

M. GRACE ANDREWS

RESEARCH INTERESTS

Chemical weathering, Enhanced Weathering, Carbon Dioxide Removal (CDR), climate change, novel stable isotope systems

EDUCATION

Ph.D., Earth and Planetary Sciences, Northwestern University Dec. 2017

M.S., Earth and Planetary Sciences, Northwestern University June 2014

Advisor: Andrew D. Jacobson

Thesis: "Carbon cycling of glaciated landscapes on modern and geologic timescales: Investigation with strontium and carbon isotope geochemistry"

B.A. with distinction and honors, Earth Sciences, Boston University June 2010

Advisor: Ethan F. Baxter

Thesis: "Development of a TIMS Total Evaporation method for measurement of stable strontium isotope fractionation"

PROFESSIONAL APPOINTMENTS

Advisor, Verra Enhanced Weathering and Mineralization (EWM) Advisory Group Feb. 2023 –

Scientific Advisor, Silicate Carbon Ltd Jan. 2023 –

Vice President & Head of Science, Vesta, PBC Nov. 2021 –

Vesta is a Public Benefit Corporation (PBC) developing the science and business model behind Coastal Enhanced Weathering, an emerging ocean-based CDR strategy.

Director of Scientific Operations, Project Vesta (non-profit) April – Nov. 2021

Visiting Academic, Ocean and Earth Science, Uni. of Southampton, National Oceanography Centre Southampton March 2020 –

Research Scientist & Post-doctoral Research Fellow (*joint position*) Jan. 2017 – Feb. 2020

Ocean and Earth Science, University of Southampton at the National Oceanography Centre, Southampton, UK

Leverhulme Centre for Climate Change Mitigation (LC3M; non-profit), Sheffield, UK

P.I.'s: Rachael James & Christopher Pearce

AWARDS

Editors' Citation for Excellence in Refereeing, Geophysical Research Letters 2020

Horace A. Scott Graduate Award for Outstanding Research, Earth & Planetary Sciences, Northwestern University 2016

Sloss Award for Outstanding Graduate Teaching Assistant, Earth & Planetary Sciences, Northwestern University 2016

Departmental Prize for Excellence in Earth Science, Earth Science, Boston University 2010

LARGE SCIENTIFIC COLLABORATIONS

Oman Drilling Project, Phase 2 Science Party 2018

P.I.'s: Juerg Matter (University of Southampton) and Peter Kelemen (Lamont-Doherty Earth Observatory)

Kangerlussuaq International Research Network (KAIRN) 2016

Organizers: Jasmine Saros (University of Maine) and John Anderson (Loughborough University)

INVITED TALKS

Yale University, Center for Natural Carbon Capture Spring Symposium 2023

Columbia University, Dept. of Earth and Environmental Sciences 2022, 23

East Carolina University, STEM @ Starlight 2023

Northwestern University, Institute for Sustainability and Energy (ISEN) Annual Symposium 2022

GEOMAR Helmholtz Centre for Ocean Research, OceanNETS 2nd Annual Conference 2022

Environmental Network of Dominican Universities (RAUDO) 2022

Whitman College, Geology Department 2022

Heriot-Watt University, Research Centre for Carbon Solutions 2022

University of North Carolina Wilmington, Dept. of Earth and Ocean Sciences 2022

Northwestern University, Environmental Culture and Policy Program 2022

Woods Hole Oceanographic Institute 2022

National Oceanography Center & University of Southampton, Ocean and Earth Science Seminar 2021

Montclair State University, Dept. of Earth & Environmental Studies 2021

University of Sheffield, LC3M Annual Meeting 2017 - 20

Geological Society of London, Lyell Meeting, *Keynote* 2019

University of Minnesota Twin Cities, Dept. of Earth Sciences 2019

CONFERENCE ABSTRACTS

Larkin, C.S., **Andrews, M.G.**, Pearce, C.R., Shepherd, E., Goring-Harford, H., Epihov, D., Beerling, D.J and James, R.H. (2023) Carbon dioxide removal in field trials of enhanced weathering on arable croplands. Goldschmidt Conference.

