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Benthic oxygen consumption and carbon mineralization in Hadal Trenches

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Hadal trenches act as important depo-centres for organic material, but the extent that the deposited material is mineralized or retained remain largely unknown. Based on in situ measurements of benthic O_2 consumption, we assess the benthic carbon mineralization in a range of biogeographic separated hadal trench systems and relate the activity to proxies for deposition dynamics and surface ocean productivity. The data documents that hadal systems act as hot spots for early diagenesis as compared to adjacent abyssal sites and that the activity level in the different trench systems correlates to the regional primary production at the ocean surface. However, measurements also document an extensive variation in diagenetic activities along the respective trench axes. This implies that the direct linkage to vertical deposition from the surface ocean probably is modulated by local dynamics such as mass-wasting, hydrodynamic driven focusing, or winnowing of material along the trench axis. Thus, the carbon turn-over and the biological activity of hadal sediments appear more diverse and dynamic than generally recognized. Preliminary investigations also suggest that benthic carbon mineralization at the extreme hydrostatic pressure at the trench bottom - mainly mediated by poorly investigated microbial communities - is as efficient as mineralization in shallower and more well studied benthic habitats. The relative contribution from anaerobic mineralization pathways for hadal carbon turn-over and the extent that these processes are integrated in the total benthic carbon mineralization as derived from benthic O_2 microprofiles will be discussed.