Marcos E. Salas-Saavedra, Ph.D.

Environmental Geoscientist | Analytical Chemistry | Geochronology Research

Postdoctoral Research Associate, Princeton University

Phone: +1 (848) 251 6872| Emails: ms3407@princeton.edu : msalassaavedra.e@gmail.com | Princeton, NJ, USA
Web: https://geosciences.princeton.edu/people/marcos-salas-saavedra

Professional Summary

I am an environmental geochemist with nearly 20 years of experience in Earth and environmental sciences, with a strong background in carbonate systems, U–Th geochronology, and trace element geochemistry. Currently, as a Postdoctoral Research Associate at Princeton University, I investigate past climate and sea-level variability using coral archives and advanced geochemical techniques such as LA-ICP-MS, LIBS, and micro-CT 3D modeling. My research integrates traditional analytical methods with modern approaches—including Python-based data science and machine learning—to interpret complex environmental dynamics. I am committed to conducting high-impact research that bridges geochronology, geochemistry, and sustainability. My goal is to advance our understanding of long-term Earth system processes and to develop data-driven approaches to address today's global challenges.

Education

- **Ph.D. in Geochemistry and Geochronology**
  The University of Queensland, Brisbane, Australia
  01/2014 – 12/2019
- **Licentiate in Biological Sciences**
  Austral University of Chile, Valdivia, Chile
  01/2007 – 12/2010
- **Bachelor of Sciences**
  Austral University of Chile, Valdivia, Chile
  01/2005 – 12/2009

Skills

- **Technical Skills:** U-Th geochronology, radiogenic and stable isotope analysis, critical mineral systems, trace element geochemistry, ICP-MS, laser ablation (LA-ICP-MS), multi-collector ICP-MS (MC-ICP-MS), sample preparation and cleaning techniques, automated column chemistry (prepFAST MC), and micro-CT/3D image processing, SEM and FIB.
- **Analytical & Research Skills:** High-resolution geochemical profiling, experimental design, multi-proxy paleoclimate reconstruction, rare earth element (REE) analysis, statistical modeling, and quality control for low-level trace element detection.
- **Computational & Data Processing:** Python programming, Jupyter Notebook, data visualization, time-series analysis, interpretation of large geochemical datasets, and Python U-Th analysis algorithms.
- **Software & Platforms:** IOLITE, Aviso 3D, Dragonfly, MS Office Suite, Adobe Illustrator, LaTeX.
- **Soft Skills:** Laboratory and project management, interdisciplinary collaboration, science communication (oral/written), student mentorship, and leadership in research environments.
- **Languages:** Native Spanish speaker; fluent in English.

Research Experience

Postdoctoral Research Associate, Princeton University, NJ, USA
01/2023 – Present

- Leading multiple research projects, including U-Th dating of meteoric calcite and paleoclimate reconstruction using nitrogen isotopes and rare earth elements; manuscripts in preparation.
- Mentoring graduate students in advanced analytical techniques (e.g., MC-ICP-MS, LA-ICP-MS), contributing to skill development and research productivity.
- Developed precise $^{238}U/^{232}Th$ gravimetric solutions, significantly improving dating accuracy.
- Awarded Princeton grant funding (~AUD$30,000) to advance geochronology and paleoclimate studies.
- Presented research findings at major international conferences, including AGU.
- Coordinating lab operations and safety protocols as part of lab manager duties in the Niespolo Lab.
- Liaising with departmental facilities manager to schedule instrument maintenance and laboratory infrastructure upgrades.

Research Assistant – Centre for Mined Land Rehabilitation, SMI-UQ
Dec 2019 – Mar 2020

- Developed and streamlined protocols for geochemical soil analysis, enhancing accuracy and workflow efficiency.
- Prepared plant and bauxite tailings/red mud samples for ICP-MS/OES under ultra-clean laboratory conditions to support mine rehabilitation studies.
- Performed pH, electrical conductivity, and pre-acidification tests to ensure sample integrity.

Scientific Officer – Radiogenic Isotope Facility, UQ
May 2019 – Nov 2019

- Managed preparation of carbonate and archaeological samples for high-precision U-Th dating using multi-collector ICP-MS.
- Optimized analytical methods for ultra-low (~1 ppb) trace element analysis in carbonates, achieving RSD values under 10% for rare earth elements.
- Prepared chromatographic columns for elemental separation and purification.
- Operated SEM for detailed sample vetting and quality assurance.

Teaching and Mentoring Experience

Volunteer Teaching Assistant, Bangladesh
01 – 01/2025

- Delivered a short undergraduate course on soil science and biogeochemical nutrient cycles for ~25 rural students.
- Designed lectures and practicals linking environmental geochemistry to local agricultural practices.

Mentor, Princeton University, NJ, USA
03/2023 – Present

- Guided 4 graduate students in research projects, fostering their analytical skills in instruments like ICP-MS and SEM.

