Sangyoung Son, Ph.D

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Education

University of Southern California, Los Angeles, CA, US — Aug. 2012
Ph.D in Civil Engineering (Advisor : Patrick J. Lynett)
- Dissertation Title : *Wave Induced Hydrodynamic Complexity and Transport in the Nearshore*

Texas A&M University, College Station, TX, US — Dec. 2011
M.E. in Civil Engineering (Advisor : Patrick J. Lynett, relocated to USC)
- Research Topic: *Coupled Numerical Model for Lifeline Tsunami Evolution*

Seoul National University, Seoul, Korea — Feb. 2002
M.S. in Civil, Urban and Geosystem Engineering (Advisor : Kyung-Duck Suh)
- Thesis Title : *Calculation of Irregular Wave Reflection from Perforated-Wall Caisson Breakwaters*

Seoul National University, Seoul, Korea — Feb. 2000
B.S. in Civil, Urban and Geosystem Engineering

Employments

Korea University, Seoul, Korea — Sep. 2015 - Present
Assistant/Associate/Full Professor

University of Southern California, Los Angeles, CA, USA — Jan. 2019 - Aug. 2019
Visiting Faculty

University of Ulsan, Ulsan, Korea — Sep. 2013 - Aug. 2015
Assistant Professor

University of Southern California, Los Angeles, CA, USA — Sep. 2012 - Aug. 2013
Postdoctoral Scholar - Research Associate

University of Southern California, Los Angeles, CA, USA — Sep. 2011 - Aug. 2012
Graduate Research Assistant

Oregon State University, Corvallis, OR, USA — May. 2009 - Jul. 2009
Visiting Graduate Researcher in O.H. Hinsdale Wave Research Laboratory
- Performed experiments of solitary wave evolutions over a 3D shallow shelf (funded by NSF)

Texas A&M University, College Station, TX, USA — Aug. 2008 - Aug. 2011
Graduate Research Assistant

Hyundai Engineering & Construction Co., Korea — Mar. 2002 - Jul. 2008
Assistant Senior Engineer

Certificates

Professional Engineer (#79108PE), OR, USA — since 2007

Information Processing Engineer, Korea — since 1999

Editorial Services for SCIE-indexed Journals

Section Editor, **Geoscience Letters** — since Dec. 2023

Associate Editor, **Journal of Hydro-environment Research** — since Mar. 2022

Associate Editor, **Coastal Engineering Journal** — since Jul. 2019

Topical Editor, **Applied Sciences** — since Jul. 2021

Guest Editor, **Journal of Marine Science and Engineering** — July 2019

International Conference Organization and Service

Local Organization Committee, Seoul, Korea, — Jul. 2021
9th International Symposium on Environmental Hydraulics (ISEH)

Local Organization Committee, Busan, Korea, — May. 2018
International Coastal Symposium (ICS)

International Coastal Engineering Committee & TPC member — since 2018
International Society of Offshore & Polar Engineering Conference (ISOPE)

Local Organization Committee, Incheon, Korea, — Aug. 2016
International Conference on Hydroinformatics (HIC)

Honors and Awards

Minister's Commendation — Mar. 2025
Minister of Land, Infrastructure and Transport, Korea

Academic Award — Jan. 2024
Korea Water Resources Association, Korea

Academic Award — Feb. 2022
Korean Society of Hazard Mitigation, Korea

President's Commendation — Dec. 2020
Korea Society of Civil Engineers, Korea

President's Commendation — May 2020
Korea Water Resource Association, Korea

Best Paper Awards, KOSHAM Annual Conference — Feb. 2019
Korean Society of Hazard Mitigation, Korea

Minister's Commendation for Supporting Services of Hazards Mitigation — Jan. 2019
Ministry of the Interior and Safety, Korea

Best Paper Awards, KSCE Annual Conference — Oct. 2018
Korean Society of Civil Engineers, Korea

Best Presentation Awards, KWRA Annual Conference — May 2017
Korean Water Resource Association, Korea

