# Dr. Johan Nilsson

+46 (0) 702893525
johan.n.nilsson@geo.uu.se
nilssonj8403@gmail.com
Google Scholar (i10-index: 18)
ORCID: https://orcid.org/0000-0002-1496-122X

**Relevant Experience**

Dr. Johan Nilsson has 15 years of experience and expertise in remote sensing of the cryosphere using satellite and airborne altimetry. He also has extensive experience in the areas of GNSS, imaging, and gravimetry related to the fields of geodesy, geodynamics, hydrology, subglacial hydrology, and global sea-level rise. His research focuses on mass balance studies of ice sheets and glaciers and the estimation of submarine basal melt rates for ice shelves. This includes improving firn modeling to enhance mass balance estimates derived from altimetry. He is currently involved in research on gravity, particularly in improving mass estimates from GRACE and GRACE-FO by using joint inversion techniques that combine gravity and altimetry measurements to enhance spatial resolution and reduce signal leakage.

Dr. Nilsson has been a key collaborator on the ICESat-2 science team, contributing significantly to the current validation efforts for the mission. He produced the first-ever unbiased estimates of laser-only mass loss from Greenland and Antarctica using ICESat and ICESat-2. Additionally, he applies his expertise from the ICESat-2 and CryoSat-2 missions to study the effects of changing radar penetration and snow properties on long-term mass balance trends. He was one of the first researchers to quantify and document the real-world impact of near-surface melt events on radar altimeter-based surface topography recovery. His work also extends to applying satellite altimetry to study global freshwater storage and discharge variability in lakes, rivers, deltas, and estuaries. From 2020 to 2024, Dr. Nilsson was part of JPL's calibration and validation team for the Jason-3, Sentinel-6, and SWOT missions, contributing to improving current sea-level products. Since mid-2024, he has been extensively involved in developing capabilities for estimating sea ice freeboard from SAR altimetry using Sentinel-6 and CryoSat-2. This work has provided him with valuable experience in both the operational aspects of space-borne altimetry missions and the organizational structures of NASA and ESA.

In his research, Dr. Nilsson applies novel statistical and signal-processing techniques for advanced data analysis of big data, utilizing large-scale parallel processing to study complex geophysical problems related to ice sheets and glaciers' contributions to sea-level rise. He has a keen interest in space and airborne radar and laser data processing. One of his major accomplishments is the development of a state-of-the-art synthesis of long-term elevation change records for Antarctica and Greenland. He also developed a novel L1b surface elevation processor for the CryoSat-2 mission, which has been extensively published and validated. A strong advocate of open science, Dr. Nilsson is actively involved in teaching and software development. He has been part of the organizing team for several ICESat-2 Hackweeks, creating tutorials and lectures. Additionally, he is one of the creators and the primary developer of the "Cryosphere Altimetry Processing Toolkit" (captoolkit), a Python software package for large-scale processing of low-level L1-L2 products from satellite and airborne radar and laser altimetry, aimed at generating high-quality scientific products. As a mentor, he has also contributed to the

development of a CryoSat-2 SWATH mode processor for glaciological purposes, improving mass balance estimates in the highly dynamic and fast-changing marginal areas of the ice sheets.

Dr. Nilsson possesses substantial fieldwork experience, having actively participated in numerous campaigns on the Greenland Ice Sheet over the past decade. These efforts include airborne validation campaigns for CryoSat-2 (known as CryoVex) and the Black and Bloom project, which investigates algae growth in the interior regions of the Greenland Ice Sheet.

**Professional Experience**

2025 - Present **Researcher** – Uppsala University, Department of Earth Science, Uppsala, Sweden.
2025 - Present **Affiliate** – NASA Jet Propulsion Laboratory, California Institute of Technology, Pasadena, United States
2020 - 2025 **Research Technologist III** – NASA Jet Propulsion Laboratory, California Institute of Technology, Pasadena, United States.
2024 - 2025 **Guest Researcher** - Uppsala University, Earth Science Department, Uppsala, Sweden
2018 - 2020 **Research Scientist II** – NASA Jet Propulsion Laboratory, California Institute of Technology, Pasadena, United States.
2015 - 2018 **Postdoctoral Scholar** - NASA Jet Propulsion Laboratory, California Institute of Technology, Pasadena, United States.
2011 (6m) **Staff Associate** - Lamont-Doherty Earth Observatory, Columbia University of New York City, New York, United States.
2008/9 (6m) **Measurement System Designer and Test Engineer** - Saab Defense and Security,Gothenburg, Sweden.

