

A Unified View of Research Needs for the Columbia River, Estuary and Plume

David A. Jay

Department of Environmental and Biomolecular Systems
OGI School of Science and Engineering
Oregon Health and Science University
20000 NW Walker Road
Beaverton, OR 97006-8921 USA
djay@ese.ogi.edu www.ese.ogi.edu/~jaylab

The Columbia River Basin covers parts of nine states and two Canadian provinces, and the Columbia River plume influences the critical coastal upwelling regime from central Oregon to the Strait of Juan de Fuca. Because of this large geographic scope, it is often difficult to anticipate remote impacts of alterations of any part of the system. Climate change in interior tributaries may, for example, have biophysical impacts that extend along the coast to the Canadian border. Ocean conditions may change the vital nitrogen input to mountainous tributaries from the carcasses of spawning salmonids. The reservoir system and navigational development have impacted the sediment budget throughout the Columbia River littoral cell. Willamette valley flood control measures may even have influenced supply of micronutrients to the plume. Formulation of wise management decisions often requires understanding such remote impacts, yet such attempts are limited both by scientific difficulties and multiple political and legal jurisdictions. This talk attempts to provide a unified overview of biophysical research needs for the Columbia River, estuary and plume. Resolving these issues will greatly improve our understanding of the complex interrelated physical, chemical, and geological processes that affect the region's marine ecosystems and salmon.

Lower Columbia River and Estuary Research Needs Identification Workshop, Lower Columbia River Estuary Partnership, 24-25 March 2003

Curriculum Vitae

DAVID A. JAY

Associate Professor

Department of Environmental Science and Engineering

OGI School of Science and Engineering, Oregon Health & Science University

20000 NW Walker Road, Portland, OR 97291-1000

E-mail: djay@ese.ogi.edu

Web: <http://www.ese.ogi.edu/~jaylab/>

SS# 469-60-7902

ACADEMIC TRAINING AND HONORS

Ph.D. in Physical Oceanography 1987, Department of Oceanography, University of Washington; thesis advisor: J. D. Smith; title: *Residual circulation in shallow, stratified estuaries*

M.S. in Marine Environmental Studies 1974, SUNY at Stony Brook, Stony Brook, New York

B.A. (*cum laude*) in Chemical Physics 1970, Pomona College, Claremont, California

ACADEMIC EMPLOYMENT

1995 to date, Associate Professor; Oregon Graduate Institute, Department of Environmental Science and Engineering

2000 to date, Affiliate Associate Professor, College of Oceanic and Atmospheric Sciences, Oregon State University

1993 to 1995, Research Associate Professor; Geophysics Program, University of Washington

1996 to 1999, Affiliate Research Associate Professor; Geophysics Program, University of Washington

1993 to 1999, Adjunct or Affiliate Research Associate Professor; Physics Department, University of Washington

1991 to 1995, adjunct faculty member; Oregon Graduate Institute Center for Coastal and Land Margin Ecosystem Research

1987 to 1993, Research Assistant Professor; Geophysics Program, University of Washington

PROFESSIONAL AFFILIATIONS AND ACTIVITIES

Member, National Science Foundation, Long-Term Ecological Research Program Review Panel, December 1999 and Physical Oceanography Panel, May 2002.

Program Chair for 1998 Eastern Pacific Ocean Conference

Faculty Senate Chair, 1998-2000, Oregon Graduate Institute

Associate Editor, *Estuaries*, 1993-1995

Member, Coordinating Committee, NSF Land Margin Ecosystem Research Program 1991-98

San Francisco Bay Estuary Study, Salinity Standards Committee, 1991-92.

Member Coordinating Committee SCOPE Conference on Estuarine Synthesis 1994-98

Consultant in estuarine and fluvial ecosystem process, 1979-date

Chair "Harbors and Approaches Working Group", National Research Council Conference on Coastal Oceanography and Littoral Warfare, San Diego, CA, 1993.

Memberships: American Association for the Advancement of Science, American Geophysical Union, The Oceanography Society, Estuarine and Coastal Science Association, Estuarine Research Federation.