Best Paper Awards, KSCDP Annual Conference — Nov. 2015
Korean Society of Coastal Disaster Prevention, Korea

Best Paper Awards, KSCOE Fall Conference — Oct. 2013
Korea Society of Coastal and Ocean Engineers, Korea

Chester P. Jelesnianski Scholarship — 2010-2011
Zachry Department of Civil Engineering, Texas A&M University

Joseph A. Orr. Fellowship — 2008-2009
Zachry Department of Civil Engineering, Texas A&M University

Scholarship Assistance — 1997-1999
Seoul National University, Korea

Professional Memberships

American Society of Civil Engineers(ASCE) | Coasts, Oceans, Ports and Rivers Institute(COPRI) | American Geophysical Union(AGU) | European Geosciences Union(EGU) | International Associationof Hydraulic Engineering and Research(IAHR) | Coastal Eduation & Research Foundation(CERF) | International Society of Offshore & Polar Engineering(ISOPE) | Korean Society of Civil Engineers(KSCE) | Korean Water Resource Association(KWRA) | Korean Society of Coastal and Ocean Engineers(KSCOE) | Korean Society of Hazard Mitigation(KOSHAM) | Korean Wetland Society (KWS) | Korean Society of Ocean Engineers(KSOE)

Research Interests

High-performance, Immersive Numerical Modelling of Ocean Waves with Multi-scales
- Development of hybrid-architectural/parallelized/GPU-accelerated/immersive model for coastal processes by long waves.

Turbulence-dominant Processes in the Nearshore
- Study on the physical diversity in estuarine flows such as wave-current interaction, freshwater-seawater mixing, wave breaking, wave-bottom interaction

Tsunamis and Storm Surges Modeling with an Advanced Accuracy and Efficiency
- Improvement of tsunami modeling tool with better physical understanding, numerical skills and high-performance computing system. In particular, coupling between hydrostatic and hydrodynamic models is of interest.

Modelling Sediment Transport by Shallow, Dispersive and Turbulent Flows
- Numerical study on sediment transport by long waves using a depth-integrated 2D approach

Publications

J1. J-Y. Kim, D.-H. Wee, Y.-S. Jang, J.-Y. Choi, H.-J. Hong and **S. Son** (2025) Strategic Offshore Deployment of Tsunami Gauges for Rapid Warning at Critical Coastal Sites: A Case Study for a Nuclear Power Plant in Korea, (under review)

J2. J. Yoon, S. Hwang, X. Qian, S. Im and **S. Son** (2025) A Random Forest-based Method for Reconstructing Pressure Fields in Tropical Cyclones from Wind Data, (under review)

J3. S. Hwang and **S. Son** (2025) Virtual reality-based hydrodynamic rainfall-runoff model for real-time flood simulation and simultaneous visualization, (under review)

J4. P. Lynett, B. Ebrahimi, **S. Son**, S. Hwang, S. Bak (2025) Celeris-WebGPU: An Interactive Nearshore Wave Simulator for Engineering Design and Natural Hazard Education, (under review)

J5. S. Hwang, P. Lynett and **S. Son** (2025) A Two-dimensional Second-order Positivity-preserving Well-balanced Reconstruction Scheme of Wet/dry Fronts for the Saint-Venant System, (under review)

J6. D.-H. Kim, **S. Son**, T.-H. Jung (2025) Topocaustically Driven Similarity in Far-Field Tsunami Runup Along a Coast, ***KSCE Journal of Civil Engineering***, 29(9), 100194

J7. A. Chrysanti, **S. Son** (2025) Unraveling Atmosphere and Surface Boundary Interactions Behind Extreme Tropical Rainfall: A Case Study in Indonesia Using Fully Coupled Atmosphere-Hydrology Simulations, ***Journal of Advances in Modeling Earth Systems***, 17(4), e2024MS004730

J8. S. Hwang, P. Lynett and **S. Son** (2024) A GPU-accelerated Numerical Model for Nearshore Scalar Transport by Dispersive Shallow Water Flows, ***Computer Physics Communications***, 310, 109539