**Education**

Ph.D - 2015 **Cryosphere Monitoring from Satellites and Aircrafts** - DTU Space, National Space Institute, Technical University of Denmark, Copenhagen, Denmark.
M.Sc - 2011 **Engineering Physics, Radio and Space Science** - Chalmers University of Technology, Gothenburg, Sweden
B.Sc - 2008 **Electrical Engineering** - Chalmers University of Technology, Gothenburg Sweden

**Project and Science Teams**

2026 - Present S3NG-T Mission Advisory Group (MAG)
2026 - Present SWOT Glaciology Product Working Group/Team
2026 - Present SIOS Remote Sensing Working Group (national representative)
2026 - Present ISMIP7 Working Group on Observations
2024 - 2025 The Ice sheet Mass Balance Inter-comparison Exercise (IMBIE) (JPL-Liaison)
2022 - 2024 SWOT Calibration and Validation Team (member)
2020 - 2024 Sentinel-6 Michael Freilich Scientific Calibration and Validation Team (member)
2020 - 2024 Jason-3 Calibration and Validation Team (member)
2017 - 2020 NASA ICESat-2 Science Team (collaborator)
2016 - 2018 NASA Sea Level Rise Team (postdoc)

**Committees**

2026 **SPIE Program Committee, Edinburgh, Scotland**
Remote Sensing of the Ocean, Sea Ice, Coastal and Inland Waters 2026: Applications for Monitoring and Management

**Honors and Awards**

| | |
|---|---|
| 2022 | **JPL Team Award:** For development of large scale processing of cryospheric data ($1k). |
| 2019 | **NASA Silver Achievement Medal - (ICESat-2 Team)**: For stellar achievement in overcoming a number of challenges resulting in the successful launch of the ICESat-2 mission. |
| 2019 | **NASA Group Achievement Award** - **(ICESat-2 Team)**: For exceptional technological achievement and scientific performance seen in the first half year after launch of the ICESat-2 mission. |
| 2019 | **NASA Group Achievement Award - (ICESat-2 Launch and Commissioning)**: For significant launch and commissioning preparations and achievements enabling the success of the ICESat-2 mission. |
| 2018 | **Goddard Space Flight Center Award:** In recognition and appreciation of your outstanding contribution to the successful launch, and activation of ICESat-2. |

**External Research Stays**

| | |
|---|---|
| 2013 (6m) | Geological Survey of Canada, Ottawa, Ontario, Canada. |
| 2013 (5w) | The University Centre in Svalbard, Longyearbyen, Norway. |

**Projects and Grants**

| | |
|---|---|
| 2025 - 2027 | **Swedish National Space Agency** - Senior Researcher Career Grant: Remote Sensing of the Cryosphere and Terrestrial Water Sources using Satellite Altimetry (PI) ($545.2k). (extendable by another 3 years after 2027). |
| 2024 - 2025 | **NASA Cryosphere -** Mass Balance Intercomparison Exercise - Phase 3 (Co-I/Lead) ($162K) |
| 2024 - 2027 | **NASA Cryosphere -** Ice-Shelf Thickness Changes: Effects on Stability and Ice Flow Across Antarctic Grounding Lines (Co-I) ($538K) |
| 2023 - 2028 | **NASA MEaSUREs** - “Next Generation - Intermission Time Series of Land Ice Velocity and Elevation” (Co-I) ($4.4M) |
| 2023 - 2028 | **NASA MEaSUREs** - “An ESDR of surface mass change from a hydro-geodetic sensor combination” (Co-I) ($3.0M) |
| 2020 - 2023 | **NASA Studies with ICESat-2** – “Global land ice contributions to sea level: 2003-present” (Co-I) ($600k) |
| 2020 - 2021 | **NASA Decadal Survey - Surface Topography and Vegetation** – “Topography Measurements Required to Advance Ice Sheet, Ice Shelf and Glacier Science Over the Coming Decades” (Co-I) ($100k) |
| 2020 - 2023 | **NASA GRACE-FO Science Team** – “Geodetic Data Combination for Increased Spatial Resolution in Earth System Mass Flux” (Co-I) ($800k) |
| 2019 (1yr) | **Spontaneous Research and Technology Development** - “Ice sheet wide study of coincident laser and radar observations from ICESat-2 and CryoSat-2 for Greenland and Antarctica” (PI) ($43k). |
| 2018 (1yr) | **NASA NISAR** (Marc Simard JPL) - “Quantifying and characterizing water level characteristics of Deltas and Estuaries for NISAR and Future missions using pulse-limited altimetry" (Collaborator) |
| 2018 - 2023 | **NASA MEaSUREs** – “Inter-mission Time Series of Land Ice Velocity and Elevation” (Co-I) ($4.2M) |
| 2018 - 2020 | **NASA Cryosphere** – “Exploring the dynamic response of West Antarctica to Ocean Variability” (Co-I) ($550k) |

