Geir Nævdal

PERSONAL INFORMATION

First name, Surname:	Geir Nævdal
Year of birth:	1964
Sex:	Male
Nationality:	Norwegian
ORCID:	0000-0003-2497-198X
Google scholar:	https://scholar.google.com/citations?user=CtqY_U4AAAAJ
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KEY QUALIFICATIONS

Educated as a **mathematician**, I have more than 25 years of experience solving applied problems across a wide range of fields. My recent work has focused on **maritime applications**, **renewable energy**, **seismic inversion**, **ultrasound**, and **medicine**. I have placed particular emphasis on **data assimilation**, **large-scale parameter estimation**, and **optimization**, making significant contributions to **reservoir engineering**.

EDUCATION

1991:	PhD (Dr. Ing.): Division of Mathematical Sciences, Norwegian University of Science and Technology, Norway. (*Disputation date:* October 18, 1991.)
1987:	Master (Cand. Scient). Department of Mathematics, University of Bergen, Norway.

POSITIONS – CURRENT AND PREVIOUS

2004-	Research Professor at Division of Energy and Technology, NORCE. (The position was at International Research Institute of Stavanger (IRIS) until 2018.)
2020	Førsteamanuensis II at the University of Stavanger
2013-2015	Assistant director of research at National IOR centre of Norway
2009-2012	Adjunct professor. Department of Mathematics, University of Bergen
2009	Adjunct principal researcher. Centre for Integrated Petroleum Research, Uni
1997-2004	Senior Research Scientist. Rogaland Research (changed name to IRIS)
1991-1997	Associate professor. Department of Engineering, Stord/Haugesund College

PROJECT MANAGEMENT EXPERIENCE

2022 - 2025	Heading the work package “Automatisering av operasjoner” in “Grønn platform prosjektet” “Ocean Charger - maritim verdikjede for havvind med offshore energioverføring”.
2022 -	Heading the work package “End user applications” in the FME Center “Norwegian Centre for Hydrogen Research (HyValue)”.
2022-2025	“Energy efficient operation of hydrogen powered vessels.” Research Council of Norway (RCN) MAROFFF project with a total budget of 12.666 MNOK.
2022-2024	“Måling og analyse av litiumbatterier og batterimoduler med hjelp av ultralyd.” RFF Vestland researcher project with total budget of 3 MNOK.
2021	“Måling og analyse av helsetilstand til litiumbatterier”. RFF Vestland Forprosjekt, with budget 556 KNOK.
2013 - 2021	Heading the task “Field scale evaluation and history matching” at National IOR Center of Norway.

PROJECT MANAGEMENT EXPERIENCE (continued)

2012	"Integrated Workflow & Realistic Geology." RCN Petromaks project from 2012-2015 with a total budget of 24.9 MNOK.
2011-2012	"Transient well flow modelling and modern estimation techniques for accurate production allocation." RCN Petromaks project with total budget of 10.4 MNOK.
2008-2011	"Reservoir characterization using ensemble Kalman filter." RCN Petromaks project with total budget of 21.6 MNOK.
2007-2010	"Production optimization and model predictive control for improved reservoir management." RCN Petromaks project with total budget of 14 MNOK.
2005-2007	"ROAW phase II: Continuous model updating of reservoir simulation models and improved reservoir management." RCN Petromaks. Budget: 13.5 MNOK.

(CO-)SUPERVISION OF STUDENTS

Master students	PhD students	Institution
1	2	Department of Mathematics, University of Bergen, Norway
	3	Department of Earth Science, University of Bergen, Norway
1		Department of Informatics, University of Bergen
	1	Department of Petroleum Engineering, University of Stavanger, Norway
	1	Department of Petroleum Eng. and Applied Geophysics, NTNU, Norway