J9. S. Hwang, B. Na and **S. Son** (2024) Understanding Tidal Jet Vortices over Complex Bathymetry via Numerical Modeling and Drone Observation: Match and Mismatch in the Vortex Dynamics under Idealized and Realistic Topographic Settings, ***Journal of Geophysical Research - Oceans***, 129 (12)

J10. X. Qian, S. Hwang and **S. Son** (2024) A Study on Key Determinants in Enhancing Storm Surges along the Coast: Interplay between Tropical Cyclone Motion and Coastal Geometry, ***Journal of Geophysical Research - Oceans***, 129 (2)

J11. S. Hwang, **S. Son** (2023) An Efficient HLL-based Scheme for Capturing Contact-discontinuity in Scalar Transport by Shallow Water Flow, ***Communications in Nonlinear Science and Numerical Simulation***, 127, 107531

J12. **S. Son**, T. Jung (2022) Statistical Analysis on the Tsunamis from Multiple Faults' Sequential Failure with Different Time-Intervals and Geographical Layouts, ***Ocean Engineering***, 250, 110720

J13. Y. Na†, B. Na†, **S. Son** (2022) Near Real-time Predictions of Tropical Cyclone Trajectory and Intensity in the Northwestern Pacific Ocean using Echo State Network, ***Climate Dynamics***, 58, 6511-667

J14. I. Yeo, T. Jung, **S. Son**, H. Yoon (2022) Probabilistic Assessment of Delayed Multi-Fault Rupture Effect on Maximum Tsunami Runup along the East Coast of Korea, ***KSCE Journal of Civil Engineering***, 26(1), 1-12

J15. B. Na† and **S. Son** (2021) Void Fraction Estimation using a Simple Combined Wave Gauge System under Breaking Waves, ***Ocean Engineering***, 241, 110059

J16. S. Tavakkol, **S. Son**, P. Lynett (2021) Adaptive Third Order Adams-Bashforth Time Integration for Extended Boussinesq Equations, ***Computer Physics Communications***, 265, 108006

J17. B. Na†, **S. Son** (2021) Prediction of Atmospheric Motion Vectors around Typhoons using Generative Adversarial Network, ***Journal of Wind Engineering & Industrial Aerodynamics***, 214, 104643

J18. B. Na†, **S. Son** (2021) Modeling of Accidental Oil Spill at the Different Phases of LNG Terminal Construction, ***Journal of Marine Science Engineering***, 9(4), 392

J19. Y. Kim, **S. Son**, T. Jung, T. Gallien (2021) An analytical and numerical study of a vertically discretized multi-paddle wavemaker for generating free surface and internal waves, ***Coastal Engineering***, 165, 103840

J20. T. Jung and **S. Son** (2021) Active Tsunami Generation by Tectonic Seafloor Deformation of Arbitrary Geometry Considering the Rupture Kinematics, ***Wave Motion***, 100, 102683

J21. S. Hwang†, **S. Son**, C. Lee†, H. Yoon (2020) Quantitative Assessment of Inundation Risks from Physical Contributors Associated with Future Storm Surges: A Case Study of Typhoon Maemi (2003), ***Natural Hazards***, 104(2), 1389–1411

J22. J.-A. Yang†, S. Kim, **S. Son**, N. Mori and H. Mase (2020) Assessment of Uncertainties in Projecting Future Changes to Extreme Storm Surge Height Depending on Future SST and Greenhouse Gas Concentration Scenarios, ***Climatic Change***, 162(2), 425–442

J23. J. Borrero, T. Solihuddin, H. Fritz, P. Lynett, G. Prasetya, V. Skanavis, S. Husrin, W. Kongko, D. Istiyanto, A. Daulat, D. Purbani, H. Salim, R. Hidayat, V. Asvaliantina, M. Usman, A. Kodijat, **S. Son**, C. Synolakis (2020) Field Survey and Numerical Modelling of the December 22, Krakatau Tsunami, ***Pure and Applied Geophysics***, 177, 2457–2475

