

Chase J. Shyu (Chase Jhih-Huang Shyu, 徐志煌)

Postdoctoral Fellow in Geodynamics

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Professional Profile

Chase J. Shyu specializes in geodynamics, thermochronology, tectonics, and geology. He focuses on developing and applying numerical models to study interactions of surface and crustal rifting processes. Key contributions include enhancing DynEarthSol (DES) with functions for sediment accumulation, deterministic modeling, and implementing of million-elements scaling up and GPU parallelization using OpenACC and CUDA. Work in 2024 involves simulating crustal rifting and extracting heat flow values for hydrocarbon maturity estimation in collaboration with Taiwan CPC Corporation and National Taiwan University. In 2025, the integration of magma migration into DES is being conducted to investigate the magma-related rifting processes of modeling volcanic rifts and magma migration in Afar. In 2026, further developments of DynEarthSol focus on implementing robust two-phase flow algorithms to improve magma and fluid migration modeling of Jupiter's moon Europa ice shell chaos.

Core Skills

- Numerical modeling in Geodynamics (FLAC)
- Tectonics, Structural, and Field Geology
- Low-temperature Thermochronology
- Sedimentary basin analysis
- Programming: Python, C++, Fortran 95
- Library: OpenMP, OpenACC, Numpy, pandas, matplotlib
- Software: Conda, Git, DynEarthSol, geoflac, Paraview, VS Code, Claude Code, Gemini CLI.
- Languages: English (Working proficiency), Mandarin Chinese (Native proficiency)

Education & Research Experience

Core Developer of [GeoFLAC](#), International Academic GitHub Organization

2016 – Present

- **Developing and reviewing physical and geodynamic features in [DynEarthSol](#).**
- **Designing and implementing GPU parallelization in DynEarthSol.**

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January 2026 – Present

- **Developing two-phase flow under explicit FLAC algorithm.**
- **Modeling of ice shell convection and surface chaos terrain on Jupiter's moon Europa.**
- **Developed GPU friendly Structure of Array memory access and BVH nearest-neighbor algorithm for [DynEarthSol](#).**

January 2025 – December 2025

- **Developed GPU acceleration and 3D rifting related magma migration function for [DynEarthSol](#).**
- **Modeling of Volcanic Rift and Magma Migration in Afar.**

Research Collaborator

January 2024 – October 2024

- Proposed and secured funding for the project "Sedimentary Basin Framework and Thermal History Evolution of the North West Shelf of Australia" in collaboration with Taiwan CPC Corporation, Taiwan, and National Taiwan University.
- Responsible for utilizing DynEarthSol to simulate the crustal rifting process and extract heat flow values for Taiwan CPC Corporation's estimation of hydrocarbon maturity.

Ph.D. in Earth System Science, Academia Sinica and National Central University, Taiwan

2016 – 2024

- **Developed surface processes function for DynEarthSol** such as the correction of sediment marker location for erosion and sedimentation, surface depth-dependent diffusion for terrigenous sources.
- **Optimized parallelization for DynEarthSol** such as two-step node-element processing to avoid race conditions and round-off errors of OpenMP parallelization, and OpenACC implementation for some functions. Optimized OpenMP parallelization of DynEarthSol on Mac Arm64 architecture with Docker packaging in a container.
- **Investigated sedimentary basin interactions during continental rifting**, using DynEarthSol to simulate dynamic basin formation, analyze fault strain partitioning, and study sediment deposition and basin evolution.

M.S. in Geosciences, National Taiwan University, Taiwan
2011 – 2014

B.S. in Geosciences, National Taiwan University, Taiwan
2007 – 2011

- **Zircon Fission Track Experiment:** Determined cooling ages to reconstruct the exhumation history.
- **FLAC Thermochronology and Sedimentation Functions Development:** Enhanced FLAC software for thermochronological and sedimentation capabilities.
- **2D Orogenic and Cooling History Simulation:** Modeled the thermal and mechanical evolution of the Middle Hsuehshan Range, Taiwan.

