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Title: Early diagenesis of organic material in Hadal trenches.

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Hadal trenches are as important depo-centers for organic material and recent evidence suggests that hadal sediments act as diagenetic deep sea hot spots. However, the sources, transport and lability of the deposited material and the pathways responsible for the carbon degradation remain largely unknown. Furthermore, current investigations are based on very few measurements that typically target one spot in the central deposition basins. To explore the nature of organic material and quantify the diagenetic pathways involved in the turn-over of organic material in hadal trenches, we deployed different benthic lander systems and recovered intact sediment cores along two major trenches that are exposed underlying water columns of very different productivity; the Kermadec Trench (KT) and the Atacama Trench (AT). In both systems in situ O_2 microprofiles documented intensified diagenetic activity along the trench axis as compared to the adjacent abyssal plain – and higher overall activity in the AT underlying the highly productive upwelling region off Chile relative to KT. However, measurements also reflected a large variation in biological activity along both trench axes presumably reflecting the local deposition dynamics and the nature of the deposited organic material. Shallow in situ O_2 penetration in both trench systems also implied significant contributions of anaerobic diagenesis at these trench sites. Porewater profiles and onboard incubations of AT sediment indeed revealed variable but substantial manganese and iron redox cycling and sulphate respiration. The presentation will provide an overview of the early diagenetic activity and pathways in two major trench systems and discuss factors that regulate the variability in benthic activity between and within these two trench systems and how this might affect benthic community compositions at these extreme water depths.