J24. Y. Seo, H.-S. Ko and **S. Son** (2020) The Effect of Nozzle Geometry on the Turbulence Evolution in an Axisymmetric Jet Flow: a Focus on Fractals, ***Physica A: Statistical Mechanics and its Applications***, 550, 124145

J25. **S. Son**, P. Lynett and A. Aykut (2020) Modeling Scour and Deposition in Harbors Due to Complex Tsunami-Induced Currents, ***Earth Surface Processes and Landforms***, 45(4), 978–998

J26. P. Lynett, D. Swigler, H. El-Safty, L. Montoya, A. Keen, **S. Son**, P. Higuera (2019) Three-dimensional Hydrodynamics Associated with a Solitary Wave Traveling over an Alongshore-Variable, Shallow Shelf, ***ASCE Journal of Waterway, Port, Coastal, and Ocean Engineering***, 145 (6), 04019024

J27. M. Cho, H.-D. Yoon, K. Do, **S. Son** and I.-H. Kim (2019) Comparative Study on the Numerical Simulation of Bathymetric Changes under Storm Condition , ***Journal of Coastal Research***, SI91, 106–110

J28. D.-H Kim and **S. Son** (2019) Role of Geophysical-Scale Wave Breaking and Shelf Geometry in N-type Tsunami Wave Runup, ***Ocean Modelling***, 138, 13–22

J29. C. Lee†, S. Hwang†, K. Do and **S. Son** (2019) Increasing Flood Risk due to River Runoff in the Estuarine Area during a Storm Landfall, ***Estuarine, Coastal and Shelf Science***, 221, 104–118

J30. D.-H Kim and **S. Son** (2018) Lagrangian-like Volume Tracking Paradigm for Mass, Momentum and Energy of Nearshore Tsunami and Damping Mechanism, ***Scientific Reports***, 8 (1), 14183

J31. Y. Seo, H.-S. Ko and **S. Son** (2018) Multifractal Characteristics of Axisymmetric Jet Turbulence Intensity from RANS Numerical Simulation, ***Fractals***, 26(1), 1850008

J32. **S. Son**, Y.-U. Ryu and T.-H. Jung (2017) An Energy–controlling Boundary Condition for Partial Wave Reflections in the Mild Slope Equation, ***Applied Ocean Research***, 68, 244–248

J33. T.-H. Jung, **S. Son** and Y. Ryu (2017) Finite Element Solution of Linear Waves on a Sloping Bottom Boundary, ***Journal of Coastal Research***, 33(3), 731–737

J34. **S. Son**, J. Kim, H.-D. Yoon, T.-H. Jung, K. Do and S. Shin (2017) An Observational and Numerical Study of Storm-Induced Morphologic Changes at Sanpo Beach, Korea, ***Journal of Coastal Research***, SI79, 334–338

J35. S. Shin, J. Nam, **S. Son**, I.-H. Kim and T.-H. Jung (2017) Field Observation and Numerical Modelling of Rip Currents within a Pocket Beach, ***Journal of Coastal Research***, SI79, 229–233

J36. H.-D. Yoon, M. Cho and **S. Son** (2016) Investigation of Wave Breaking Turbulence in Morphodynamic Modelling, ***Journal of Coastal Research***, SI75, 924–946

J37. **S. Son** T.-H. Jung, F. Shi (2016) Investigation of Vertical Structure of Rip-currents in the Nearshore Circulation, ***Journal of Coastal Research***, SI75, 1402–1406

J38. T.-H. Jung, **S. Son** and P. Lynett (2016) A Comprehensive Sensitivity Analysis of Tsunami Model System to the Parametric and Input Uncertainties, ***Journal of Coastal Research***, SI75, 1117–1121

J39. **S. Son** and P. Lynett (2014) Interaction of Weakly Dispersive Water Waves with Sheared Currents of Arbitrary Profile, ***Coastal Engineering***, 90, 48 – 64.

