

# Oscar SEPÚLVEDA STEINER, Ph.D.

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## Education

- 2016-2020 **Ph.D. in Civil and Environmental Engineering**, École Polytechnique Fédérale de Lausanne (EPFL), Switzerland. Thesis title: Mixing processes and their ecological implications: From vertical to lateral variability in stratified lakes. Supervisors: A. Wüest and D. Bouffard.
- 2013-2015 **M.Sc. in Water Resources and Environment** (First-Class Honours), University of Chile, Santiago, Chile. Thesis title: Effect of wind-induced baroclinic circulation on vertical mixing in Comau Fjord, Chile. (*in Spanish*). Supervisor: A. de la Fuente.
- 2011-2012 **Civil Engineer Diploma with major in Water Resources** (First-Class Honours), University of Chile, Santiago, Chile. Equivalent to P.E. (PEng) in Chile.
- 2007-2010 **B.Sc. in Civil Engineering** (Honours), University of Chile, Santiago, Chile.

## Research appointments

- 2025-present **Project Scientist**, University of California Davis (UC Davis), Tahoe Environmental Research Center, Davis, CA, USA.
1. Modeling the impacts of stream inflows on lake water quality under a changing climate. Funded by USBR.
  2. Boundary Layer Under-Ice Environmental Sensing (BLUES). Funded by NSF Ideas Lab. PI: A. L. Forrest.
- 2023-2025 **Postdoctoral research fellow**, UC Davis, Civil & Environmental Engineering, Davis, CA, USA.
- Project: Basin-scale gyres effects on lake water heterogeneity using underwater gliders. Advisor: A. L. Forrest. Funded by Swiss-NSF Postdoc Mobility grant
- 2020-2022 **Postdoctoral researcher** (90% Research, 10% Mentoring/Teaching), Eawag: Swiss Federal Institute of Aquatic Science and Technology, SURF department, Kastanienbaum, Switzerland.
1. 2020-2022. Bioconvection in Lake Cadagno (BioCad). Supervisor: D. Bouffard.
  2. 2022. Effect of turbulent fluxes on metal cycling in Lake Zug. Supervisor: D. Janssen.
- 2016-2020 **Doctoral assistant** (80% Research, 20% Teaching), Aquatic Physics Laboratory (AHPYS), EPFL, Switzerland.
- 2014 **Visiting Master's student**, AHPYS, EPFL, Switzerland.
- 2012-2015 **Student researcher**, Department of Civil Engineering, University of Chile, Chile.

## Professional development

- 2025 **Effective teaching series**, UC Davis.
- 2024 **Mentoring academy for postdoctoral scholars**, UC Davis.
- 2024 **Scientific leadership and management skills**, UC Davis.

## Grants & scholarships

- 2023-2025 **Postdoc Mobility grant** (~160,000 USD), awarded by the Swiss National Science Foundation (SNSF), Switzerland. Destination: UC Davis & Tahoe Environmental Research Center (TERC), CA, USA.
- 2022 **Academic Transition grant** (~50,000 USD), awarded by Eawag, Switzerland.
- 2013-2014 **National Master scholarship** (~15,000 USD, 20% selection rate), awarded by the National Commission for Scientific and Technological Research - CONICYT (now ANID), Chile.
- 2014 **Scholarship for international research internship** (~5,000 USD), awarded by University of Chile, Chile. Destination: AHPYS Laboratory, EPFL, Switzerland.

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## Relevant field experience

- 2024 **Antarctic scientific cruise.** Participation in the RVIB Araon expedition to Pine Island Bay (Amundsen Sea).
- 2023 **Arctic expedition.** Ice-ocean interactions in Milne Fiord epishelf lake, Ellesmere Island, Canada.
- 2023 **Underwater glider monitoring.** Gyre-induced heterogeneity in Lake Tahoe.
- 2018 **Underwater glider field campaign.** Spatial variability of turbulent mixing in Lake Geneva, Switzerland.
- 2016-2022 **Alpine lake monitoring.** Annual field campaigns to study bioconvection in alpine Lake Cadagno, Switzerland.
- 2014 **Patagonia expedition.** Hydrodynamics of Comau Fjord, Northern Patagonia, Chile.