OTHER RELEVANT PROFESSIONAL EXPERIENCES

	Reviewer for a number of papers for different journals.
2024	In organization committee of the Workshop on "Cost-Efficient Hydrogen-Driven Maritime Operations", Bergen, November 4, 2024, with approximately 30 participants.
2023	In organization committee of "HyValue WP 3 workshop", Bergen, 30-31.10.23. Day 1 was on maritime applications, day 2 on "land and air".
2020-2022	Reviewer of research proposals for the Swiss National Science Foundation.
2021	In organizing committee of "National IOR Center Workshop on Production optimization, value of information and decision-making"", September 7-8, 2021. Online event with more than 80 participants.
2019-2021	Serving as a reviewer for Mathematical Reviews, American Mathematical Society.
2020	In organizing committee of "Workshop on ensemble-based 4D seismic history matching", The National IOR Centre of Norway, October 14-15, 2020. Online event with more than 50 participants.
2009-2016	Associate editor for "SPE Journal", Society of Petroleum Engineers.
2016	Organized "Workshop on 4D seismic and history matching" at IRIS, Stavanger, Norway, April 28, 2016, with 30 participants, from 4 countries.
2016	In organizing committee for "Workshop on modelling of flow in live tissue - Methodological interaction between geo- and life-science", Bergen, Norway, March 9, 2016. Approximately 30 participants, from 2 countries.
2015	In organization committee for **IOR Norway**, University of Stavanger, April 28-29, 2015. International conference with more than 300 participants.

TRACK RECORD

Publications during the career: 66 peer reviewed journal papers and book chapters, 82 conference papers (as of March 2025).

Type of publication index	Statistics
WebOfScience (Researcher-ID) (March 2025)	No. of publications: 113 1898 citations, h-index: 22.
Google scholar (March 2025)	No. of publications: 162 6375 citations, h-index: 37.

My most cited publication is [17] with 959 citations (google-scholar). It is listed with 472 citations in Web Of Science and listed there as the fourth most cited paper ever from SPE Journal, one of the top journals within petroleum engineering.

Selected publications

[1] G. Nævdal and S. Evje, Can cancer cells inform us about the tumor microenvironment?. *Journal of Computational Physics*, **492**, 112449, Nov. 2023.

[2] K. Xiang, M. Jakobsen, K. S. Eikrem, and G. Nævdal, A matrix-free variant of the distorted Born iterative method for seismic full-waveform inversion. *Geophysical Prospecting*, **71**, 3, 431–442, Feb. 2023.

[3] R. J. Lorentzen, G. Nævdal, O. Sævareid, E. Hodneland, E. A. Hanson, and A. Munthe-Kaas, Perfusion estimation using synthetic mri-based measurements and a porous media flow model. *PLOS Computational Biology*, **19**, 10, e1011127, Oct. 2023.

[4] G. Nævdal, E. K. Rofstad, K. Søreide, and S. Evje, Fluid-sensitive migration mechanisms predict association between metastasis and high interstitial fluid pressure in pancreatic cancer. *Journal of Biomechanics*, **145**, 111362, Dec. 2022.

[5] D. S. Oliver, K. Fossum, T. Bhakta, I. Sandø, G. Nævdal, and R. J. Lorentzen, 4D seismic history matching. *Journal of Petroleum Science and Engineering*, **207**, 109119, 2021.

[6] K. S. Eikrem, G. Nævdal, and M. Jakobsen, Iterative solution of the Lippmann–Schwinger equation in strongly scattering acoustic media by randomized construction of preconditioners. *Geophysical Journal International*, **224**, 3, 2121–2130, Mar. 2021.

[7] X. Huang, K. S. Eikrem, M. Jakobsen, and G. Nævdal, Bayesian full-waveform inversion in anisotropic elastic media using the iterated extended Kalman filter. *Geophysics*, **85**, C125–C139, 2020.

[8] J. Magnusson, G. Nævdal, F. Matt, J. F. Burkhart, and A. Winstral, Improving hydropower inflow forecasts by assimilating snow data. *Hydrology Research*, **51**, 2, 226–237, 2020.

[9] R. J. Lorentzen, T. Bhakta, D. Grana, X. Luo, R. Valestrand, and G. Nævdal, Simultaneous assimilation of production and seismic data: Application to the Norne field. *Computational Geosciences*, **24**, 907–920, 2020.

[10] Y. Chang, R. J. Lorentzen, G. Nævdal, and T. Feng, Olympus optimization under geological uncertainty. *Computational Geosciences*, **24**, 6, 2027–2042, Sep. 2019.

[11] K. S. Eikrem, G. Nævdal, and M. Jakobsen, Iterated extended Kalman filter method for time-lapse seismic full-waveform inversion. *Geophysical Prospecting*, **67**, 379–394, 2019.