Campbell, J.E., Lemus, A.M., Zeiger, S., Krause, J., Walworth, N.G., Catunda, C., Moreau, C., Romaniello, S., Montserrat, F., **Andrews, M.G.**, and J. Fourqurean (2023) The effects of olivine addition on the physiological functioning of tropical seagrasses. 51st Annual Benthic Ecology Meeting.

Andrews, M.G., Walworth, N.G., Romaniello, S.J., Montserrat, F. and the Vesta Science and Social Science Teams. (2023) Learnings from the development of Coastal Enhanced Weathering as an ocean-based Carbon Dioxide Removal strategy. Ocean Visions Biennial Summit.

Andrews, M.G., Hayes, H., Ethen, S., Gobler, C., Cerrato, R., Sclafani, M., Fisher, J.J., Monserrat, F., Romaniello, S., and Walworth, N.G. (2023) Preliminary findings from a small-scale field trial of Coastal Enhanced Weathering with olivine in NY, USA. 1st International Conference on Earth Sciences and Energy Transition (ICESET), Earth Sciences Research Center (ESRC) Sultan Qaboos University Oman.

Andrews, M.G., van Loenen, O., Hayes, H., Ethen, S., Moreau, C., Hostak, R., Halonen, R., Jankowska, E., Leach, C., Sulpis, O., Gobler, C., Cerrato, R., Sclafani, M., Fisher, N.S., Middelburg, J.J., Monserrat, F., Romaniello, S., and Walworth, N.G. (2022) Preliminary findings from a small-scale field trial of Coastal Enhanced Weathering with olivine in NY, USA. Fall American Geophysical Union.

Romaniello, S.J., Sulpis, O., Cole, D.B., Syverson, D.D., Monserrat, F., Moreau, C., Walworth, N.G. and **Andrews, M.G.** (2022) Impacts of Enhanced Olivine Weathering in Nearshore Marine Environments. Goldschmidt Conference.

Larkin, C.S., **Andrews, M.G.**, James, R.H., Pearce, C.R., Goring-Harford, H., Epihov, D., Beerling, D.J. (2022) CO₂ removal associated with enhanced rock weathering in arable croplands in Norfolk, UK. Goldschmidt Conference.

Andrews, M.G., Romaniello, S.J., Sulpis, O., Syverson, D., Hsu, T.-J., Rafati, Y., Zhang, J., Calantoni, J., Montserrat, F., Walworth, N., Moreau, C., Lopez, P., Hayden, M., and Green, T. (2021) Advancing Coastal Enhanced Weathering as a climate change mitigation technology through strategic, interdisciplinary research. WHOI Ocean Carbon & Biochemistry (OCB) Summer Workshop.

Larkin, C.S., **Andrews, M.G.**, James, R.H., Pearce, C.R., Collins, A., Goring-Harford, H., Jardine, G., Kantola, I.B, DeLucia, E.H., Masters, M.D., Yeong, K.L, Beerling, D.J. (2021) Quantifying CO₂ removal via enhanced rock weathering in contrasting croplands. Goldschmidt Conference.

Andrews, M.G., Epihov, D., Pearce, C.R., James, R.H., Beerling, D.J (2020) CO₂ sequestration by Enhanced Weathering of agricultural soils in Norfolk, UK. Fall American Geophysical Union.

James, R.H., **Andrews, M.G.**, Pearce, C.R., Jardine, G., Goring-Harford, H., Epihov, D., Masters, M., Yeong, B., and Beerling, D.J (2020) Carbon Dioxide Removal via Enhanced Rock Weathering With Agriculture in Large-Scale Field Trials. Fall American Geophysical Union.

Andrews, M.G., Pearce, C.R., James, R.H., Masters, M.D., Kantola, I.B., Yeong, K.L., Hanapi, M.J., Benedick, S., Reynolds, G., DeLucia, E.H., and Beerling, D.J. (2019) Field trials of Enhanced Weathering in two contrasting climate zones. Goldschmidt Conference. *Invited presentation.*

Andrews, M.G., Pearce, C.R., James, R.H., Masters, M.D., Kantola, I.B., DeLucia, E.H., and Beerling, D.J. (2018) Enhanced rock weathering in agroecosystem field trials, Illinois, USA. Goldschmidt Conference.