Awards & Honors

- 2019 Outstanding Student Paper Award, **Taiwan Geosciences Assembly**
- 2018 [Third Place Award in Taiwan Region](#), **NASA Space Apps Challenge**
- 2018 Outstanding Student Paper Award, **Joint Annual Meeting of Geological Society and Geophysical Society**
- 2013 [Outstanding Student Poster Award](#), **EGU General Assembly**

Publication

- **Shyu, C. J.**, Lee, S., Ding, X., Keum, J., Tan, T., Lavier, L. L., & Choi, E. (submitted) DynEarthSol v2.0: An Efficient Explicit Lagrangian Solver for Geodynamics, Surface Processes, and Earthquake-Cycle Dynamics. *Geoscientific Model Development*. [Preprint](#)
- Tan, E., Lee, Y.-H., Chang, J.-B., Zheng, M.-J., **Shyu, C. J.** (2024). Mountain Building Process of the Taiwan Orogeny. *Science advances*. [DOI](#)
- **Shyu, C. J.**, Tan, E., Kirstein, L. A., Stuart, F. M., & Chen, Y.-G. (2023). The exhumation history of the middle Hsuehshan Range, Taiwan, as revealed by zircon thermochronological modeling. *Tectonophysics*, 860, 229907. [DOI](#)

International Conference Communications

- **Shyu, C. J.**, & Lavier, L. L. (2025). Simulation of 3D Magma Migration and Oceanic Crust Formation During Continental Rifting. AGU Fall Meeting 2025, New Orleans, USA. [URL](#)
- **Shyu, C. J.**, Lavier, L. L., Eh, T., Choi, E., & Lee, S. (2025). New 3D Features in DynEarthSol: Efficient Simulation of Magma Migration and Oceanic Crust Formation During Continental Rifting. CIG Community Workshop 2025, Colorado, USA. [URL](#)
- **Shyu, C. J.**, Tan, E., Chang, J.-H., Fan, Z.-K., Hsu, Y.-W., Yu, S.-W., & Lin, A. T. (2024). Numerical thermo-mechanical and depositional models on the heat flux evolution of the basins offshore NW Australia. AGU Fall Meeting 2024, Washington, USA. [URL](#)
- **Shyu, C. J.**, Tan, E., Wu, P.-R., Yang, K.-M., & Lin, A. T. (2023). Relationship Among Basin Evolution, Fault Activity, and Syn-Rift Sedimentary Strata: Insights from Thermo-Mechanical Modeling of Rifted Sedimentary Basins (p. 392454). GSA Connects 2023 Meeting in Pittsburgh, Pennsylvania, USA. [DOI](#)
- **Shyu, C. J.**, Tan, E., Kirstein, L. A., Stuart, F. M., & Chen, Y.-G. (2023). The exhumation history of the middle Hsuehshan Range, Taiwan, as revealed by zircon thermochronological modeling (p. 393734). GSA Connects 2023 Meeting in Pittsburgh, Pennsylvania, USA. [DOI](#)
- **Shyu, C. J.**, Tan, E., Kirstein, L. A., Stuart, F. M., & Chen, Y.-G. (2019). Early onset of rapid exhumation of the Hsuehshan Range, Taiwan revealed by zircon thermochronological modeling. Abstract No. T51E-0307 AGU Fall Meeting 2019, San Francisco, USA.
- **Shyu, C. J.**, Tan, E., Kirstein, L. A., Stuart, F. M., & Chen, Y.-G. (2018). Joint zircon thermochronology modeling on the uplift history of the Middle Hsuehshan Range in Taiwan Abstract No. T32A-08 AGU Fall Meeting 2018, Washington, USA.

- **Shyu, C.J.**, Tan, E., & Lin, A.T. (2017). The influence of sedimentation on the structural development of continental rifting with numerical experiments. Abstract No. T33A-0700 AGU Fall Meeting 2017, New Orleans, USA.
- **Shyu, C.J.**, Tan, E., Kirstein, L.A., Stuart, F.M., & Chen, Y.-G. (2016). The Thermal-Mechanical Evolution of the Middle Hsuehshan Range in Taiwan Based on Zircon Thermochronology and Numerical Modeling Abstract No. EGU2016-17747-3 EGU General Assembly 2016, Vienna, Austria.
- **Shyu, C.J.**, Tan, E., Kirstein, L.A., & Chen, Y.-G. (2013). Wide-zoned Closure, a Thermochronological Phenomenon, in Initial Stage of Orogeny: Example from Middle Hsuehshan Range, Taiwan. Abstract No. T43F-2729 AGU Fall Meeting 2013, San Francisco, USA.
- **Shyu, C.J.**, Tan, E., Chen, Y.-G. (2013). The Thermal- Mechanical Evolution of Mid-Hsuehshan Range, Taiwan: Through Numerical Modeling and ZFT Ages. Abstract No. EGU2013-3890 EGU General Assembly 2013, Vienna, Austria.

Referees

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Postdoctoral Research

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