J40. **S. Son** and P. Lynett (2014) Nonlinear and Dispersive Free Surface Waves Propagating over Fluids with Weak Vertical and Horizontal Density Variation, ***Journal of Fluid Mechanics***, 748, 221 – 240.

J41. P. Lynett, J. Borrero, **S. Son**, R. Wilson, K. Miller (2014) Assessment of Current-Induced Tsunami Hazards for Maritime Planning, ***Geophysical Research Letters***, 41, 2048 – 2055.

J42. P. Lynett, R. Weiss, W. Renteria, G. Morales, **S. Son**, M. Arcos and B. Maclnnes, (2013) Coastal Impacts of the March 11th Tsunami in the Galapagos Islands, ***Pure and Applied Geophysics***, 170(6 – 8), 1189 – 1206

J43. P. Lynett, J. Borrero, R. Weiss, **S. Son**, D. Greer and W. Renteria (2012) Observations and Modeling of Tsunami-Induced Currents in Ports and Harbors, ***Earth and Planetary Science Letters***, 327 – 328, 68 – 74.

J44. **S. Son**, P. Lynett, and D.-H. Kim (2011) Nested and Multi-Physics Modeling of Tsunami Evolution from Generation to Inundation, ***Ocean Modelling***, 38, 96 – 113

J45. S.-H. Oh, K.-D. Suh, **S.-Y. Son** and D.-Y. Lee (2009) Performance Comparison of Spectral Wave Models Based on Different Governing Equations Including Wave Breaking, ***KSCE Journal of Civil Engineering***, 13(2), 75 – 84

Conference Proceedings (* denotes oral presenter)

C1. **S. Son*** and X. Qian (2023) On the effect of tropical cyclones' translation speed and landfall trajectory on the storm surge dynamics, *EGU General Assembly 2023*, Vienna, Austria.

C2. X. Qian* and **S. Son**, (2022) The Effect of Tropical Cyclones' Translation Speeds and Landfall Angles on Maximum Surge Heights along Idealized Coasts, *37th International Conference on Coastal Engineering*, Sydney, Australia

C3. S. Hwang* and **S. Son**, (2022) Nearshore Scalar Transport with Virtual Reality Environment *37th International Conference on Coastal Engineering*, Sydney, Australia

C4. S. Hwang* and **S. Son**, (2021) Development of GPU-accelerated 2DH hydrodynamic and transport model, *The 9th International Symposium on Environmental Hydraulics*, Seoul, South Korea

C5. **S. Son***, P. Lynett (2020) Inter-Coupled Tsunami Modelling Through An Absorbing-Generating Boundary, *virtual International Conference on Coastal Engineering*. Online format.

C6. **S. Son**, P. Lynett, D. Kim, H. Yoon (2020) Modeling morphological changes by tsunami Induced currents, *EGU General Assembly 2020*, Vienna, Austria.

C7. J. Yang, **S. Son**, (2019) Parameter sensitivity analysis of Delft3D in the assessment of hydrodynamics and sediment transport at Maengbang beach, *Coastal Structures 2019*, Hannover, Germany

C8. M. Cho, J. Yang, **S. Son**, H. Yoon (2019) Sensitivity And Uncertainty Analysis Of Coastal Numerical Model Under Various Beach Conditions In Korea, *Coastal Sediments 2019*, Petersburg, Florida, US

C9. Y. Na and **S. Son** (2018) Prediction of Tropical Cyclone Trajectories using Echo State Networks, *AGU Fall Meeting*, Washington DC, US.

C10. **S. Son*** , C. Lee, K. Do and T. Jung (2018) Coupled Hydrodynamic-Hydrological Modeling for Storm Surge Inundation in the Coastal Area *36th International Conference on Coastal Engineering*, Baltimore, MD, US.

