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Dr. Dennis Höning

Curriculum Vitae

Department of Earth System Analysis, Potsdam-Institute for Climate Impact Research
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Education

05/2011 – 10/2016 **Ph.D. (Dr. rer. nat.)**

Institute of Planetary Research, German Aerospace Center, Berlin, Germany
Institute of Planetology, Westfälische Wilhelms-Universität Münster, Germany

Dissertation: "The influence of the biosphere on continental coverage and mantle hydration as feedback cycles in the thermal evolution of Earth"

10/2005 – 01/2011 **Diploma in Geophysics (Dipl.-Geophys., comparable to MSc)**

Institute of Geophysics, Westfälische Wilhelms-Universität Münster, Germany

Thesis: "Excursions and reversals in Rayleigh-Bénard convection at infinite Prandtl-Number"

Vordiplom (comparable to BSc) in Physics and in Geophysics

Academic Employment

Since 09/2021 **Post-Doc**

Department of Earth System Analysis,
Potsdam-Institute for Climate Impact Research, Potsdam, Germany

- Modelling impact of CO_2 emissions on stability and melting of ice sheets
- Guest lecturer at VU Amsterdam, student supervision

02/2018 – 07/2021 **Origins Center Postdoctoral Research Fellow**

Department of Earth Sciences, VU Amsterdam, The Netherlands

- PI of the project "Modelling Earth as an exoplanet"
- Interior-atmosphere coupling and modelling the impact of life
- Carbon cycle modelling for planets without plate tectonics
- Organization of workshops and conferences in planetary science
- Teaching Master courses, supervision of Bachelor and Master students
- Work visit at the Earth-Life Science Institute, Tokyo, Japan

11/2016 – 01/2018 **Post-Doc**

Institute of Planetary Research, German Aerospace Center, Berlin, Germany

- Modelling the long-term carbon cycle to predict planetary habitability
- Work visit at the Geological Survey of Norway, Trondheim, Norway

Peer-Reviewed Publications (*supervised student)

2023

- **Höning, D.**, Willeit, M., Calov, R., Klemann, V., Bagge, M., Ganopolski, A., 2023. Multistability and transient response of the Greenland ice sheet to anthropogenic CO_2 emissions. Geophysical Research Letters 50(6), e2022GL101827.
- **Höning, D.**, Spohn, T., 2023. Land fraction diversity on Earth-like planets and implications for their habitability. Astrobiology 23(4).
- Westall, F., **Höning, D.**, Avice, G., Gentry, D., Gerya, T., Gillmann, C., Izenberg, N., Way, M., Wilson, C., 2022. The habitability of Venus and a comparison to early Earth. In: Venus evolution through time. Space Science Reviews 219(17).

2022

- Way, M., et al. (incl. **Höning, D.)**, 2022. Synergies between Venus & exoplanetary observations. In: Venus evolution through time. Space Science Reviews 219(13).
- Gillmann, C., et al. (incl. **Höning, D.**), 2022. Long-term atmosphere interior evolution of Venus: Processes and feedback. In: Venus evolution through time. Space Science Reviews 218(56).
- Dehant, V., et al. (incl. **Höning, D.**), 2022. From science questions to Solar System exploration. In: Planetary exploration horizon 2061, Ed. Blanc, M., Elsevier, ISBN: 9780323902267.

2021

- **Höning, D.**, Baumeister, P., Grenfell, J.L., Tosi, N., Way, M.J., 2021. Early habitability and crustal decarbonation of a stagnant-lid Venus. JGR Planets 126(10), e2021JE006895.
- *Kruijver, A., **Höning, D.**, van Westrenen, W., 2021. Carbon cycling and habitability of massive Earth-like exoplanets. Planet. Sci. J. 2(208).
- *Oosterloo, M., **Höning, D.**, Kamp, I., van der Tak, F., 2021. The role of planetary interior in the long-term evolution of atmospheric CO_2 on Earth-like exoplanets. Astron. Astrophys. 649, A15.

