DR. MELISSA SOPHIA SCHWAB

BIOGEOCHEMIST

POSTDOCTORAL RESEARCHER AT JET PROPULSION LABORATORY | CALIFORNIA INSTITUTE OF TECHNOLOGY

4800 Oak Grove Drive
M/S 233-300
Pasadena | CA 91109 | USA

+1 626 319 5501

melissa.s.schwab@jpl.nasa.gov

0000-0001-5600-4439

PROFILE STATEMENT

I am a highly self-motivated and enthusiastic scientist with an expertise in sedimentary, inorganic, and organic geochemistry. I combine established and novel approaches to gain a deeper understanding of biogeochemical cycles and their influence on atmospheric CO_2 concentrations. My research focuses on the deconvolution of riverine and marine organic carbon export, residence times, and climatic factors regulating organic carbon cycling.

EDUCATION

Doctor of Science | Biogeochemistry | ETH Zurich | Switzerland
2020 | *Radiocarbon Constraints on Carbon Dynamics in River Basins* | Dr. Timothy I. Eglinton (ETH Zurich), Dr. Robert G. Hilton (Durham University), Dr. Maarten Lupker (ETH Zurich), Dr. Miguel Goñi (Oregon State University)

Master of Science | Earth Sciences | ETH Zurich | Switzerland
2015 | *Coupled Organic and Inorganic Tracers of Particle Flux Processes in the North American Arctic Ocean* | Dr. Timothy I. Eglinton, Dr. Derek Vance, Dr. Jörg D. Rickli | with honors

Bachelor of Science | Earth Sciences | Ruprecht Karl University of Heidelberg | Germany
2013 | *Ein Aufschlussanalog für geothermische Reservoirgesteine: Diagenese und Fazies des Mittleren Bundsandsteins bei Ettlingen (Baden)* | Dr. Thilo Bechstädt | with honors

RESEARCH EXPERIENCE

Postdoctoral Researcher with Dr. Charles E. Miller | Jet Propulsion Laboratory | California Institute of Technology | USA | 2021 - present
Sagavanirktok and Kuparuk Rivers time series

- Coupling hyperspectral Airborne Visible/Infrared Imaging Spectrometer - Next Generation (AVIRIS-NG) imagery and ground truthing to map instantaneous sediment and organic carbon export and to pinpoint hotspots of permafrost degradation
- Exploring the response of particulate, dissolved, and gaseous organic and inorganic carbon to changes in geomorphological gradients and seasonality
- Using dissolved carbon dioxide and sulfate isotopic compositions to infer rock weathering conditions in association with permafrost degradation

Doctoral Student with Dr. Timothy I. Eglinton and Dr. Robert G. Hilton | ETH Zurich | Switzerland | 2016 - 2020
Mackenzie River time series

- Assessing the influence of hydrodynamics on fluvial organic carbon storage and transfer using compound-specific radiocarbon analyses
- Tracing the systematic in-river transport of discrete, waterlogged plant-derived debris and its impact on regional organic carbon budgets
- Linking the mobilization of aged dissolved organic carbon and nitrate to the percolation of supra-permafrost groundwater through previously frozen layers

Sihl River time series

- Investigating hydrodynamic and seasonal controls on the export of organic carbon in a moderately steep river basin bridging headwater streams and lowland rivers
- Examining the impact of hydrodynamics and environmental stressors on the composition and export of plan-derived biomarkers

Master Student with Dr. Timothy I. Eglinton | ETH Zurich | Switzerland | 2013 - 2015
Western Arctic Ocean

- Delineating regional sediment and organic carbon sources and their respective transport pathways in the Western Arctic Ocean using a coupled inorganic tracer (Nd, Sr) and organic carbon (^{13}C, ^{14}C) approach

Intern with Dr. Bernd Frieg | Radioactive Waste Disposal | Nagra | Switzerland | 2012

- Revision of spring registers | data clean-up | installation of a borehole seismic imager

PUBLICATIONS: PEER-REVIEWED JOURNAL ARTICLES | 11|22

[5] **Schwab, M. S.**, Gies, H., Freymond, C. V., Lupker, M., Haghipour, N., & Eglinton, T. I. (2022). Environmental and hydrologic controls on sediment and organic carbon export from a subalpine catchment: insights from a time-series. *Biogeosciences*, *In Press*.

[4] **Schwab, M. S**., Hilton, R. G., Haghipour, N., Baronas, J. J., & Eglinton, T. I. (2022). Vegetal undercurrents - Obscured riverine dynamics of plant debris. *Journal of Geophysical Research: Biogeosciences*, *127*(3).

