The Formation, Alteration and Preservation of Flood Deposits on the Pacific Northwest Continental Margin

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LONG-TERM GOALS

The ultimate objective of this research program is to obtain a predictive understanding of the physical and biological processes responsible for the formation, alteration and preservation of marine sedimentary deposits. The general approach of this research program is the development and testing of theory mainly through field observations and measurements.

OBJECTIVES

This is a proposal, within the STRATAFORM Shelf Program, to study the formation, post-depositional alteration and preservation of flood deposits on the Pacific Northwest continental margin. Five related activities are being pursued: (1) continuation of time series measurements of the areal distribution and small-scale properties of the 1995 and 1997 flood deposits, (2) statistical analysis of the small-scale spatial variability of flood bed thickness and geometry at stations K60 and S60, (3) x-radiographic examination of piston cores for past flood deposits, (4) testing of simple conceptual ideas of event layer alteration and preservation using the above data sets, and (5) examination of patterns of sediment accumulation and event layer preservation offshore of other Pacific Northwest rivers.

APPROACH

Box cores are the primary sampling device used in this research. Cores are taken in two different modes: (1) replicate time-series sampling of four stations along the 70-m isobath, and (2) broad, large-scale coverage of the Eel and other river-system margins. Subsequent sources of data include transmission x-radiographs, microresistivity profiles, profiles of the radionuclides, Pb-210, Cs-137 and Th-234, and macrofaunal community composition, abundance and biomass. In addition, box cores were collected offshore of several other major rivers in the Pacific Northwest (e.g., Russian, Klamath, Umpqua).

WORK COMPLETED

FY 00 was primarily an analysis and writing year with no field activities. Laboratory measurements primarily focused on completing Pb-210 and Cs-137 geochronology of cores from other Pacific Northwest rivers. Modeling the Pb-210 and Cs-137 data to account for the affect of deep mixing on sediment accumulation rates was also begun. Lastly, USGS sediment concentration data were used to calculate long term sediment loads for Pacific Northwest rivers.

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During FY 00, I served as a guest editor for a special issue of Continental Shelf Research on Oceanic Flood Sedimentation (due out in late 2000). In addition, I convened a workshop on Shelf Sedimentation in July that was attended by roughly 30 STRATAFORM scientists..

RESULTS

New results in FY 00 have mainly involved our studies of sediment accumulation patterns offshore other Pacific Northwest rivers. We are testing two hypotheses: (1) sediment accumulation rate should scale directly with the magnitude of the sediment load of the adjacent river, and (2) there should be an asymmetry in the sediment accumulation pattern, with greater accumulation to the north. Figure 1 illustrates accumulation rate and river load data on the Eel and Russian margins. Surprisingly, despite a roughly 20-fold difference in annual river loads, the sediment accumulation rates are approximately the same. This result implies that the retention efficiencies of sediment on the two margins is drastically different, and indicates the importance of sediment redistribution processes in the coastal ocean (i.e., wave climate), as well as margin geometry in controlling sediment retention. The second hypothesis was largely supported, although large-scale coastal promontories (e.g., Cape Blanco) may complicate along-margin accumulation patterns.

IMPACT/APPLICATIONS

Documenting the initial distribution and subsequent modification of sedimentary event beds, as well as patterns of sediment accumulation will provide key insight for modelers of strata development on continental margins.

RELATED PROJECTS

Field sampling has been a joint effort with Drs. J. Borgeld (HSU), D. Drake (USGS), C. Nittrouer (UW) and C. Sommerfield (UDel). In addition, Chris Sommerfield (UDel) and I are collaborating on the studies of Pacific Northwest rivers.

