marine systems plays a significant role in transport of POPs from air to water and to sediment. However, knowledge about organic pollutants in deep-sea environments is scarce. In the present study, sediment samples from two deep-sea trenches with different trophic states and deposition regimes are analysed for POPs with a wide range of physicochemical properties. Concentrations will be compared between the semi-eutrophic Atacama and the oligotrophic Kermadec Trench. Sampling of sediment cores was performed at the slope, abyssal plain and trench at Atacama (depth between 2,500 and 8,000m) and at the abyssal plain and trench at Kermadec (depth of 6,000 and 9,600m). The total organic carbon content largely varied between 0.3 and 2.1% at different sites at the Atacama Trench, while values were more homogeneous at the Kermadec Trench (around 0.3%). Preliminary results from the Atacama samples demonstrate concentrations of PCBs at the pg g⁻¹ dw level, and indicate highest concentrations to occur at the highest depth in the trench. Low sedimentation- and high mineralization rates in the trench centre, as well as the funnel-effect from the topology may explain these differences.