Fieldwork Experience

- **Great Barrier Reef, Australia**
  10/2023
  - Collected samples for U-Th dating and carbonate geochemistry analysis.
- **Caribbean**
  06/2023 & 11/2024
  - Conducted fieldwork for paleoenvironmental reconstruction studies in the island of Curacao.
- **Great Barrier Reef, Australia**
  03/2015
  - Supported sample collection for Holocene reef development research ARC funded.

Grants and Scholarships

- **Paleo-Fund from Geoscience Department at Princeton University**
  2023 – Present
  - Funded postdoctoral research on paleoclimate studies (AUD$30,000).
- **CONICYT Scholarship, Chile**
  2014 – 2018
  - Supported Ph.D. research on Holocene reef development (AUD$250,000).
- **ELAP Program, Canada**
  2016
  - Funded research exchange for paleoenvironmental studies between Chile and Canada (CAD$10,000).

Peer reviewed Publications

- **Sanborn, K. L., Webster, J. M., Erler, D., Webb, G. E., Salas-Saavedra, M., & Yokoyama, Y.** (2024). The impact of elevated nutrients on the Holocene evolution of the Great Barrier Reef. *Quaternary Science Reviews, 332*, 108636. https://doi.org/10.1016/j.quascirev.2024.108636
- **Salas-Saavedra, M., Webb, G.E., Sanborn, K.L., Zhao, J., Webster, J.M., Nothdurft, L.D., Nguyen, A.** (2022). Holocene microbialite geochemistry records > 6000 years of secular influence of terrigenous flux on water quality for the southern Great Barrier Reef. *Chemical Geology*, 120871. https://doi.org/10.1016/j.chemgeo.2022.120871.
- **Sanborn, K.L., Webster, J.M., Webb, G.E., Braga, J.C., Humblet, M., Nothdurft, L., Patterson, M.A., Dechnik, B., Warner, S., Graham, T., Murphy, R.J., Yokoyama, Y., Obrochta, S.P., Zhao, J., Salas-Saavedra, M.** (2020). A new model of Holocene reef initiation and growth in response to sea-level rise on the Southern Great Barrier Reef. *Sedimentary Geology*, 397, 105556.
- **Duce, S., Dechnik, B., Webster, J.M., Hua, Q., Sadler, J., Webb, G.E., Nothdurft, L., Salas-Saavedra, M., Vila-Concejo, A.** (2020). Mechanisms of spur and groove development and implications for reef platform evolution. *Quaternary Science Reviews*, 231, 106155.
- **Salas-Saavedra, M., Dechnik, B., Webb, G.E., Webster, J.M., Zhao, J., Nothdurft, L.D., Clark, T.R., Graham, T., Duce, S.** (2018). Holocene reef growth over irregular Pleistocene karst confirms major influence of hydrodynamic factors on Holocene reef development. *Quaternary Science Reviews*, 180, 157–176.

Presentations

- Salas-Saavedra, M., Niespolo, E., Webb, G. E., Webster, J., & Nothdruft, L. (2024, December). U-Th dating of meteoric calcite on highly altered fossil corals to improve sea-level reconstruction. Presented at the AGU 2024 Fall Meeting, American Geophysical Union, USA.

- Salas-Saavedra, M., Webb, G.E., Sanborn K.L., Zhao, J-X., Webster, J.M., Nothdurft, L., Nguyen, A. Holocene microbialites records of terrigenous influence on water quality for the offshore southern Great Barrier Reef. Australian Earth Sciences Convention – 'Core to Cosmos' – 9-12 February 2021
- Webb, G.E., Salas-Saavedra, M., Sadler, J., Chambers, J., Dechnik, B., Sanborn, K.L., Webster, J.M., Nothdurft, L.D., Braga,
- J.C., Zhao, J.X., Graham, T. (2019) Reef coring: insights into Holocene palaeoenvironments, southern Great Barrier Reef. 13th International Conference on Paleoceanography, Sydney, Australia
- ,Salas-Saavedra, M., Dechnik, B., Webb, G.E., Webster, J.M., Zhao, J., Nothdurft, L.D., Clark, T.R., Graham, T Braga, J.C. (2016) Irregular Pleistocene platform beneath Heron Reef Southern Great Barrier Reef 13th International Coral Reef Symposium 2016, Honolulu, Hawaii USA.
- Salas-Saavedra, M., St-Onge, G., Mulsow, S., Chapron, E., Debret, D., Desmet, M., Winiarski T., (2010) Physical properties and initial dating of rapidly deposited layer in a Chilean margin fjords (Seno Reloncaví): a record of major historical earthquakes. XI Student Conference GEOTOP Montreal, Canada.
- St-Onge, G., Chapron, E., Mulder, T., Salas- Saavedra, M., Mulsow, S., Piper D. J. W., (2010) Comparison of earthquake-triggered turbidites from an active and a passive continental margin. International Association of Sedimentologists, Reunion, Mendoza, Argentina.