2017 - 2019 **NASA Cryosphere** – "Constraining Mass Balance Uncertainties in East Antarctica from 2003 to the Present with Laser and Radar Altimetry Observations" (Co-I) ($750k)
2017 - 2021 **NASA ICESat-2 Science Team** (Collaborator)
2017 - 2020 **NASA Sea Level Change Team** – "Global interconnections of Cryosphere and Solid Earth, Sea-level Change and Ice Mass Balance" (postdoc) ($4M)
2011 - 2015 **Stability and Variations of Arctic Land Ice Project** (PhD)

**Outside Consulting**

2020-2021 **Lead Scientist/ Engineer:** Project 42 - Coldplay's Green Initiative: Provided scientific guidance on climate mitigation and design specifications for the development of mature high-level power system architectures that could be used as part of the band's next concert tour 2021. Tour canceled due to COVID (unpaid consulting).

**Teaching**

2025 **Remote Sensing with Applications in Weather and Climate** (1ME419) (Lead)
2025 **Glaciology and Landscape Processes** (1GEO040) (Lecturer)
2025 **Cold Region Hydrology and Environmental Change Hydrology** (1GE072) (Lecturer)
2023 - Present **Guest Lecturer at University of Houston** (Prof. Pietro Milillo): "Introduction to Satellite Altimetry for Ice Sheet Applications" on an annual basis.
2019, 2020 **ICESat-2 Cryospheric Science Hackweek Instructor,** eScience Institute, University of Washington.

**Academic Advising**

2026 **Helmer Öst** (BSc student), Thesis project, Uppsala University
2024 - Present **Eric Kabe** (PhD-Student) , University at Buffalo, Buffalo, NY, United States. Multisensor Bayesian Data Fusion and Reconstruction of Ice Sheets Topography. **Role: Outside reader**
2023 - Present **Maria Kappelsberger** (PhD-Student), Institute of Planetary Geodesy, TU Dresden, "Surface elevation changes of the Antarctic ice sheet from multi-mission altimetry"
2018 - 2023 **Natalia Havelund Andersen** (PhD student), DTU-Space, Technical University of Denmark, "Development of a CryoSat-2 SWATH processor for ice sheets"

**Field Research Experience**

| | | |
|---|---|---|
| 2016 | Black and Bloom Project (5w) - Field Assistant | Greenland |
| 2013 | Glaciology Course (5w) - Student | Svalbard |
| 2012 | CryoVex Airborne Validation Campaign (1w) - Team member | Greenland & Svalbard |

**Press-Releases and Interviews**

2022 **NASA Studies Find Previously Unknown Loss of Antarctic Ice**
*https://www.nasa.gov/feature/jpl/nasa-studies-find-previously-unknown-loss-of-antarctic-ice*
2020 **NASA Space Laser Missions Map 16 Years of Ice Sheet Loss**
*https://www.nasa.gov/feature/goddard/2020/nasa-space-laser-missions-map-16-years-of-ice-sheet-loss*
2019 **Hallands Nyheter**
*https://www.hn.se/nyheter/varberg/buapojken-som-blev-nasa-forskare-1.16742880*
2018 **Weird Magazine**
*https://www.wired.com/story/how-scientists-tracked-antarcticas-stunning-ice-loss/*
2016 **ScienceNordic**

*http://sciencenordic.com/calling-all-armchair-scientists-esa-releases-greenland-satellite-data*