2020

- **Höning, D.**, 2020. The impact of life on climate stabilization over different timescales. Geochem. Geophys. Geosyst. 21(9), e2020GC009105.
- Steinke, T., Hu, H., **Höning, D.**, van der Wal, W., Vermeersen, B., 2020. Tidally induced lateral variations of Io's interior. Icarus 335, 113299.

2019

- Hakim, K., van den Berg, A., Vazan, A., **Höning, D.**, van Westrenen, W., Dominik, C., 2019. Thermal evolution of rocky exoplanets with a graphite outer shell. Astron. Astrophys. 630, A152.
- **Höning, D.**, Tosi, N., Spohn, T., 2019. Carbon cycling and interior evolution of water-covered plate tectonics and stagnant-lid planets. Astron. Astrophys. 627, A48.
- **Höning, D.**, Tosi, N., Hansen-Goos, H., Spohn, T., 2019. Bifurcation in the growth of continental crust. Phys. Earth Planet. Inter. 287, 37-50.
- Dehant, V., et al. (incl. **Höning, D.**), 2019. Geoscience for understanding habitability in the solar system and beyond. Space Sci. Rev. 215:42.

2017

- Tosi, N., Godolt, M., Stracke, B., Ruedas, T., Grenfell, J.L., **Höning, D.**, Nikolaou, A., Plesa, A.-C., Breuer, D., Spohn, T. 2017. The habitability of a stagnant-lid Earth. Astron. Astrophys. 605, A71.

2016

- **Höning, D.**, Spohn, T., 2016. Continental growth and mantle hydration as intertwined feedback cycles in the thermal evolution of Earth. Phys. Earth Planet. Inter. 255, 27-49.
- Noack, L., **Höning, D.**, Rivoldini, A., Heistracher, C., Zimov, N., Journaux, B., Lammer, H., Van Hoolst, T., Bredehöft, J.H., 2016. Water-rich planets: how habitable is a water layer deeper than on Earth? Icarus 277, 215-236.
- Dehant, V., et al. (incl. **Höning, D.**), 2016. PLANET TOPERS: planets, tracing the transfer, origin, preservation, and evolution of their reservoirs. Orig. Life Evol. Biosph. 46(4), 360-384.

2014

- **Höning, D.**, Hansen-Goos, H., Airo, A., Spohn, T., 2014. Biotic vs. abiotic Earth: A model for mantle hydration and continental coverage. Planet. Space Sci. 98, 5-13.

Received Grants

- Origins Center Research Fellowship, PI (3 years), ~265k (2018)
- Lorentz Center Oort Workshop "Diversity of Rocky Planets", PI, ~35k (2020)
  (Including additional support from DFG)
- Research grant for the PhD project "Steamy, watery, rocky worlds",
  NWO (Netherlands Organization for Scientific Research), co-investigator, ~275k (2020)
- Research grant for the PhD project "Tracing H, C, O and S from disks to planetesimals: constraints on planetary budgets of life-essential elements", NWO, co-investigator, ~275k (2020)
- ISSI (International Space Science Institute) grant for work visit (3 weeks), PI, ~1.5k (2021)
- ELSI (Earth-Life Science Institute Tokyo) grant for travel and work visit (3 weeks), PI, ~3.5k (2019)
- Small Project Funding, "The role of thick atmospheres in habitability of exoplanets from thermal evolution" NWO, co-investigator, ~5k (2019)
- Small Project Funding, "Solids, ices and gas composition in the disk midplane – Input tables for planetary compositions", NWO, co-investigator, ~5k (2019)

Awards

- Günter-Bock-Preis (best paper award) of the German Geophysical Association (DGG) 2014 for the publication "Biotic vs. abiotic Earth: A model for mantle hydration and continental coverage"
- Poster Award (2rd prize) of the Netherlands Earth-Science Conference (NAC) 2021 for the virtual poster "Effects of mantle cooling and biological evolution on Earth's climate"
- Horneck-Brack-Award (3rd prize) of the European Astrobiology Network Association (EANA) 2018 for the talk "Long-term water and carbon cycles and habitability of planets"
- EANA Poster-Award 2014 for the poster "A thermal evolution model of the Earth including the biosphere, continental growth and mantle hydration"
- EANA Student Poster-Award 2013 for the poster "Biotic vs. abiotic Earth: A model for mantle hydration and continental coverage"