RECENT PUBLICATIONS

- Jay, D. A., and T. Kukulka, 2002, Revising the paradigm of tidal analysis – the uses of non-stationary data, submitted to *Ocean Dynamics*.
- Kukulka T., and D. A. Jay, 2002, Impacts of Columbia River discharge on salmonid habitat I. a non-stationary fluvial tide model, in press, *J. Geophys. Res.*
- Kukulka T., and D. A. Jay, 2003, Impacts of Columbia River discharge on salmonid habitat II. Changes in shallow-water habitat, submitted, *J. Geophys. Res.*
- Kay, D. J. and D. A. Jay, 2002, Interfacial mixing in a highly-stratified estuary. 1. characteristics of Mixing, in press, *J. Geophys. Res.*
- Kay, D. J. and D. A. Jay, 2002, Interfacial mixing in a highly-stratified estuary. 2. a "method of constrained differences" approach for the determination of the momentum and mass balances and the energy of mixing, in press, *J. Geophys. Res.*
- Jay, D. A., and P. Naik, 2002, Separating Human and Climate Impacts on Columbia River Hydrology and Sediment Transport, pp. 38-48 in G. Gelfenbaum and G. Kaminsky, eds., *Southwest Washington Coastal Erosion Workshop Report 2000*, US Geological Survey Open File Report, 02-229, 308 pp.
- Naik, P, and D. A. Jay, 2002, Estimation of the Columbia River virgin flow, pp. 68-73 in G. Gelfenbaum and G. Kaminsky, eds., *Southwest Washington Coastal Erosion Workshop Report 2000*, US Geological Survey Open File Report, 02-229, 308 pp.
- Orton, P.M., Wilson, D., Jay, D.A., and Fain, A.M.V. 2002, High resolution sediment dynamics in salt-wedge estuaries, pp. 61-67 in G. Gelfenbaum and G. Kaminsky, eds., *Southwest Washington Coastal Erosion Workshop Report 2000*, US Geological Survey Open File Report, 02-229, 308 pp.
- Jay, D. A., P. M. Orton, D. J. Wilson, A. M. V. Fain, and J. McGinity, 2001, Particle trapping in stratified estuaries -- explorations of a parameter space, submitted to *Contin. Shelf Res.*
- Bottom D.L., C.A. Simenstad, A.M Baptista, D.A. Jay, J. Burke, K.K. Jones, E. Casillas, M.H. Schiewe, 2001, *Salmon at river's end: the role of the estuary in the decline and recovery of Columbia River salmon*, National Marine Fisheries Service, Seattle, WA., 271 pp.
- Fain, A.M.V., D. A. Jay, D. J. Wilson, P. M. Orton, and A. M. Baptista, 2001, Seasonal, monthly and tidal patterns of particulate matter dynamics in the Columbia River estuary, *Estuaries* 24: 770-786.
- Cudaback, Cynthia N. and D. A. Jay, 2001, Tidal asymmetry in an estuarine pycnocline, 2, Transport *J. Geophys. Res.* **106**: 2639-2652.
- Cudaback, C. N., and D. A. Jay, 2000, Tidal asymmetry in an estuarine pycnocline: Depth and thickness, *J. Geophys. Res.* **105**: 26,237-26,252.
- Flinchem, E. P. and D. A. Jay, 2000, An introduction to wavelet transform tidal analysis methods, *Coast. Estuar. Shelf Sci.* **51**: 177-200.
- Jay, D. A., W. R. Geyer and D. R. Montgomery, 2000, An ecological perspective on estuarine classification: *Estuarine Science, A Synthetic Approach to Research and Practice*, J. E. Hobbie (ed.), Island Press, pp. 149-175.
- Jay, D. A. and Flinchem, E. P., 1999, A comparison of methods for analysis of tidal records containing multi-scale non-tidal background energy, *Contin. Shelf Res.* **19**: 1695-1732.
- Hickey, B. M., L. J. Pietrafesa, D. A. Jay and W. C. Boicourt, 1997, The Columbia River plume study: subtidal variability in the velocity and salinity field, *J. Geophys. Res.* **103**: 10339-10368.
- Jay, D. A. and Flinchem, E. P., 1997, Interaction of fluctuating river flow with a barotropic tide: A test of wavelet tidal analysis methods, *J. Geophys. Res.* **102**: 5705-5720.
- Jay, D. A., R. J. Uncles, J. Largier, W. R. Geyer, J. Vallino and W. R. Boynton (LMER Scalar Transport Working Group), 1997, A review of recent developments in estuarine scalar flux estimation, *Estuaries* **20**: 262-280.