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## Teaching Experience

- 2025 **Lecturer**, University of California Davis, USA.  
Engineering Hydraulics, lectureship and laboratory (100 students; 1 quarter).
- 2019, 2021 **Lecturer**, University of Geneva (UniGe) & SUPSI, Switzerland.  
Block course of Physical Limnology. Part of the Alpine Hydrobiology summer school (15-20 students; 2 semesters).
- 2021 **Teaching assistant**, ETHZ, Switzerland.  
Biogeochemical modeling (20 students/direct mentor of 2 students; 1 semester).
- 2016-2019 **Teaching assistant**, EPFL, Switzerland.  
Limnology (15-20 students; 3 semesters), Hydrological risks and structures (20-30 students; 2 semesters).
- 2012-2014 **Teaching assistant**, University of Chile, Chile.  
1 semester each: Numerical modeling (10 students), Environmental hydrodynamics (10 students), Aquatic transport processes (20 students), Newtonian systems (~Physics II; 90 students), Hydraulics (grader; 40 students), Fluid mechanics (grader; 40 students).

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## Student Mentoring

- 2025-present **Claire Moats** (MSc, UC Davis). Under-ice lake hydrodynamics.
- 2022-present **Kenneth Larrieu** (PhD, UC Davis). Ice-free radiatively driven convection, Hydrodynamics of suspended particles.
- 2021-2025 **Drew Friedrichs** (PhD, UC Davis). Turbulence in Antarctic polynyas.
- 2023-2024 **Jade Hinson** (MSc, UC Davis). Controlling hypolimnetic anoxia using dual loop diffusors.
- Spring 2021 **Clara Klöcker and Christoph Diezinger** (MSc, ETHZ). Semester project. Nutrient dynamics in lakes.
- 2020-2023 **Francesco DiNezio** (PhD, SUPSI/UniGe). Effects of bioconvection on microbial physiology.
- Fall 2017 **Josquin Puntos-Dami** (MSc, EPFL). Semester project. Meromixis dynamics.
- Summer 2017 **Angelo Carlino and Emilie Haizmann** (Summer interns, EPFL). Monitoring of Lake Cadagno.

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## Examination committees

- 2024 External expert on PhD dissertation panel ("Mención Internacional"). Student: **Esperanza Broullón Mandado**. Thesis title: Thin layers of phytoplankton in the Rías Baixas (NW off Iberia): occurrence, formation and relevance. Universidad de Vigo, Spain. Supervised by Prof. Beatriz Mouriño Carballido and Dr. Bieito Fernández Castro (University of Southampton, UK).

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## Membership & Service

- Member** of: ASLO, AGU.
- Reviewer** for: Limnology and Oceanography, Hydrology and Earth System Sciences, Aquatic Sciences & Journal of Limnology.
- 2023, 2024 **AGU Fall Meeting** session co-convenor. Lakes and Inland Water Bodies.
- 2016-2019 **Treasurer** for the Association of Chilean Researchers in Switzerland - **ICES**.

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## Languages

Spanish	Mother tongue	French	Fluent
English	Professional proficiency	German	Beginner

