

# Anne-Sofie Crüger Ahm, PhD

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## Research Interests

**I am fascinated by the complexity and elegance of the biogeochemical cycles that regulate surface conditions and climate on Earth.**

Ancient sedimentary rocks contain hidden clues of past processes and climate dynamics within their chemical composition and stable isotope signature. My doctoral research explored the effects of modern oxidative weathering in sedimentary rocks on our ability to detect past oxygen levels using proxies such as Fe speciation. This approach showed that speciation of Fe in sedimentary rocks is highly sensitive to modern weathering and, in particular, remobilization and oxidation of pyrite. Driven by these results, I have become increasingly intrigued by the fundamental processes that transform sediments into lithified rocks during early diagenesis and how these processes affect the geochemical signatures. I work with numerical models that simulates early recrystallization of sediments by tracking the reaction between fluid and rock through the stable isotopic composition of calcium, magnesium, and strontium. Excitingly, this modeling effort has shown that we can quantify the degree of chemical alteration of the rocks and thereby provide more robust records of past seawater chemistry. Currently, I am motivated to combine this modeling approach with geochemical redox proxies to map the history of oxygen and disentangle the evolution of life on Earth.

## Research Experience

**Carlsberg Foundation Postdoctoral Fellow**  
Princeton University, 2017– present  
Advisor: Dr. John A. Higgins

## Education

**University of Copenhagen**  
Ph.D., Geoscience, November 2016.  
Advisor: Dr. Christian J. Bjerrum,  
Committee: Dr. Alexandre Turchyn, Dr. David S. Jones, Dr. Emily C. Pope

Thesis title: “Refining the Neoproterozoic and Early Paleozoic record of carbon cycling and seawater chemistry using quantitative geochemical models of redox dynamics and carbonate diagenesis.”

### **University of Copenhagen**

MSc, Geology-Geoscience, 2014.

Advisor: Dr. Christian Bjerrum

Thesis title: “Persistent deep water anoxia through the Hirnantian mass extinction event.”

### **University of Copenhagen**

BSc, Geology-Geoscience, 2011.

Advisor: Dr. Christian J. Bjerrum

Thesis title: “Biological regulation of the climate through the impact on cloud albedo.”

### Journal Articles

**Ahm, A-S. C.**, Bjerrum C. J., Hammarlund, E. U., 2017

Earth and Planetary Letters, doi: 10.1016/j.epsl.2016.09.049

*Disentangling the record of diagenesis, local redox conditions, and global sea-water chemistry during the latest Ordovician glaciation*

**Ahm, A-S. C.**, Bjerrum, C. J., Blättler, C. L., Swart, P. K., Higgins, J. A.,

2018, Geochimica et Cosmochimica Acta, doi: 10.1016/j.gca.2018.02.042,

*Quantifying early marine diagenesis in shallow water carbonate sediments*

Higgins, J. A., Blättler, C. L., Lundstrom, E. A., Santiago-Ramos, D. P.,

Akhtar, A. A., **Ahm, A-S. C.**, Bialik, O., Holmden, C., Bradbury, H.,

Murray, S. T., Swart, P. K., 2018, Geochimica et Cosmochimica Acta,

doi: 10.1016/j.gca.2017.09.046, *Mineralogy, early marine diagenesis, and the chemistry of shallow-water carbonate sediments*

### Current Projects

**Ahm, A-S. C.**, Maloof, A. C., Bjerrum C. J., Bold, U., Hoffman, P. F.,

Macdonald, F. A., Rose, C. V., Strauss, J. V., Higgins, J. A, in prep.