Selected Invited Presentations

- 2022 (Invited Talk). Impact of carbon emissions on ice sheet stability and towards understanding feedback with the biosphere. Climate change and carbon cycle workshop, Pisa, Italy.
- 2021 (Invited Seminar Talk). Planetary habitability controlled by carbonate-silicate cycle feedbacks and biogeochemical processes. FU Berlin Geosciences Seminar, virtual.
- 2020 (Invited Seminar Talk). Climate evolution of rocky planets and the impact of life. European Astrobiology Institute Seminar, virtual.
- 2019 (Invited Review Talk). Habitability, biosignatures, and the search for life on exoplanets. AstroNAC 2019, Groningen, the Netherlands.
- 2018 (Invited Keynote Talk). Long-term water and carbon cycles and habitability of terrestrial planets. GeoNAC 2018, Veldhoven, the Netherlands.
- 2017 (Invited Keynote Talk). Impact of life on feedbacks cycles in Earth's evolution. EGU Galileo Conference, Furnas, Acores, Portugal.
- 2016 (Invited Talk). Surface-interior interplay and bifurcations in planetary evolution. Workshop on planetary diversity, Tokyo, Japan.
- 2014 (Invited Keynote Talk). A thermal evolution model of the Earth including the biosphere, continental growth and mantle hydration. Planet TOPERS, Liege, Belgium.

Teaching, University Courses

Department of Earth Sciences, Vrije Universiteit Amsterdam, The Netherlands

- Guest Lecturer, Advanced Planetary Science Course, 2021
- Main teacher, Planetary Science Course, 6 ECTS Master level course, 2020
- Main teacher, Planetary Science Course, 6 ECTS Master level course, 2019

Student Supervision

Department of Earth Sciences, Vrije Universiteit Amsterdam, The Netherlands

Master Students

- Nynke Visser (2021/22, joint supervision with the University of Groningen, ongoing)
  Topic: Deep water cycling and the ice-albedo feedback of Earth-like planets
- Lars Ruhe (2020, main supervision)
  Topic: The effect of the mantle oxidation state on the climate of Earth-like planets
- Arlene Dingemans (2020, co-supervision)
  Topic: Insights from microphysical cloud modelling into the atmospheres of hot Jupiters
- Mark Oosterloo (2019/20, joint supervision with the University of Groningen)
  Topic: The role of plate tectonics in the long-term evolution of CO_2 on Earth-like planets
- Linah Krigee (2019/20, main supervision)
  Topic: The influence of planetary albedo on the habitable zones of main-sequence stars
- Amanda Kruijver (2019/20, main supervision)
  Topic: The influence of planet size on the long-term carbon cycle and exoplanet habitability

Bachelor Students

- Chris de Jong (2020, co-supervision)
  Topic: Experimental evaporation of granitic magma
- Evelien Trish de Moes (2020, co-supervision)
  Topic: Evaporating basaltic rocks

Workshop and Conference Organization, Session Chair

- EGU 2023, session "Evolution and characterization of exoplanets", convener
  23.-28. April 2023, Vienna, Austria (session in preparation)
- Lorentz Center Oort Workshop "Diversity of Rocky Planets 2022", main organizer
  5.-9. September 2022, Leiden, the Netherlands
- EGU 2022, session "From Planetary Interiors to Atmospheres", co-convener & session chair
  23.-27. May 2022, Vienna, Austria
- Origins 2021 Conference, co-organizer & session chair
  27.-28. January 2020, virtual
- Lorentz Center Workshop "Diversity of Rocky Planets 2020", main organizer
  26.-28. October 2020, virtual
- AbSciCon 2019, session "Astrobiogeochemistry", co-convener
  24.-28. June 2019, Bellevue, Washington, US
- NAC (Netherlands Earth Sciences Congress) 2019, co-organizer & session chair
  14.-15. March 2019, Utrecht, the Netherlands
- EANA (European Astrobiology Network Association) 2018, co-organizer
  24.-28. September 2018, Berlin, Germany