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## Publications

### Published

- [1] Bonneau, J., Rajewicz, J. S. T., Friedrichs, D. M., Mueller, D., Laval, B. E. Forrest, A. L., Hamilton, A. K., Antropova, Y. & **Sepúlveda Steiner, O.** (2025). Momentum, heat and salt budgets to estimate drag and transfer coefficients inside an ice shelf basal channel. *Journal of Physical Oceanography*: 55, 1353–1373.
- [2] Larrieu, K., **Sepúlveda Steiner, O.**, Friedrichs, D. M., McInerney, J. B. T., Austin, J. A. & Forrest, A. L. (2025). Turbulence characteristics of ice-free radiatively driven convection in a deep, unstratified lake. *Geophysical Research Letters*: 52, e2024GL112607.
- [3] Storelli, N., **Sepúlveda Steiner, O.**, Di Nezio, F., Roman, S., Buetti-Dinh, A. & Bouffard, D. (2025). Physically stable yet biologically sensitive: multiyear ecological dynamics of anoxygenic phototrophs in stably redox-stratified Lake Cadagno. *Aquatic Sciences*: 87(2), 58.
- [4] Irani Rahaghi, A., Odermatt, D., Anneville, O., **Sepúlveda Steiner, O.**, Reiss, R., *et al.* (2024). Combined Earth observations reveal the sequence of conditions leading to a large algal bloom in Lake Geneva. *Communications Earth & Environment*: 5, 229.
- [5] Di Nezio, F., Roman, S., Buetti-Dinh, A., **Sepúlveda Steiner, O.**, Bouffard, D., Sengupta, A. & Storelli, N. (2023). Motile bacteria leverage bioconvection for eco-physiological benefits in a natural aquatic environment. *Frontiers in Microbiology*: 14:1253009.
- [6] **Sepúlveda Steiner, O.**, Forrest, A. L., McInerney, J. B. T., Fernández Castro, B., Lavanchy, S., Wüest, A. & Bouffard, D. (2023). Spatial variability of turbulent mixing from an underwater glider in a large, deep, stratified lake. *JGR: Oceans*: 128, e2022JC018913.
- [7] Bartosiewicz, M., Venetz, J., Laübli, S., **Sepúlveda Steiner, O.**, Bouffard, D., Zopfi, J. & Lehmann, M. F. (2023). Detritus-hosted methanogenesis sustains the methane paradox in an alpine lake. *Limnology and Oceanography*: 68, 248-264.
- [8] Janssen, D.J., Rickli, J., Wille, M., **Sepúlveda Steiner, O.**, Vogel, H., Dellwig, O., Berg, J., Bouffard, D., Lever, M. A., Hassler, C. S. & Jaccard, S. L. (2022). Chromium cycling in euxinic basins challenges  $\delta^{53}\text{Cr}$  paleoredox proxy applications. *Geophysical Research Letters*: 49, e2022GL099154.
- [9] Friedrichs, D. M., McInerney, J. B. T., Oldroyd, H. J., Lee, W. S., Yun, S., Yoon, S.-T., Stevens C. L., Zappa, C. J., Dow, C. F., Mueller, D., **Sepúlveda Steiner, O.** & Forrest, A. L. (2022). Observations of submesoscale eddy-driven heat transport at an ice shelf calving front. *Communications Earth & Environment*: 3, 140.
- [10] Fernández Castro, B., Bouffard, D., Troy, C., Ulloa, H. N., Piccolroaz, S., **Sepúlveda Steiner, O.**, Chmiel, H. E., Serra Moncadas, L., Lavanchy, S. & Wüest, A. (2021). Seasonality modulates wind-driven mixing pathways in a large lake. *Communications Earth & Environment*: 2, 215.
- [11] Fernández Castro, B., **Sepúlveda Steiner, O.**, Knapp, D., Posch, T., Bouffard, D. & Wüest, A. (2021). Inhibited vertical mixing and seasonal persistence of a thin cyanobacterial layer in a stratified lake. *Aquatic Sciences*: 83(2), 38.
- [12] **Sepúlveda Steiner, O.**, Bouffard, D. & Wüest, A. (2021). Persistence of bioconvection-induced mixed layers in a stratified lake. *Limnology and Oceanography*: 66(4), 1531-1547.
- [13] **Sepúlveda Steiner, O.**, Bouffard, D. & Wüest, A. (2019). Convection-diffusion competition within mixed layers of stratified natural waters. *Geophysical Research Letters*: 46(22), 13199-13208.
- [14] Ulloa, H. N., Constantinescu, G., Chang, K., Horna-Munoz, D., **Sepúlveda Steiner, O.**, Bouffard, D. & Wüest, A. (2019). Hydrodynamics of a periodically wind-forced small and narrow stratified basin: A large-eddy simulation experiment. *Environmental Fluid Mechanics*: 19(3), 667-698.
- [15] Sommer, T., Danza, F., Berg, J., Sengupta, A., Constantinescu, G., Tokyay, T., Bürgmann, H., Dressler, Y., **Sepúlveda Steiner, O.**, Schubert, C. J., Tonolla, M. & Wüest, A. (2017). Bacteria-induced mixing in natural waters. *Geophysical Research Letters*: 44(18), 9424-9432.

