Particulate organic carbon redistribution driven by turbidity currents

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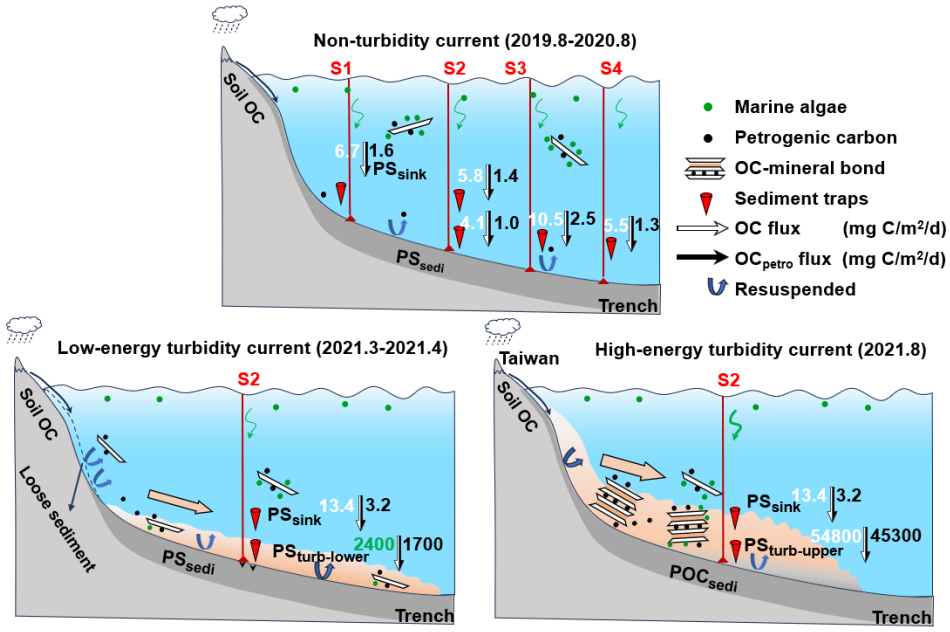
Abstract: Turbidity currents are critical mechanisms for lateral transport of particulate organic carbon (POC) to the deep sea, yet sampling challenges have created substantial knowledge gaps regarding their impact on POC biogeochemistry. Here, a systematic comparison of turbidity current-driven particles (PS_{turb}), background sinking particles (PS_{sink}), and seafloor surface particles (PS_{surf}) via direct sampling revealed unique POC features of PS_{turb} in the northern Manila Trench. The ~51±33-fold higher PS_{turb} flux than PS_{sink} suggested that turbidity currents efficiently redistributed POC, especially the petrogenic fraction derived from mountainous Taiwan. While global sediment trap POC data synthesis enabled diagnosis of turbidity-current influences in this region using fraction of modern carbon Fm < 0.82 and total organic carbon content TOC < 1.62%, water-column particles affected by turbidity currents followed Manila Equation (Fm=0.7*TOC-0.08, R^2=0.95, p<0.01). These results provide new insights regarding lateral POC transport processes and their importance when building global carbon cycle models.