[3] **Schwab, M. S.**, Rickli, J. D., Macdonald, R. W., Harvey, H. R., Haghipour, N., & Eglinton, T. I. (2021). Detrital neodymium and (radio)carbon as complementary sedimentary bedfellows? The Western Arctic Ocean as a testbed. *Geochimica et Cosmochimica Acta*, *315*, 101-126.

[2] Eglinton, T. I., Galy, V. V., Hemingway, J. D., Feng, X., Bao, H., Blattmann, T. M., Dickens, A. F., Gies, H., Giosan, L., Haghipour, N., Hou, P., Lupker, M., McIntyre, C. P., Montluçon, D. B., Peucker-Ehrenbrink, B., Ponton, C., Schefuß, E., **Schwab, M. S.**, Voss, B. M., Wacker, L., Wu, Y., & Zhao, M. (2021). Climate control on terrestrial biospheric carbon turnover. *Proceedings of the National Academy of Sciences*, *118*(8).

[1] **Schwab, M. S.**, Hilton, R. G., Raymond, P. A., Haghipour, N., Amos, E., Tank, S. E., Holmes, R. M., Tipper, E. T., & Eglinton, T. I. (2020). An Abrupt Aging of Dissolved Organic Carbon in Large Arctic Rivers. *Geophysical Research Letters*, *47*, e2020GL088823.

OTHER PUBLICATIONS: MANUSCRIPTS IN PROGRESS

[2] **Schwab, M. S.**, Haghipour, N., & Eglinton, T. I. (2022). Temporal phasing of plant wax signatures exported from a sub-alpine catchment.

[1] **Schwab, M. S**., Hilton, R. G., Haghipour, N., & Eglinton, T. I. (2022). Dynamics of carbon and sediment transport through the Mackenzie River Delta.

CONFERENCE & SEMINAR PRESENTATIONS

[7] **Schwab, M. S.**, Hilton, R. G., Haghipour, N, Baronas, J. J., & Eglinton, T. I. (2022). Vegetal Undercurrents - Obscured Riverine Dynamics of Plant Debris. *Goldschmidt Conference*, Honolulu, HI, USA.

[6] **Schwab, M. S.**, Hilton, R. G., Raymond, P. A., Haghipour, N., Amos, E., Tank, S. E., Holmes, R. M., Tipper, E. T., & Eglinton, T. I. (2020). An Abrupt Aging of Dissolved Organic Carbon in Large Arctic Rivers. *Japan Agency for Marine-Earth Science and Technology (JAMSTEC)*, Yokosuka, Japan.

[5] **Schwab, M. S**., Haghipour, N., & Eglinton, T. I. (2019). Temporal aliasing of molecular proxy signals carried by a sub-alpine river. *International Meeting on Organic Geochemistry (IMOG)*, Gothenburg, Sweden.

[4] **Schwab, M. S.**, Hilton, R. G., Raymond, P. A., Haghipour, N., & Eglinton, T. I. (2019). A smoking gun for the carbon cycle change in the Canadian Arctic? *Goldschmidt Conference*, Barcelona, Spain.

[3] **Schwab, M. S.**, Hilton, R. G., Galy, V., Haghipour, N., GrafPannatier, E., Macdonald, R., & Eglinton, T. I. (2018). Organic carbon export from the Mackenzie basin: Insights from observations spanning 30 years. *Goldschmidt Conference*, Boston, MA, USA.

[2] **Schwab, M. S.**, Rickli, J. D., Blusztajn, J., Manganini, S., Harvey, H. R., Macdonald, R. W., Vance, D., McIntyre, C., & Eglinton, T. I. (2018). Geochemical constraints on Particle Flux Processes in the Western Arctic Ocean. *Polar2018*, Davos, Switzerland.

[1] **Schwab, M. S.** (2017). Freund oder Feind? Der Einfluss arktischer Flüsse auf den Klimawandel. Seminar Series "*Schweizer Polarforschung - Swiss Camp*", *focusTerra*, *ETH Zurich*, Zurich, Switzerland.

POSTER PRESENTATIONS

[5] **Schwab, M. S.**, Hilton, R. G., Galy, V., Haghipour, N., GrafPannatier, E., Macdonald, R. W., & Eglinton, T. I. (2018). Organic carbon export from the Mackenzie basin: Insights from observations spanning 30 years. *Organic Geochemistry, Gordon Research Conference*, Holderness, NH, USA.

[4] **Schwab, M. S.**, Hilton, R. G., Haghipour, N., & Eglinton, T. I. (2018). Carbon export by the Mackenzie River during the spring freshet. *Polar2018*, Davos, Switzerland.