## Submitted & in preparation

- [16] Friedrichs, D. M., Lee, W. S., Yun, S., Na, J., Wählin, A. K., Stevens C. L., Larrieu, K., **Sepúlveda Steiner, O.** & Forrest, A. L. Glacial meltwater-driven turbulent heat and salt transport in the southeastern Amundsen Sea Polynya. In preparation for submission to *JGR: Oceans*.
- [17] Bartosiewicz, M., Chmiel, H. E., Doda, T., Bouffard, D & **Sepúlveda Steiner, O.** Hydrodynamic periodicity of CO<sub>2</sub> fluxes and peak emissions from a meromictic alpine lake. In preparation for submission to *JGR: Biogeosciences*.
- [18] **Sepúlveda Steiner, O.**, Larrieu, K., Valbuena, S., Friedrichs, D. M. & Forrest, A. L. Rotationally driven turbulent mixing in a stratified, deep lake. In preparation for submission to *Geophysical Research Letters*.
- [19] **Sepúlveda Steiner, O.**, Bouffard, D. & Ulloa, H. N. A minimal model for bioconvection in stratified aquatic systems. In preparation for submission to *Limnology and Oceanography*.

## Conferences (Selected Oral Presentations)

- [1] **Sepúlveda Steiner, O.**, Forrest, A. L., McNerney, J. B. T., Fernández Castro, B., Wüest, A. & Bouffard, D. Glider-based turbulence measurements in Lake Geneva. *24th Workshop on Physical Processes in Natural Waters*. 2022. Vancouver, Canada.
- [2] **Sepúlveda Steiner, O.**, Forrest, A. L., McNerney, J. B. T., Baracchini, T., Lavanchy, S., Bouffard, D. & Wüest, A. Basin-scale gyres: Rotationally-driven mixing in Lake Geneva. *16th Swiss Geoscience Meeting*. 2018. Bern, Switzerland.
- [3] **Sepúlveda Steiner, O.**, Bouffard, D. & Wüest, A. Day and night bio-convection in Lake Cadagno. *21st Workshop on Physical Processes in Natural Waters*. 2018. Solothurn, Switzerland.
- [4] **Sepúlveda Steiner, O.**, Bouffard, D., Schill, F. & Wüest, A. Measuring bio-convection in natural waters. *8th International Symposium on Environmental Hydraulics (IAHR-ISEH)*. 2018. University of Notre Dame, Indiana, USA.
- [5] **Sepúlveda Steiner, O.**, de la Fuente, A., Meruane, C., Contreras, M. & Niño, Y. Caracterización de la hidrodinámica del fiordo Comau y análisis de su influencia en la distribución vertical de microalgas. *XXVI Congreso Latinoamericano IAHR de Hidráulica*. 2014. Santiago, Chile (*in Spanish*).

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## Outreach activities (Selected)

- [1] Journée des gymnasiens, EPFL (2019). Presentation on aquatic physics to high-school students (*in French*).
- [2] An underwater glider for measuring turbulence in Lake Geneva (2018). EPFL news.
- [3] Un planeur dans les gyres du Léman. 24 heures, 10 September, 2018 ([front page](#)). Newspaper article on underwater robotics work performed in Lake Geneva.