C11. S. Hwang and **S. Son** (2018) 3D Numerical Investigation on the Onset and Growth of Tide-induced, Geometry-governed Turbulent Coherent Structure – A Case Study of Uldolmok Strait, Korea *3rd International Water Safety Symposium*, Incheon, Republic of Korea

C12. **S. Son*** and C. Lee (2018) Inland Flooding Responses to the Inclusion of Estuarine Discharges in the Storm Surge Modelling, *The 28th International Ocean and Polar Engineering Conference*, Sapporo, Japan

C13. D.-H. Kim* and **S. Son** (2018) Mass, Momentum and Energy Paradigm of idealized Tsunami: On Steep Sloped Bathymetry, *The 28th International Ocean and Polar Engineering Conference*, Sapporo, Japan

C14. **S. Son** and C. Lee (2017) Establishment of Coupled Modelling System by linking Surge-Tide-Riverine Flow Effect, *International Research Symposium on Engineering and Technology* , Singapore.

C15. **S. Son*** , C. Lee, K. Do and T. Jung (2017) Increasing Flood Risk due to Run-off Outflow near Estuarine City during Storm Event, *AGU Fall Meeting*, New Orleans, LA, US.

C16. **S. Son*** and P. Lynett (2017) Tsunami Modelling System Inter-coupled through Absorbing-Generating Boundaries, *The Twenty-seventh International Tsunami Symposium*, Bali, Indonesia.

C17. T. Jung and **S. Son** (2016) Effective Boundary Condition for Wave Treatment, *12th International Conference on Hydroinformatics*, Incheon, Republic of Korea.

C18. **S. Son** and T. Jung (2016) Tsunami Modelling System Coupled through Absorbing-Generating Boundaries, *12th International Conference on Hydroinformatics*, Incheon, Republic of Korea.

C19. Kim, D.-H.* and **S. Son** (2015) Coastal Geomorphology Model Using Boussinesq Equation Considering Undertow Effect, *The Twenty-fifth International Offshore and Polar Engineering Conference*, Kona, Hawaii, USA.

C20. **S. Son*** and P. Lynett (2014) Numerical Prediction of Tsunami-Induced Sediment Transport in the Harbor, *AGU(Americal Geophysical Union) Fall Meeting*, San Francisco, CA

C21. **S. Son*** and P. Lynett (2014) Numerical Study of Morphological Changes by Far-Field Tsunami Impacts, *34th International Conference on Coastal Engineering*, Seoul, Korea

C22. P. Lynett*, J. Borrero, **S. Son**, R. Wilson, K. Miller (2013) Assessment of Nearshore Hazard due to Tsunami-Induced Currents(Invited), *AGU(Americal Geophysical Union) Fall Meeting*, San Francisco, CA

C23. P. Lynett*, J. Borrero, **S. Son**, R. Wilson, K. Miller (2013) Assessment of Near Shore Hazard due to Tsunami-Induced Currents, *26th International Tsunami Symposium*, Göcek, Turkey

C24. T.-H. Jung, M. Son, **S. Son**, H.-S. Park (2013) Inclined Bottom Boundary Condition for the Mild-slope Equation, *The 7th International Conference on Asian and Pacific Coasts*, Bali, Indonesia.

C25. P. Lynett*, J. Borrero, R. Wilson, K. Miller, K., **S. Son** (2013) Detailed Simulation of Tsunami-Induced Currents in California Ports and Harbors, *Port 2013*, Seattle, WA

C26. P. Lynett*, D. ,**S. Son**, D.-H. Kim (2011) Simulation of tsunami-induced currents in ports and harbors, *Coastal Structures*, Yokohama, Japan.

C27. P. Lynett*, D. ,Swigler, **S. Son**, D. Bryant, and S. A. Socolofsky (2010) Experimental Study of Solitary Wave Evolution over a 3D Shallow Shelf, *Proceeding of 32nd International Conference on Coastal Engineering*, Shanhai, China.

C28. K.-D. Suh*, **S. Son**, J.-I. Lee and T.-H. Lee (2004) Calculation of Irregular Wave Reflection from Perforated-wall Caisson Breakwaters using a Regular Wave Model, *Proceeding of the 28th International Conference on Coastal Engineering*, Cardiff, UK.

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