Andrews, M.G., Jacobson, A.D., Osburn, M.R., and Flynn, T.F. (2017) Microbial CO₂ production at the Greenland Ice Sheet margin. Goldschmidt Conference.

Jacobson, A.D., and **Andrews, M.G.** (2017) The impact of subsurface silicate weathering on the long-term C cycle. Goldschmidt Conference, Paris, France.

Andrews, M.G. and Jacobson, A.D. (2016) Radiogenic and stable Sr isotope ratios as tracers of silicate and carbonate weathering in Iceland. Goldschmidt Conference, Yokohama, Japan.

Andrews, M.G. and Jacobson, A.D. (2015) Seasonal variation and controls on subglacial riverine CO₂ concentrations from a small catchment, west Greenland Ice Sheet. Fall American Geophysical Union, San Francisco, CA, USA.

Andrews, M.G., Jacobson, A.D., and Lehn, G.O. (2014) Stable strontium isotopes ($\delta^{88/86}\text{Sr}$) as a tracer of Sr sources and biogeochemical cycling in two catchments draining Fiordland, New Zealand. Fall American Geophysical Union.

PUBLICATIONS

- Hutchins, D.A., Fu, F.-X., Yang, S.-C., John, S.G., Romaniello, S.J., **Andrews, M.G.**, and Walworth, N.G. Responses of keystone phytoplankton groups to olivine dissolution products. *Submitted to Biogeosciences: egosphere-2023-930*
- Larkin, C.S., **Andrews, M.G.**, Pearce, C.R., Yeong, K.L. Beerling, D., Bellamy, J., Benedick, S., Freckleton, R.P., Goring- Harford, H., Sadekar, S., and James, R.H. (2022) Quantification of CO₂ removal in a large-scale enhanced weathering field trial on an oil palm plantation in Sabah, Malaysia. *Frontiers in Climate*, 4:959229, doi:10.3389/fclim.2022.959229.
- Beerling D.J., Kantzas E., Lomas M.R., Wade P., Eufrazio R.M., Renforth P., Quirk J., Sarkar B., **Andrews M.G.**, James R.H., Pearce C.R., Khanna M., Koh L., Quegan S., Pidgeon N.F., Janssens I.A., Hansen J. and Banwart S.A. (2020) Potential for large-scale CO₂ removal via enhanced rock weathering with croplands. *Nature* 583, 242 - 248.
- Kelland, M.E., Wade, P.W., Lewis, A.L., Taylor, L.L., Sarkar, B., **Andrews, M.G.**, Lomas, M.R., Cotton, T.E.A., Kemp, S.J., James, R.H., Pearce, C.R., Hartley, S.E., Hodson, M.E., Leake, J.R., Banwart, S.A., and Beerling, D.J. (2020) Increased yield and CO₂ sequestration potential with the C₄ cereal *Sorghum bicolor* cultivated in basaltic rock dust-amended agricultural soil. *Global Change Biology* 26, 3658-3676.
- Griffith, E.M., Schmitt, A.D, **Andrews, M.G.**, and Fantle, M.S. (2020) Elucidating modern geochemical cycles at local, regional, and global scales using calcium isotopes. *Chemical Geology* 538, 119445.
- Andrews, M.G.** and Taylor, L.L. (2019) Combating climate change through Enhanced Weathering of agricultural soils. *Elements* 15(4).
- Saros, J., Anderson, N. J., Juggins, S., McGowan, S., Yde, J., Telling, J., Bullard, J., Yallop, M., Heathcote, A., Burpee, B., Fowler, F., Barry, C., Northington, R., Osburn, C., Pla-Rabes, S., Mernild, S.H., Whiteford, E., **Andrews, M.G.**, Kerby, J., and Post, E. (2019) Arctic climate shifts drive rapid ecosystem responses across the West Greenland landscape. *Environmental Research Letters*. DOI: 10.1088/1748-9326/ab2928
- Andrews, M.G.** and Jacobson, A.D. (2018) Controls on the solute geochemistry of subglacial discharge from the Russell Glacier, Greenland Ice Sheet determined by radiogenic and stable Sr isotope ratios. *Geochimica et Cosmochimica Acta* 238, 312 - 329.
- Andrews, M.G.**, Jacobson, A.D., Osburn, M.R., and Flynn, T.M. (2018) Dissolved carbon dynamics in meltwaters from the Russell Glacier, Greenland Ice Sheet. *Journal of Geophysical Research – Biogeosciences*. DOI: 10.1029/2018JG004458
- Andrews, M.G.** and Jacobson, A.D. (2017) The radiogenic and stable Sr isotope geochemistry of basalt weathering in Iceland: Role of hydrothermal calcite and implications for long-term climate regulation. *Geochimica et Cosmochimica Acta* 215, 247 – 262.
- Andrews, M.G.**, Jacobson, A.D., Lehn, G.O., Horton, T.W., and Craw, D. (2016) Radiogenic and stable Sr isotope ratios (⁸⁷Sr/⁸⁶Sr, δ^{88/86}Sr) as tracers of riverine cation sources and biogeochemical cycling in the Milford Sound region of Fiordland, New Zealand. *Geochimica et Cosmochimica Acta* 173, 284 – 303.
- Jacobson, A.D., **Andrews, M.G.**, Lehn, G.O., and Holmden, C. (2015) Silicate versus carbonate weathering in Iceland: New insights from Ca isotopes. *Earth and Planetary Science Letters* 416, 132 – 142.

