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RESEARCH & COLLABORATION PROFILE

KEY WORDS: Sediment Dynamics, Cohesive Sediments, Salt Marshes, Estuarine Circulation

Research Snapshot. Prof. Seo investigates sediment dynamics across coastal and marine environments, with a particular focus on cohesive sediments and suspended particle transport. His research combines field observations and laboratory experiments to examine how hydrodynamic forcing and sediment properties regulate erosion, resuspension, advection, flocculation, settling, and deposition. His recent work focuses on sediment–flow–vegetation interactions in salt marshes, particularly how vegetation modifies hydrodynamics and promotes the trapping and retention of suspended sediments. He also investigates the transport and redistribution of sediment-associated materials, including organic carbon and microplastics, in relation to estuarine circulation and sediment resuspension.

RESEARCH EXPERTISE

- **Sediment dynamics:** field- and laboratory-based investigation of sediment erosion, resuspension, advection, settling, and deposition under varying hydrodynamic conditions.
- **Cohesive sediment erosion & flocculation:** quantification of critical shear stress and erosion rates, together with investigation of floc formation, breakup, particle size, and settling behavior.
- **Salt-marsh sediment trapping:** investigation of vegetation–flow–sediment interactions, with particular emphasis on how vegetation modifies flow and turbulence and enhances the capture, deposition, and retention of suspended sediments.
- **Estuarine circulation & suspended sediment transport:** investigation of circulation-driven sediment redistribution, including vertical and lateral sediment transport, turbidity development, and sediment exchange between tidal flats, channels, and adjacent coastal waters.
- **Sediment-associated microplastic transport:** investigation of the deposition, erosion, resuspension, and redistribution of microplastics associated with natural sediment transport processes.

RECENT RESEARCH HIGHLIGHTS

- **Suspended sediment & acoustic monitoring (Ocean Sci. J. 2026):** evaluated the reliability of ADCP-derived echo intensity under varying scattering conditions, including sediments, zooplankton, and bubbles.
- **Flocculation & microplastic transport (Mar. Pollut. Bull. 2025; Water Res. 2025–2026):** investigated biophysical flocculation, settling, and sediment–microplastic interactions to understand the transport and fate of suspended particles in coastal waters.
- **Coastal sediment transport & morphodynamics (Nat. Commun. 2025; Ocean Coast. Manage. 2026):** examined tidal-flat morphological dynamics and their responses to environmental forcing, including sea-level rise and increasing nearshore wave energy.

POTENTIAL COLLABORATION RESEARCH

Best-fit collaborator areas: sediment dynamics | environmental fluid mechanics | estuarine processes | cohesive sediment transport | microplastic transport

- **1. Sediment dynamics and bottom boundary layer processes:** integrated field observations and laboratory experiments to investigate sediment–flow interactions, turbulence, erosion, resuspension, and sediment fluxes under waves and currents.
- **2. Salt-marsh sediment trapping:** investigation of vegetation-induced flow attenuation and turbulence modification to quantify the capture, deposition, and retention of suspended sediments and sediment-associated materials within salt marshes.
- **3. Estuarine circulation and sediment exchange:** investigation of how estuarine circulation, tidal forcing, and stratification regulate suspended sediment transport and exchanges among tidal flats, tidal channels, estuaries, and adjacent coastal waters.
- **4. Microplastic–sediment interactions:** investigation of how particle properties, cohesive sediment processes, flocculation, and hydrodynamic forcing regulate the deposition, burial, erosion, resuspension, and redistribution of microplastics in coastal environments.

SELECTED RECENT PUBLICATIONS

- **Ocean Sci. J. 2026, 61, 5** — Assessing the reliability of ADCP-derived echo intensity under variable scattering conditions: Roles of sediment, zooplankton, and bubbles
- **Mar. Pollut. Bull. 2025, 219, 118308** — Role of biophysical flocculation on microplastics and sediment interactions in a microtidal estuary.
- **Front. Mar. Sci. 2024, 11, 1392435** — Contribution of coastal seiches to sediment transport in a microtidal semi-enclosed bay.
- **Sci. Total Environ. 2021, 766, 144493** — Assessment of potential impact of invasive vegetation on cohesive sediment erodibility in intertidal flats.

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REPRESENTATIVE RESEARCH FIGURES / SCHEMES

