

Sangyoung Son, Ph.D

School of Civil, Environ. and Arch. Eng.
Korea University
145 Anam-ro, Seongbuk-gu
Seoul, 02841, Korea

Phone: +82-2-3290-4865
Fax: +82-2-3290-5999
Email: sson@korea.ac.kr
Homepage: <http://coastal.korea.ac.kr>

Education

University of Southern California, Los Angeles, CA, US Ph.D in Civil Engineering (Advisor : Patrick J. Lynett) - Dissertation Title : <i>Wave Induced Hydrodynamic Complexity and Transport in the Nearshore</i>	Aug. 2012
Texas A&M University, College Station, TX, US M.E. in Civil Engineering (Advisor : Patrick J. Lynett, relocated to USC) - Research Topic: <i>Coupled Numerical Model for Lifeline Tsunami Evolution</i>	Dec. 2011
Seoul National University, Seoul, Korea M.S. in Civil, Urban and Geosystem Engineering (Advisor : Kyung-Duck Suh) - Thesis Title : <i>Calculation of Irregular Wave Reflection from Perforated-Wall Caisson Breakwaters</i>	Feb. 2002
Seoul National University, Seoul, Korea B.S. in Civil, Urban and Geosystem Engineering	Feb. 2000

Employments

Korea University, Seoul, Korea Assistant/Associate/Full Professor	Sep. 2015 - Present
University of Southern California, Los Angeles, CA, USA Visiting Faculty	Jan. 2019 - Aug. 2019
University of Ulsan, Ulsan, Korea Assistant Professor	Sep. 2013 - Aug. 2015
University of Southern California, Los Angeles, CA, USA Postdoctoral Scholar - Research Associate	Sep. 2012 - Aug. 2013
University of Southern California, Los Angeles, CA, USA Graduate Research Assistant	Sep. 2011 - Aug. 2012
Oregon State University, Corvallis, OR, USA Visiting Graduate Researcher in O.H. Hinsdale Wave Research Laboratory - Performed experiments of solitary wave evolutions over a 3D shallow shelf (funded by NSF)	May. 2009 - Jul. 2009
Texas A&M University, College Station, TX, USA Graduate Research Assistant	Aug. 2008 - Aug. 2011
Hyundai Engineering & Construction Co., Korea Assistant Senior Engineer	Mar. 2002 - Jul. 2008

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, 9th International Symposium on Environmental Hydraulics (ISEH)	Jul. 2021
Local Organization Committee, Busan, Korea, International Coastal Symposium (ICS)	May. 2018
International Coastal Engineering Committee & TPC member International Society of Offshore & Polar Engineering Conference (ISOPE)	since 2018
Local Organization Committee, Incheon, Korea, International Conference on Hydroinformatics (HIC)	Aug. 2016

Honors and Awards

President's Commendation Korea Society of Civil Engineers, Korea	Dec. 2020
President's Commendation Korea Water Resource Association, Korea	May 2020
Best Paper Awards, KOSHAM Annual Conference Korean Society of Hazard Mitigation, Korea	Feb. 2019
Minister's Commendation for Supporting Services of Hazards Mitigation Ministry of the Interior and Safety, Korea	Jan. 2019
Best Paper Awards, KSCE Annual Conference Korean Society of Civil Engineers, Korea	Oct. 2018
Best Presentation Awards, KWRA Annual Conference Korean Water Resource Association, Korea	May 2017
Best Paper Awards, KSCDP Annual Conference Korean Society of Coastal Disaster Prevention, Korea	Nov. 2015

Best Paper Awards, KSCOE Fall Conference Korea Society of Coastal and Ocean Engineers, Korea	Oct. 2013
Chester P. Jelesnianski Scholarship Zachry Department of Civil Engineering, Texas A&M University	2010-2011
Joseph A. Orr. Fellowship Zachry Department of Civil Engineering, Texas A&M University	2008-2009
Scholarship Assistance Seoul National University, Korea	1997-1999

Professional Memberships

American Society of Civil Engineers(ASCE) | Coasts, Oceans, Ports and Rivers Institute(COPRI) | American Geophysical Union(AGU) | European Geosciences Union(EGU) | International Association of Hydraulic Engineering and Research(IAHR) | Coastal Education & 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. S. Hwang, P. Lynett and **S. Son** (2024) A Two-dimensional Second-order Positivity-preserving Well-balanced Reconstruction Scheme of Wet/dry Fronts for the Saint-Venant System, (under review)
- J2. A. Chrysanti, **S. Son** (2024) Unraveling Atmosphere and Surface Boundary Interactions Behind Extreme Tropical Rainfall: A Case Study in Indonesia Using Fully Coupled Atmosphere-Hydrology Simulations (under review)
- J3. S. Hwang, P. Lynett and **S. Son** (2024) A GPU-accelerated Numerical Model for Nearshore Scalar Transport by Dispersive Shallow Water Flows, (in revision)

- J4. D.-H. Kim, **S. Son**, T.-H. Jung (2024) Topocausically Driven Similarity in Far-Field Tsunami Runup Along a Coast, (in revision)
- J5. 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*, (in press)
- J6. 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)
- J7. 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
- J8. **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
- J9. 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
- J10. 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
- J11. B. Na[†] and **S. Son** (2021) Void Fraction Estimation using a Simple Combined Wave Gauge System under Breaking Waves, *Ocean Engineering*, 241, 110059
- J12. S. Tavakkol, **S. Son**, P. Lynett (2021) Adaptive Third Order Adams-Bashforth Time Integration for Extended Boussinesq Equations, *Computer Physics Communications*, 265, 108006
- J13. B. Na[†], **S. Son** (2021) Prediction of Atmospheric Motion Vectors around Typhoons using Generative Adversarial Network, *Journal of Wind Engineering & Industrial Aerodynamics*, 214, 104643
- J14. 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
- J15. 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
- J16. T. Jung and **S. Son** (2021) Active Tsunami Generation by Tectonic Seafloor Deformation of Arbitrary Geometry Considering the Rupture Kinematics, *Wave Motion*, 100, 102683
- J17. 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
- J18. 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
- J19. 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

- J20. 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
- J21. **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
- J22. 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
- J23. 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
- J24. 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
- J25. 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
- J26. 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
- J27. Y. Seo, H.-S. Ko and **S. Son** (2018) Multifractal Characteristics of Axisymmetric Jet Turbulence Intensity from RANS Numerical Simulation, *Fractals*, 26(1), 1850008
- J28. **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
- J29. 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
- J30. **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
- J31. 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
- J32. H.-D. Yoon, M. Cho and **S. Son** (2016) Investigation of Wave Breaking Turbulence in Morphodynamic Modelling, *Journal of Coastal Research*, SI75, 924–946
- J33. **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
- J34. 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
- J35. **S. Son** and P. Lynett (2014) Interaction of Weakly Dispersive Water Waves with Sheared Currents of Arbitrary Profile, *Coastal Engineering*, 90, 48 – 64.
- J36. **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.
- J37. 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.

- J38. P. Lynett, R. Weiss, W. Renteria, G. Morales, **S. Son**, M. Arcos and B. MacInnes, (2013) Coastal Impacts of the March 11th Tsunami in the Galapagos Islands, *Pure and Applied Geophysics*, 170(6 – 8), 1189 – 1206
- J39. 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.
- J40. **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
- J41. 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(American 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(American 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*, Shanghai, 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.