**Oral Presentations (Selected)**

2026 **Svenska Rymdforskares Samarbetsgrupp (SRS), Stockholm, Sweden (Invited)**
Remote sensing of the cryosphere and terrestrial water sources

2026 **ISMIP Scoping Workshop, Copenhagen, Denmark (Invited)**
Representing Observational Focus Group

2025 **Nordea - Nordic Ideas Event, Embassy of Finland, Stockholm (Invited)**
Rising Sea Levels: Cause and Effect

2025 **IGS Nordic Branch, Copenhagen, Denmark**
Two Decades if of Changes in Mass Balance of Icelandic Glaciers

2024 **Cryo2Ice Symposium, Reykjavik, Iceland**
Enhancing Glacier Mass Balance Estimates in Iceland by Combining CryoSat-2, ICESat and ICESat-2 Altimetry Data.

2024 **Cryo2Ice Symposium, Reykjavik, Iceland**
Satellite and airborne altimetry reveal changes in ice dynamics on the Siple Coast ice streams, West Antarctica in 1997-2024.

2023 **Ocean Topography Science Team Meeting, Puerto Rico, USA**
Global Validation of the Jason-3 Mission: Current Status

2022 **American Geophysical Union (AGU), Chicago, USA**
Submarine Melting of Antarctic Ice Shelves on Sub-annual Time Scales from CryoSat-2 and ICESat-2 Altimetry

2021 **ESA Workshop: Dual Altimetry of the Cryosphere, Online**
Time varying surface penetration bias generated from coincident ICESat-2 and CryoSat-2 observations for Greenland and Antarctica

2019 **American Geophysical Union (AGU), San Francisco, USA**
Ice sheet wide comparison of coincident laser and radar observations from ICESat-2 and CryoSat-2 for Greenland and Antarctica

2018 **American Geophysical Union (AGU), Washington D.C, USA**
Integration of nearly 30 years of disparate satellite altimetry observations of the Antarctic ice sheet, 1985-2018

2018 **European Geophysical Union (EGU), Vienna, Austria (invited)**
Monthly estimates of Antarctic Ice Sheet elevation change from a quarter-century of combined radar and laser altimetry

2017 **American Geophysical Union (AGU), New Orleans, USA**
Synthesis of a quarter-century of satellite and airborne altimetry records to resolve long-term ice sheet elevation change

2017 **North-American CryoSat Science Meeting, Banff, Canada**
On a Path Towards the Reassessment of Antarctic Volume Change: Synthesis of ESA CryoSat-2 Radar and NASA Airborne and Satellite Laser Altimetry Observations.

2015 **Ilulissat Climate Days, Ilulissat, Greenland (invited):**
Surface elevation change of the Greenland ice sheet from CryoSat-2 altimetry

2014 **European Geophysical Union (EGU), Vienna, Austria:**
Greenland 2012 melt event effects on CryoSat-2 radar altimetry.

2014 **IGS Nordic Branch, Mýrdalur, Iceland**
Precision and accuracy of newly developed CryoSat-2 LRM and SARIn processors over glaciated terrain.

**Peer-Reviewed Publications**

- Nilsson, J. and Gardner, A. S.: Elevation change of the Greenland Ice Sheet and its peripheral glaciers: 1992–2023, Earth Syst. Sci. Data, 18, 1729–1745, https://doi.org/10.5194/essd-18-1729-2026, 2026

- The GlaMBIE Team. Community estimate of global glacier mass changes from 2000 to 2023. *Nature* (2025). https://doi.org/10.1038/s41586-024-08545-z.

- Paolo, F. S., Gardner, A. S., Greene, C. A., Nilsson, J., Schodlok, M. P., Schlegel, N.-J., and Fricker, H. A.: Widespread slowdown in thinning rates of West Antarctic ice shelves, The Cryosphere, 17, 3409–3433, https://doi.org/10.5194/tc-17-3409-2023, 2023.