*An early diagenetic deglacial origin for basal Ediacaran cap dolostones*

### Awards and Fellowships

**Carlsberg Foundation Internationalisation fellowship 2017–2019**

Princeton University, 700 000 DKK (~USD 115 000)

**The Danish Institute of Damascus 2014**

Scholarship awarded to conduct fieldwork and data collection

Sultanate of Oman, 50 000 DKK (~USD 7000)

Invited talks **Cambridge University, UK**  
Seminar, December 8th, 2016, *Constraining the ancient carbon cycle through geochemical models of diagenesis in carbonate rocks*

**Ahm, A-S, C.**, Jones, D. S., Fike, D. A., Bjerrum, C. J., Higgins, J. A.  
Geological Society of America annual meeting, Seattle, Oct 2017  
*Quantifying early marine diagenesis in shallow-water carbonate sediments during the latest Ordovician glaciation*

Conference proceedings **Gordon Conference, Geobiology, Galveston, 2018**  
Ahm, A-S. C., Maloof, A. C., Bjerrum C. J., Bold, U., Hoffman, P. F., Macdonald, F. A., Rose, C. V., Strauss, J. V., Higgins, J. A.  
An early diagenetic deglacial origin for basal Ediacaran cap dolostones (poster)

**International Symposium on the Ediacaran-Cambrian Transition, 2017**  
Ahm, A-S. C., Higgins, J. A., Hoffman, P. F., Macdonald, F. A., Maloof, A. C., Rose, C. V., Bjerrum, C. J., The Ca and Mg isotopic record of the descent into a Snowball Earth (talk)

**Geobiology Conference, Banff, Canada, 2017**  
Ahm, A-S. C., Higgins, J. A., Hoffman, P. F., Macdonald, F. A., Maloof, A. C., Rose, C. V., Bjerrum, C. J., The Ca and Mg isotopic record of the descent into a Snowball Earth (poster)

**Northeast Geobiology Symposium, Connecticut, 2017**  
Ahm, A-S. C., Bjerrum C. J., Bller, C. L., Higgins, J. A., What can carbonate diagenesis tell us about ancient seawater chemistry? (poster)

**Northeastern Geobiology Symposium, Havard, 2016**  
Ahm, A-S. C., Bjerrum, C. J., Hammarlund, E. U., Disentangling the record of diagenesis, local redox conditions, and global seawater chemistry during the latest Ordovician glaciation (poster)

**Geological Society of America Annual meeting (GSA), 2015**  
Ahm, A-S. C., Higgins, J. A., Hoffman, P. F., Macdonald, F. A., Maloof, A. C., Rose, C. V., Bjerrum C., J., The Ca and Mg isotope record of the descent and escape of the end-Cryogenian glaciation (talk)

**Goldschmidt Conference, Prague, 2015**  
Ahm, A-S. C., Higgins, J. A., Hoffman, P. F., Macdonald, F. A., Maloof, A. C., Rose, C. V., Bjerrum C., J., Ca and Mg Isotope stratigraphy of the Trezona C isotope excursion: Geochemical record of the descent into a Snowball? (poster)

**Goldschmidt Conference, Sacramento, 2014**  
Ahm, A-S. C., and Bjerrum C., J., The link between the rise of land plants, cloud-albedo, and carbon cycle perturbation (poster)

**PhD Conference, IGN, Copenhagen, 2014**

Ahm, A-S. C., Bjerrum C. J., Hammarlund, E. U., Persistent deep water anoxia through the Hirnantian mass extinction event (talk).

**Goldschmidt Conference, Florence, 2013**

Ahm, A-S. C., Bjerrum C. J., Hammarlund, E. U., Regional deep water anoxic conditions during the Hirnantian extinction event (poster).

**Geological Society of Denmark, Annual meeting 2013**

Ahm, A-S. C., Bjerrum C. J., The hurdles of the Neoproterozoic era (poster).

Teaching  
Experience

2015 Paleoclimate (lectures, teaching assistant, coordinating fieldtrip to Bremen).  
2014 Dynamic stratigraphy (teaching assistant, coordinating fieldwork in Spain).  
2014 Utah field and methods course (teaching assistant, coordinating fieldwork)  
2013 Field course Slemmestad, Norway (teaching assistant, coordinating fieldwork)  
2012 Past climate and sea-level change (teaching assistant).  
2012 Geological processes and material (teaching assistant).