Other Scientific Activities

- Reviewer activity for various scientific journals
- Co-leader of the working group "Planetary Environments and Habitability" of the European Astrobiology Institute (EAI) (since 2020)
- Member of the science team of the proposed Large Interferometer For Exoplanets (since 2020)
- ISSI workshop on Venus' evolution through time, virtual (2021), invited
- Several meetings of the Dutch PEPSci (Planetary ExoPlanetary Science) network (2018-2020)
- Several meetings of the Origins Center Synergy committee (2018-2019)
- Lorentz Center workshop on planet habitability and the search for life outside the solar system, Leiden, the Netherlands (2018), invited
- Galileo workshop on geoscience for understanding habitability, Azores, Portugal (2017), invited
- ELSI workshop on planetary diversity, Tokyo, Japan (2016), invited
- Summer School on Biogeodynamics and Earth System Sciences, Venice, Italy (2011)
- Participation at courses on transferable skills at DLR Berlin and VU Amsterdam, such as Leadership in science, proposal writing, communication, and conflict resolution

Outreach Activities, Press & Media

- Popular Science Book Essay "Earth's Sister planet: The habitability and evolution of Venus". In: "Life Beyond Us", Ed. Nováková, J., Law, L, Forest, S., 2022 (in press).
- Public lecture on planetary evolution and life, Science Café Nijmegen, the Netherlands (2022)
- Public lecture on Astrobiology at the "Leidse Biologen Club" in Leiden, the Netherlands (2020)
- Origins Center Video 2019 "Is there life on other planets?" https://youtu.be/CvurQEq6_Ps
- Several public lectures at the "Long Night of Science" and the "Astronomy Day" in Berlin, Germany (2012-2016)

Contribution to Popular Science Articles

- AGU News, 2023. “The Greenland ice sheet is close to a melting point of no return” (Rebecca Dzombak). https://news.agu.org/press-release/the-greenland-ice-sheet-is-close-to-a-melting-point-of-no-return/
- Universe Today, 2021. “Rocky planets might need to be the right age to support life” (M. Williams). https://www.universetoday.com/152897/rocky-planets-might-need-to-be-the-right-age-to-support-life/
- New Scientist, 2021. “Life on Venus may have only been possible for its first billion years” (J.A. Murugesu). https://www.newscientist.com/article/2291721-life-on-venus-may-have-only-been-possible-for-its-first-billion-years/
- Forbes, 2021. “New models show that Venus was likely habitable four billion years ago”. (B. Dorminey). https://www.forbes.com/sites/brucedorminey/2021/09/24/new-models-show-that-venus-was-likely-habitable-four-billion-years-ago/
- KENNISLINK, 2019. “Ik wil graag weten wat de invloed van leven op een atmosfeer is” (Esther Thole, in Dutch). https://www.nemokennislink.nl/publicaties/ik-wil-graag-weten-wat-de-invloed-van-leven-op-een-atmosfeer-is/
- Science & Vie, 2019. “Et si... la vie n'était pas apparue sur Terre?” (J.P. Veyrieras, in French). https://www.science-et-vie.com/science-et-culture/et-si-la-vie-n-etait-pas-apparue-sur-terre-50925
- Science Magazine, 2015: “If Earth never had life, continents would be smaller.” (Christina Reed). www.sciencemag.org/news/2015/04/if-earth-never-had-life-continents-would-be-smaller/
- Astrobiology Magazine, 2014: “Does a planet need life to create continents?” (C.Q. Choi). https://phys.org/news/2014-01-planet-life-continents.html
- New Scientist, 2013: “Early life built Earth's continents.” (M. Slezak). https://www.newscientist.com/article/mg22029443-100-early-life-built-earths-continents/