[3] **Schwab, M. S.**, Hilton, R. G., & Eglinton, T. I. (2018). Intra-channel variability of biomarker transport in the Mackenzie River. *Arctic Partner Forum*, Stockholm, Sweden.

[2] **Schwab, M. S.**, Haghipour, N., & Eglinton, T. I. (2017). Terrestrial organic carbon and plant wax biomarker export from Scottish River Systems. *Goldschmidt Conference*, Paris, France.

[1] **Schwab, M. S.**, Rickli, J. D., Blusztajn, J., Manganini, S., Harvey, H. R., Vance, D., McIntyre, C., & Eglinton, T. I. (2015). Coupled organic & inorganic tracers of particle flux processes in the Western Arctic Ocean. *Goldschmidt Conference*, Prague, Czech Republic.

AWARDS

NASA Postdoctoral Program Fellowship | Oak Ridge Associated Universities | USA | 2021 - present

RESEARCH INTERESTS

- Riverine export of organic carbon from continental reservoirs to the ocean
- Understanding exchange processes between particulate, dissolved, and gaseous organic carbon pools
- Monitoring changes in carbon cycling in response to climate warming
- Tracking the fate of organic carbon in the pedosphere and hydrosphere using compound-specific biomarker analyses
- Bridging the gap between local and regional carbon cycles using ground truthing and imaging spectroscopy
- Provenance analysis using radiogenic geochemistry (Nd, Sr)
- Radiocarbon dating (bulk, compound-specific)
- Geospatial modeling and machine learning frameworks

TECHNICAL SKILLS

- Compound-specific radiocarbon isotopic measurements (preparative capillary gas chromatography, MICADAS)
- Radiocarbon analyses of solid, dissolved, and gaseous phases (MICADAS)
- Organic matter solvent extraction (EDGE, Microwave), gas chromatography
- Stable isotopic measurements of H, C, N, and O (Picarro, EA-IRMS)
- Sequential leaching and analyses of Nd and Sr isotopic compositions (ICP-MS, MC-ICP-MS)
- Sedimentological analyses (grain size, surface area)
- Spectrophotometry
- Ion chromatography
- Supervised and semi-supervised machine learning frameworks
- Proficient in Python, R, ArcGIS/QGIS, Latex, graphic design

CRUISES & FIELD CAMPAIGNS

Sagavanirktok & Kuparuk Rivers | Alaska, USA | Chief Scientist | 3 weeks | 2022
Sihl River | Zurich, Switzerland | Time-series (78 samples) | 2016 - 2019
Mackenzie River | Northwest Territories, Canada | Chief Scientist | 2 weeks | 2019
Mackenzie River | Northwest Territories, Canada | 2 weeks | 2018
Mackenzie River | Northwest Territories, Canada | 2 weeks | 2017
Diverse Scottish rivers | Scotland, UK | Chief Scientist | 1 week | 2017
Diverse Scottish rivers | Scotland, UK | Chief Scientist | 2 weeks | 2016
Beaufort Gyre Exploration Project | WHOI | Western Arctic Ocean | 5 weeks | 2014

TEACHING ACTIVITIES

Excursion assistant

BS Fluviatile Sedimente | FS 2016 - 2019
BS Alpnach | FS 2017 - 2019
BS Ostjura | FS 2017 - 2019
BS Alpenquerschnitt | FS 2017 - 2018

Lecture assistant

BS Sedimentologie | FS 2017 - 2019
BS Kartenpraktikum | HS 2018
BS Dynamische Erde I/II | HS/FS 2016 - 2018

MENTORING

MS candidate Basian Buman | University Zurich | Switzerland | 2018 - 2019
MS candidate Elias Decker | ETH Zurich | Switzerland | 2018 - 2019
MS candidate Pien Anjewierden | ETH Zurich | Switzerland | 2018 - 2019
sample collection | biomarker extraction, purification, and analyses | sedimentological analyses

PROFESSIONAL ACTIVITIES & AFFILIATIONS

Teaching Commission | Department of Earth Sciences | ETH Zurich | Switzerland | 2016 - 2019
Geological Institute Full Board | Department of Earth Sciences | ETH Zurich | Switzerland | 2016 - 2019
Doctoral Retreat | Department of Earth Sciences | ETH Zurich | Switzerland | Chair | 2016 - 2017
Peer Reviewer | Frontiers in Earth Sciences, Geomorphology
Professional Organizations | European Association of Geochemistry, American Geophysical Union