Jeong-Gil Lee

Senior researcher
Environmental Planning Institute, Seoul National University, Seoul, Republic of Korea
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Research Interests

- Ensemble-based data assimilation for sea ice and ocean
- Sea ice physical processes
- Polar climate
- Seasonal-to-Decadal prediction

Scientific Work Experience

- **May 2025–Current** Senior Researcher, Environmental Planning Institute, Seoul National University, Seoul, Republic of Korea
- **May 2024–April 2025** Post-Doctoral Research Fellow, Environmental Planning Institute, Seoul National University, Seoul, Republic of Korea
- **August 2023–May2024** Post-Doctoral Research Fellow, Center for Sustainable Environment Research, Korea Institute of Science and Technology, Seoul, Republic of Korea
- **March 2023–July 2023** Post-Doctoral Research Fellow, Department of Oceanography, Chonnam National University, Gwangju, Republic of Korea

Education

- **Ph.D. in Oceanography, February 2023**
  Department of Oceanography, Chonnam National University, Gwangju, Republic of Korea
    - *Dissertation*: "Development of Sea Ice and Oceanic Data Assimilation System for Initializing Global Climate Model"
    - *Advisor*: Prof. Yoo-Geun Ham

- **M.S. in Oceanography, August 2017**
  Department of Oceanography, Chonnam National University, Gwangju, Republic of Korea
    - *Thesis*: "Development of the nudging-based data assimilation system using a dynamical sea ice model"
    - *Advisor*: Prof. Yoo-Geun Ham

- **B.S. in Earth System and Environmental Science, August 2015**
  Faculty of Earth System and Environmental Science, Chonnam National University, Gwangju, Republic of Korea

Peer-reviewed Publications

[11] Cheon, M., J.-H. Kim, Y. Choi, Y.-H. Choi, S.-Y. Kang, **J.-G. Lee**, Y.-G. Ham, J. Y. Kim & D. Kang (2025). Understanding data-driven weather forecasting by designing a cost-efficient model with knowledge-oriented modules, *Scientific Report*, https://doi.org/10.1038/s41598-025-32366-3

[10] Jo, H.-S., Y.-G. Ham, S.-H. Oh, **J.-G. Lee**, M.-G. Seong, D. Cho, S. Lim, S.-Y. Kang, S. Jeong, H.-J. Lee, S. Lee, G. Kwon (2025). Recent Advances in AI-based Global Climate Modeling and Forecasting, *Atmosphere*, 35(4), 585-603.

[9] Kim, J.-S., S.-M. Lee, I. Chung, Y.-C. Noh, Y. Choi, J.-H. Kim, & **J.-G. Lee** (2025). Optimal Localization Radius of Data Assimilation for Arctic Sea Ice Initialization using CICE5/DART, *Geoscience Letters*, 12(1), 63. 10.1186/s40562-025-00440-3

[8] Sim, J.-H., B.-M. Kim, **J.-G. Lee**, Y.-K. Lim, J.-H. Kim, & J. H. Kim (2025). Sea Ice Initialization and Its Impact on Winter Seasonal Prediction Skill in Coupled Forecast System, *Journal of Climate*, 38(16), 3989-4001. https://doi.org/10.1175/JCLI-D-24-0524.1

[7] **Lee, J.-G.**, D. Kang, J.-H. Kim, J.-M. Kim, S.-M. Lee, & Y.-G. Ham (2025). Data assimilation of satellite-derived Arctic sea ice thickness during boreal summer, *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, *18*, 11330-11341. https://doi.org/10.1109/JSTARS.2025.3561257

[6] **Lee, J.-G.**, Y.-G. Ham, J.-G. Kim, & P.-H. Chang (2024). Generation of state-dependent ensemble perturbations based on time-varying seawater density for GloSea5 initialization, *Quarterly Journal of the Royal* Meteorological *Society*, *150*(764), 4609-4630. https://doi.org/10.1002/qj.4833

[5] Ham, Y.-G., Y.-S. Joo, J.-H. Kim, & **J.-G. Lee** (2024). Partial-convolution-implemented generative adversarial network for global oceanic data assimilation, *Nature Machine Intelligence*, *6*(7), 834-843. https://doi.org/10.1038/s42256-024-00867-x

[4] Eayrs, C., *et al*, (2024). Advances in machine learning techniques can assist across a variety of stages in sea ice applications, *Bulletin of the American Meteorological Society*, *105*(3), E527-E531. https://doi.org/10.1175/BAMS-D-23-0332.1

[3] **Lee, J.-G.**, & Y.-G. Ham (2023). Impact of thickness satellite data assimilation on bias reduction in Arctic sea ice concentration, *npj Climate and Atmospheric Science*, *6*(73). https://doi.org/10.1038/s41612-023-00402-6

[2] **Lee, J.-G.**, & Y.-G. Ham (2022). Satellite-based data assimilation system for the initialization of Arctic sea ice concentration and thickness using CICE5. *Frontiers in Climate*, *13*. https://doi.org/10.3389/fclim.2022.797733

[1] Ham, Y.-G., J.-G. Kim, **J.-G. Lee**, T. Li, M.-I. Lee, S.-W. Son, & Y.-K. Hyun (2021). The origin of systematic forecast errors of extreme 2020 East Asian Summer Monsoon rainfall in GloSea5. *Geophysical Research Letters*, *48*(16), 2021GL094179. https://doi.org/10.1029/2021GL094179

Publications (Preprints)

[1] Cheon, M., Y.-H. Choi, S.-Y. Kang, Y. Choi, **J.-G. Lee**, & D. Kang (2024). KARINA: An Efficient Deep Learning Model for Global Weather Forecast. *arXiv* preprint arXiv:2403.10555.

