

EGU2020-2222

<https://doi.org/10.5194/egusphere-egu2020-2222>

EGU General Assembly 2020

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



## Coastal to Abyssal Vertical Sediment Accumulation Rates Predicted via Machine-Learning: Towards Sediment Characterization on a Global Scale

Giancarlo Restrepo<sup>1</sup>, Warren Wood<sup>2</sup>, and Benjamin Phrampus<sup>2</sup>

<sup>1</sup>NRC Postdoctoral Associate, U.S. Naval Research Laboratory, Geology and Geophysics, Stennis Space Center, MS, United States of America (giancarlo.restrepo.ctr@nrlssc.navy.mil)

<sup>2</sup>U.S. Naval Research Laboratory, Geology and Geophysics, Stennis Space Center, MS, United States of America

Observed vertical sediment accumulation rates (SARs;  $n = 1166$ ) were gathered from ~55 years of peer reviewed literature. Original methods of rate calculation include long-term isotope geochronology ( $^{14}\text{C}$ ,  $^{210}\text{Pb}$ , and  $^{137}\text{Cs}$ ), pollen analysis, horizon markers, and box coring. These observations are used to create a database of contemporary vertical SARs. Rates were converted to  $\text{cm yr}^{-1}$ , paired with the observation's longitude and latitude, and placed into a machine-learning based Geospatial Predictive Seafloor Model (GPSM). GPSM finds correlations between the data and established global "predictors" (quantities known or estimable everywhere; e.g. distance from coast line, river mouths, etc.). The result, using a k-nearest neighbor (k-NN) algorithm, is a 5-arc-minute global map of predicted vertical SARs. The map generated provides a global reference for vertical sedimentation from coastal to abyssal depths. Areas of highest sedimentation,  $\sim 3\text{-}8 \text{ cm yr}^{-1}$ , are generally river mouth proximal coastal zones and continental shelves on passive tectonic margins (e.g. the Gulf of Mexico, eastern United States, eastern continental Asia, the Pacific Islands north of Australia), with rates falling exponentially towards the deepest parts of the oceans. Coastal zones on active tectonic margins display vertical sedimentation of  $\sim 1 \text{ cm yr}^{-1}$ , which is limited to near shore when compared to passive margins. Abyssal depth rates are functionally zero at the time scale examined ( $\sim 10^{-4} \text{ cm yr}^{-1}$ ), and increase one order of magnitude near the Mid-Atlantic ridge and at the conjunction of the Pacific, Nazca, and Cocos tectonic plates. Predicted sedimentation patterns are then compared to established quantities of fluvial sediment discharge to the oceans, calculated by Milliman and Farnsworth in *River Discharge to the Coastal Ocean: A Global Synthesis* (2011).