REFERENCES

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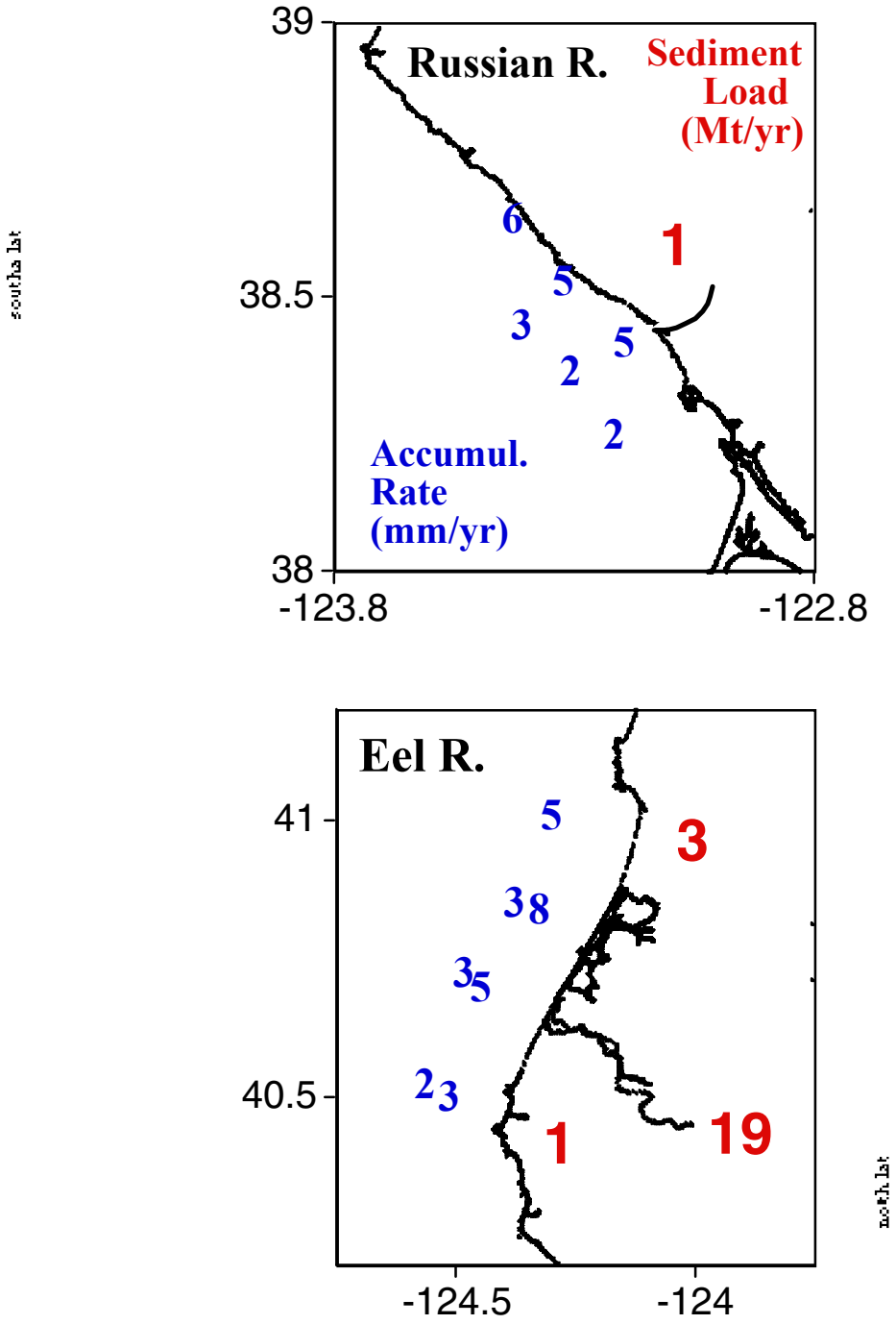

Figure 1. Comparison of shelf sediment accumulation rates and river sediment loads for the Russian and Eel River margins. Accumulation rates were measured at equivalent sites along the 70 and 110-m isobaths at spacings of 20 km off each river. **The** *Eel accumulation rate data are from Sommerfield and Nittrouer (1999).*