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Physical experiments in tsunami sedimentation key to interpreting paleotsunami deposits

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A key goal of tsunami research is to quantitatively reconstruct flow parameters from paleotsunami deposits, to better understand the geohazards of coastal areas. These methods rely on careful grain size and thickness measurements of tsunami deposits, combined with simple models that allow an inversion from deposit characteristics to wave characteristics. We conducted flume experiments to evaluate some proposed models. Key variables in the flume experiments were sediment size distribution, and ponding depth of water in the flume before bore is released. Physical experiments were run in a 32m x 0.5m x 0.8m flume at PRC. Various sediment mixtures (silt to coarse sand) were introduced to the upstream end and mobilized by a bore released from behind a mechanical lift gate. The decelerating flow behind the bore deposited thin sediment layers along the entire length of the flume. Deposits were sampled for grain size trends and thickness. The sand sheets generated in the flume thin and fine with distance away from the source. This is consistent with field observations of recent and paleotsunami deposits studied worldwide, in which tsunami deposit thickness is highly variable, while grain size distribution in a suspension-dominated deposit consistently fines landward along shore-normal transects.

Keywords: sediment, coastal, tsunami, grain size