- Otosaka, I. N., Shepherd, A., Ivins, E. R., Schlegel, N.-J., Amory, C., van den Broeke, M. R., Horwath, M., Joughin, I., King, M. D., Krinner, G., Nowicki, S., Payne, A. J., Rignot, E., Scambos, T., Simon, K. M., Smith, B. E., Sørensen, L. S., Velicogna, I., Whitehouse, P. L., A, G., Agosta, C., Ahlstrøm, A. P., Blazquez, A., Colgan, W., Engdahl, M. E., Fettweis, X., Forsberg, R., Gallée, H., Gardner, A., Gilbert, L., Gourmelen, N., Groh, A., Gunter, B. C., Harig, C., Helm, V., Khan, S. A., Kittel, C., Konrad, H., Langen, P. L., Lecavalier, B. S., Liang, C.-C., Loomis, B. D., McMillan, M., Melini, D., Mernild, S. H., Mottram, R., Mouginot, J., Nilsson, J., Noël, B., Pattle, M. E., Peltier, W. R., Pie, N., Roca, M., Sasgen, I., Save, H. V., Seo, K.-W., Scheuchl, B., Schrama, E. J. O., Schröder, L., Simonsen, S. B., Slater, T., Spada, G., Sutterley, T. C., Vishwakarma, B. D., van Wessem, J. M., Wiese, D., van der Wal, W., and Wouters, B.: Mass balance of the Greenland and Antarctic ice sheets from 1992 to 2020, Earth Syst. Sci. Data, 15, 1597–1616, https://doi.org/10.5194/essd-15-1597-2023, 2023.

- Nilsson, Johan, Alex S. Gardner, and Fernando S. Paolo. "Elevation change of the Antarctic Ice Sheet: 1985 to 2020." *Earth System Science Data* 14, no. 8 (2022): 3573-3598.

- Irvine-Fynn, Tristram DL, Pete Bunting, Joseph M. Cook, Alun Hubbard, Nicholas E. Barrand, Edward Hanna, Andy J. Hardy et al. "Temporal Variability of Surface Reflectance Supersedes Spatial Resolution in Defining Greenland's Bare-Ice Albedo." *Remote sensing* 14, no. 1 (2021): 62.

- Adhikari, S., G. A. Milne, L. Caron, S. A. Khan, K. K. Kjeldsen, J. Nilsson, E. Larour, and E. R. Ivins. "Decadal to centennial time scale mantle viscosity inferred from modern crustal uplift rates in Greenland." *Geophysical Research Letters* 48, no. 19 (2021): e2021GL094040.

- Andersen, Natalia Havelund, Sebastian Bjerregaard Simonsen, Mai Winstrup, Johan Nilsson, and Louise Sandberg Sørensen. 2021. "Regional Assessments of Surface Ice Elevations from Swath-Processed CryoSat-2 SARIn Data" *Remote Sensing* 13, no. 11: 2213. https://doi.org/10.3390/rs13112213

- Marshak, Charlie, Marc Simard, Michael Denbina, Johan Nilsson, and Tom Van der Stocken. "Orinoco: Retrieving a River Delta Network with the Fast-Marching Method and Python." *ISPRS International Journal of Geo-Information* 9, no. 11 (2020): 658.

- Trantow, Thomas, Ute C. Herzfeld, Veit Helm, and Johan Nilsson. "Sensitivity of glacier elevation analysis and numerical modeling to CryoSat-2 SIRAL retracking techniques." *Computers & Geosciences* (2020): 104610.

- Smith, Ben, Helen A. Fricker, Alex S. Gardner, Brooke Medley, Johan Nilsson, Fernando S. Paolo, Nicholas Holschuh et al. "Pervasive ice sheet mass loss reflects competing ocean and atmosphere processes." *Science* (2020).

- Benjamin Smith, Helen A. Fricker, Nicholas Holschuh, Alex S. Gardner, Susheel Adusumilli, Kelly M. Brunt, Beata Csatho, Kaitlin Harbeck, Alex Huth, Thomas Neumann, Johan Nilsson, Matthew R. Siegfried. Land ice height-retrieval algorithm for NASA's ICESat-2 photon-counting laser altimeter. *Remote Sensing of the Environment*, 2019.

- Shepherd, Andrew, Erik Ivins, Eric Rignot, and Xavier Fettweis. "Mass balance of the Greenland Ice Sheet from 1992 to 2018." *Nature* (2019).