Selected Presentations

[10] **Lee, J.-G.**, Y.-G. Ham, and D. Kang, Impact of assimilating CryoSat-2 and SMOS winter Arctic sea ice thickness on summer sea ice area, *Proceedings of the Autumn Meeting of Korean Meteorological Society*, Changwon, November, 2025

[9] **Lee, J.-G.**, D. Kang, J.-H. Kim, J.-M. Kim, S.-M. Lee, and Y.-G. Ham, Data assimilation of Arctic Sea Ice Thickness During the Boreal Summer, *Busan IAMAS-IACS-IAPSO Joint Assembly (BACO-25)*, Busan, July, 2025

[8] **Lee, J.-G.**, Y.-G. Ham, J.-G. Kim, and P.-H. Chang, Generation of state-dependent ensemble perturbations based on time-varying seawater density for GloSea5 initialization, *Proceedings of the Autumn Meeting of Korean Meteorological Society*, Daegu, October, 2024

[7] **Lee, J.-G.**, & Y.-G. Ham, Impact of satellite thickness data assimilation on bias reduction in Arctic sea ice concentration, *8th Annual meeting of the Ocean Predict Science Team (OPST)*, Busan, November, 2023

[6] **Lee, J.-G.**, Y.-G. Ham, & D. Kang, Comparison between univariate and multivariate data assimilation of satellite Arctic sea ice concentration and thickness data during winter, *Proceedings of the Fall Meeting of Korean Meteorological Society*, Busan, November, 2023

[5] **Lee, J.-G.**, Y.-G. Ham, & D. Kang, Impact of satellite thickness data assimilation on bias reduction in Arctic sea ice concentration, *International Sea Ice Modeling Workshop*, Gwangmyeong, October, 2023

[4] **Lee, J.-G.**, Y.-G. Ham and J.-G. Kim, Development of the EnOI-based data assimilation system for ocean dynamical model of NEMO, *Proceedings of the Spring Meeting of Korean Meteorological Society*, Busan, April, 2022

[3] **Lee, J.-G.**, and Y.-G. Ham, Satellite-based data assimilation system for Arctic sea ice seasonal predictions using CICE5, *Proceedings of the Fall Meeting of Korean Meteorological Society*, Online, October, 2020

[2] **Lee, J.-G.**, Y.-G. Ham, B.-M. Kim, S.-B. Lee and S.-H. Kang, Development of the seasonal forecast system of the interannual sea-ice variability using CICE5 model, *European Geosciences Union General Assembly (EGU)*, Vienna, Austria, April, 2018

[1] **Lee, J.-G.**, and Y.-G. Ham, Development of the nudging-based data assimilation system using a dynamical sea ice model (CICE5), *Proceedings of the Spring Meeting of Korean Meteorological Society*, Busan, May, 2017

Modeling and Data Assimilation Experience

[1] Los-Alamos sea ice model (CICE v5.1.2 and CICE v6.6.0)
- · Online data assimilation of sea ice concentration and thickness satellite data
- · Sensitivity experiments for investigating impact of initial thickness states and atmospheric boundary forcing data

[2] Nucleus for European Modelling of the Ocean (NEMO v3.6)
- · Offline data assimilation of ocean temperature and salinity in-situ data
- · NEMOVAR-based ocean and sea ice data assimilation

[3] NEMO5-Sea Ice modeling Integrated Initiative (NEMO5-SI3)
- · Ocean data assimilation of in-situ and satellite data with Parallel Data Assimilation Framework 3 (PDAF3)

[4] Community Earth System Model (CESM v1.2)
- · Forcing experiments for investigating impact of tropical sea surface temperature

[5] Global Seasonal forecast system (GloSea5)
- · Retrospective forecast using updated ocean initial conditions by data assimilation

[6] Ensemble Kalman Filter (EnKF) code of Evensen (2003; 2004)
- · Development of ocean and sea ice data assimilation system based on Ensemble Optimal Interpolation (EnOI)

[7] Global Ocean Data Assimilation and Prediction System 2 (GODAPS2) in KMA
- · Ocean ad sea ice data assimilation using NEMOVARvn5 (3DVAR)

[8] Parallel Data Assimilation Framework 3 (PDAF3)
- · Ocean data assimilation system utilizing NEMO5-SI3

[9] Stationary Wave Model (SWM) of Takaya and Nakamura (2001)
- · Atmospheric teleconnection patterns related to polar climate

* (Computer skills) Program language: Fortran, Python, Shell scripting | Visualization tool: GrADS, NCL

Awards and Honors

2023	Graduation with honors: *Summa cum laude*, Department of Oceanography, Chonnam National University, Korea
2018–2019	Living Expenses Scholarship, Chonnam National University, Korea
2017–2021	Merit Based Scholarship, Chonnam National University, Korea
2015–2017	Brain Korea 21 plus (BK-21) Scholarship, Korea
2015–2016	Merit Based Scholarship, Chonnam National University, Korea
2015	Graduation with honors: *Summa cum laude*, Department of Earth and Environmental Science, Chonnam National University, Korea
2012–2015	Merit Based Scholarship, Chonnam National University, Korea