MEDIA & OUTREACH

- “Reabsorbing Carbon: Vesta”**, RE:TV 2022
Film interview: RE:TV is a global film platform to showcase innovative solution to the climate crisis, founded and curated by editor-in-chief King Charles III of the United Kingdom
- “Solving for Zero” documentary** 2022
Featured vignette: Plus commentary from Bill Gates and based on his book “How to Avoid Climate Disaster” (Wondrium, April 8)
- Women in STEM Career & Confidence** 2022
Podcast Interview: Inspiring Stories Ep. 8 (Hannah Roberts, April 7)
- Authority Magazine** 2022
Article: “Project Vesta: Dr. Grace Andrews’ Big Idea That Might Change the World” (Fotis Georgiadis, March 24)
- Earth Day Web Event, Project Vesta** 2021
Featured Scientist: “Ask us Anything” Q&A with the public
- BBC World Service: People Fixing the World** 2019
Podcast Interview for episode “Can capturing carbon buy us time to tackle climate change?” (Tom Colls, 11 June).
- Pint of Science Festival**, Southampton, UK 2018

- Event Host*; this three-day festival brings science to the public as university researchers give informal talks about their work.
- Bright Club**, Southampton, UK 2018
Podcast interview; Episode 16. A conversation about the science behind my routine for this science-based stand-up comedy club.
- Café Scientifique featuring Bright Club**, Salisbury, UK 2017
Comedian; at this merger event, researchers performed stand-up comedy and hosted a Q&A with the public.
- Bright Club**, Southampton, UK 2017
Comedian; this science-based stand-up comedy club combines laughs and research to educate and entertain a diverse public audience.
- Pint of Science Festival**, Southampton, UK 2017
Organizer; this three-day festival brings science to the public as university researchers give informal talks about their work.
- STEAM Research and Design Program**, Northwestern University 2016
Graduate Student Mentor; this program brings high school students, interested in pursuing university STEM degrees, to shadow graduate students and design their own research project.
- New York Times** 2015
Article; “Climate research at the end of the world” (Josh Haner, 26 Nov.)
- NASA Television** 2015
Interview; “Rising Seas: Science on the Greenland Ice Sheet”
- Project EXCITE**, Northwestern University 2014, 2015
Module Presenter: “Evidence for paleoclimates through leaf margin analysis”; EXCITE addresses the achievement gap between minority and non-minority students by providing extracurricular opportunities in mathematics and the sciences.
- Girls Do Hack**, Adler Planetarium, Chicago, IL 2014
Mentor; GDH is designed to encourage female high school students to pursue STEM careers by partnering them with female mentors in STEM fields.
- Research Magazine**, Boston University 2010
Interview: “Rock of Ages”; a profile on my undergraduate research at Boston University.