- Sandberg Sørensen, L., Simonsen, S., Langley, K., Gray, L., Helm, V., Nilsson, J., ... & Davidson, M. (2018). Validation of CryoSat-2 SARIn Data over Austfonna Ice Cap Using Airborne Laser Scanner Measurements. *Remote Sensing*, *10*(9), 1354.

- Shepherd, A., Ivins, E., Rignot, E., Smith, B., van den Broeke, M., Velicogna, I., ... & Nowicki, S. (2018). Mass balance of the Antarctic Ice Sheet from 1992 to 2017. *Nature*, *556*, pages219-222.

- Caron, L., E.R. Ivins, E. Larour, S. Adhikari, J. Nilsson and G. Blewitt (2018), GIA model statistics for GRACE hydrology, cryosphere and ocean science, Geophys. Res.

- Cook, J. M., Hodson, A. J., Gardner, A. S., Flanner, M., Tedstone, A. J., Williamson, C., Irvine-Fynn, T. D. L., Nilsson, J., Bryant, R., and Tranter, M.: Quantifying bioalbedo: a new physically based model and discussion of empirical methods for characterizing biological influence on ice and snow albedo, The Cryosphere, 11, 2611-2632, https://doi.org/10.5194/tc-11-2611-2017, 2017.

- Gardner, A. S., Moholdt, G., Scambos, T., Fahnstock, M., Ligtenberg, S., van den Broeke, M., and Nilsson, J.: Increased West Antarctic ice discharge and East Antarctic stability over the last seven years, The Cryosphere Discuss., https://doi.org/10.5194/tc-2017-75, Accepted, 2017.

- Nilsson, J., Gardner, A., Sandberg Sørensen, L., and Forsberg, R.: Improved retrieval of land ice topography from CryoSat-2 data and its impact for volume change estimation of the Greenland Ice Sheet, The Cryosphere, 10, 1–17, doi: 10.5194/tc-10-1-2016, 2016.

- Nilsson, J., Vallelonga, P., Simonsen, S.B., Sørensen, L.S., Forsberg, R., Dahl Jensen, D., Hirabayashi, M., GotoAzuma, K., Hvidberg, C.S., Kjær, H.A. and Satow, K., 2015. Greenland 2012 melt event effects on CryoSat2 radar altimetry. Geophysical Research Letters, 42(10), pp.3919-3926.

- Nilsson, J., Sandberg Sørensen, L., Barletta, V.R. and Forsberg, R., 2015. Mass changes in Arctic ice caps and glaciers: implications of regionalizing elevation changes. The Cryosphere, 9(1), pp.139-150.

**Technical Publications, Proceedings and Workshops**


1. S. Kacimi *et al*., "Using mm-wave observations to maximize the CRISTAL mission cryosphere science applications," *2023 IEEE Aerospace Conference*, Big Sky, MT, USA, 2023, pp. 1-8, doi: 10.1109/AERO55745.2023.10115924.

2. Smith, B., S. Adusumilli, B. M. Csathó, D. Felikson, H. A. Fricker, A. Gardner, N. Holschuh, J. Lee, J. Nilsson, F. S. Paolo, M. R. Siegfried, T. Sutterley, and the ICESat-2 Science Team. ATLAS/ICESat-2 L3A Land Ice Height, **Version 5**. 2021, Distributed by NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/ATLAS/ATL06.005. Date Accessed 01-09-2023.

3. Smith, B., H. A. Fricker, A. Gardner, M. R. Siegfried, S. Adusumilli, B. M. Csathó, N. Holschuh, J. Nilsson, F. S. Paolo, and the ICESat-2 Science Team. (2020). ATLAS/ICESat-2 L3A Land Ice Height, **Version 3** [Data Set]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/ATLAS/ATL06.003. Date Accessed 01-21-2023.

4. Forsberg, R, Sørensen, LS, Fredenslund Levinsen and Nilsson J., 2013, Mass loss of Greenland from GRACE, IceSat and CryoSat. in Proceedings of the CryoSat Workshop. European Space Agency, ESA, Dresden

5. Skourup, H, Einarsson, I, Forsberg, R, Haas, C, Helms, V, Hvidegaard, SM, Nilsson, J, Olesen, AV and Olesen, AK 2012, ESA CryoVEx 2012: Airborne field campaign with ASIRAS radar, EM induction sounder and laser scanner. DTU Space, Kgs. Lyngby, Technical Report, no. 2.