[12] X. Luo, T. Bhakta, M. Jakobsen, and G. Nævdal, Efficient big data assimilation through sparse representation: A 3D benchmark case study in petroleum engineering. *Plos One*, Jul. 2018.

[13] X. Luo, T. Bhakta, and G. Nævdal, Correlation-based adaptive localization with applications to ensemble-based 4D-seismic history matching. *SPE Journal*, **23**, 2, 396–427, Apr. 2018.

[14] X. Luo, A. S. Stordal, R. J. Lorentzen, and G. Nævdal, Iterative ensemble smoother as an approximate solution to a regularized minimum-average-cost problem: Theory and applications. *SPE Journal*, **20**, 5, 962–982, Oct. 2015.

[15] R. J. Lorentzen and G. Nævdal, An iterative ensemble Kalman filter. *IEEE Transactions on Automatic Control*, **56**, 8, 1990–1995, Aug. 2011.

[16] A. S. Stordal, H. A. Karlsen, G. Nævdal, H. J. Skaug, and B. Vallès, Bridging the ensemble Kalman filter and particle filters: The adaptive Gaussian mixture filter. *Computational Geosciences*, **15**, 2, 293–305, 2011.

[17] S. I. Aanonsen, G. Nævdal, D. S. Oliver, A. C. Reynolds, and B. Vallès, The ensemble Kalman filter in reservoir engineering – a review. *SPE Journal*, **14**, 3, 393–412, Sep. 2009.

Organization of international conferences in the field of the applicant

- In organization committee for **IOR Norway**, University of Stavanger, April 28-29, 2015. International conference with more than 300 participants.
- Founder and in the organization committee (2006-2012) of the **International EnKF Workshop**s held yearly in or near Bergen, Norway. Approx. 50 participants per year. Organized by the EnKF community in Bergen (IRIS, Uni CIPR (now both in NORCE), NERSC, Equinor). The 20th workshop will be held in June 2025.

  See `https://enkf.norceprosjekt.no/home`

  (Next workshop: `https://www.data-assimilation.no/workshops`)

Major contributions to the early careers of excellent researchers
PhD co-supervisor of Xingguo Huang, currently professor at Jilin University, Changchun, China.
PhD supervisor of Andreas S. Stordal, currently researcher at NORCE.
PhD co-supervisor of Aoije Hong, currently a principal reservoir engineer at Equinor.

Examples of leadership in industrial innovation or design
Initiated the work on using ensemble Kalman filter for updating reservoir simulation models in the first years of this century and has lead several large project in that area at IRIS/NORCE. The development of the IRIS Filter Toolbox (from 2001), a set of matlab routines for running ensemble Kalman filter for updating reservoir models was an important step in this work. The IRIS Filter Toolbox was a major tool in the subsequent projects at IRIS in this area. It was also used when Eni and Total started using the methodology in their organizations.
In the report "Effekter av Forskningsrådets målrettede aktiviteter innen petroleum" (December 2019) by RCN evaluating the importance of research supported by RCN within petroleum in 2008–2018 the use of the EnKF technology was notified as one of the most important research achievements for increased oil production at the Norwegian continental shelf.

Initial publications on the use of EnKF within reservoir engineering

[18] G. Nævdal, T. Mannseth, and E. H. Vefring, "Near-well reservoir monitoring through ensemble Kalman filter," in *SPE/DOE Improved Oil Recovery Symposium*, SPE75235, Tulsa, Oklahoma, Apr. 2002.

[19] G. Nævdal, L. M. Johnsen, S. I. Aanonsen, and E. H. Vefring, "Reservoir monitoring and continuous model updating using ensemble Kalman filter," in *SPE Annual Technical Conference and Exhibition*, SPE 84372, Denver, Colorado, USA, May 2003.

[20] G. Nævdal, L. M. Johnsen, S. I. Aanonsen, and E. H. Vefring, Reservoir monitoring and continuous model updating using ensemble Kalman filter. *SPE Journal*, **10**, 1, 66–74, Mar. 2005.

The papers [18], [19] initiated the research on ensemble Kalman filter and use of ensemble based methods within reservoir engineering. This has lead to a large research activity, both in Norway and internationally. The paper [19] appeared in SPE Journal in 2005 as [20] and has 558 citations in googlescholar. [20] is listed with 169 citations in Web Of Science.