Néstor Cardozo

CONTACT INFORMATION

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RESEARCH INTERESTS

Structural Geology and Basin Analysis. Numerical modelling and computation applied to Geosciences.

EDUCATION

Cornell University, Ithaca, New York USA **January 1998 - January 2003**

Ph.D. Earth and Atmospheric Sciences, January 2003

- Dissertation: Mechanical and kinematic investigations of fault propagation folding and foreland subsidence
- Advisors: Richard Allmendinger and Teresa Jordan

Ohio University, Athens, Ohio USA **September 1995 - September 1997**

M.S., Geological Sciences, September, 1997

- Thesis: Thermomechanical modeling of the Llanos Basin, Colombia
- Advisor: Douglas Green

Universidad Nacional, Bogotá Colombia **September 1994 - September 1995**

Coursework M.S., Geotechnical Engineering, September 1994 - September 1995

Universidad Nacional, Bogotá Colombia **September 1988 - June 1994**

B.S., Geology, September, 1994

- Thesis: Structural Analysis of the Soapaga fault, Eastern Cordillera, Colombia
- Advisor: Andreas Kammer

PROFESSIONAL EXPERIENCE

Dept. of Energy Resources, University of Stavanger, Norway

Professor (since 2017) **October, 2008 - present**

Courses taught: Structural Geology (Bachelor and Master), Geotechnical Engineering (Bachelor), Modelling and Computational Engineering (Master), Python for Natural Sciences and Engineering (PhD)

Center for Integrated Petroleum Research, Bergen, Norway

Researcher II **September, 2004 - September 2008**

Fault Facies project, an initiative to realistically include faults in reservoir models. More information on this site

Norwegian Geotechnical Institute, Oslo, Norway

Postdoctoral fellow **August, 2003 - August 2004**

Mechanical modeling of fault zones, rockslides, and fractured carbonates

Department of Earth and Atmospheric Sciences, Cornell University, Ithaca, New York USA

Postdoc **August, 2002 - August 2003**
Field, kinematic and mechanical studies of fault propagation folding

PhDs

Charlotte Botter: Seismic imaging of fault zones (NFR 210425/E30). Graduated June 2016. Currently Teaching Fellow at the University of Leeds.

Luis Alberto Rojo: Impact of salt movement in the Triassic of the Nordkapp basin, Barents Sea (KD). Graduated October 2020. Currently at Aker-BP.

Jennifer Cunningham: From seismic interpretation to reservoir modelling of faults (KD). Graduated January 2021. Currently at Equinor.

Daniele Blancone: Salt characterization and modelling for the future energy mix (NCS2030). Started January 2023.

Jake Butcher: Structural Geology and Geomechanics of the Wisting field, Barents Sea. Started May 2023.

Rusmir Helja: Physics-guided proxy modelling for CO2 storage. Started February 2026 (co-supervision with Pål Andersen).

Postdocs

David Oakley (PhD University of Pennsylvania): Structural uncertainty and stochastic structural modelling (KD). September 2020 to September 2022. Currently postdoc at The University of Edinburgh.

Nisar Ahmed (PhD UiS): Data driven ML methods for reservoir characterization (NCS2030). Started June 2024.

Publications

Conference abstracts not included

52. Ahmed, N., Oikonomou, D., Cardozo, N., Weibull, W., Grana, D., Alaei, B. and Larsen, E. 2026. Enhanced Deep Learning Using a Convolutionally Embedded Transformer Architecture for Reservoir Elastic Property Prediction: Comparison With Physics-Based Seismic Inversion. Geophysical Prospecting, 74:e70211.
51. Mohammadi, M., Bratvold, R.B. and Cardozo, N. 2025. Probability forecast verification in petroleum exploration: insights from the Norwegian Continental Shelf. Petroleum Geoscience 31, petgeo2025-014.
50. Blancone, D., Ruiz Maraggi, L.M., Cardozo, N., Moscardelli, L. and Escalona, A. 2025. Assessing hydrogen storage potential in Zechstein salt caverns of the Norwegian North Sea. Journal of Energy Storage 128, 117032.
49. Butcher, J.H., Cardozo, N., Schulte, L. and Rojo, L. 2025. The low acoustic impedance of fault zones in the Wisting field, Barents Sea: Gas saturation or damage zone? Journal of Structural Geology 191, 105347.
48. Castelblanco, C., Vargas, C. and Cardozo, N. 2025. Seismic attenuation in the Middle Magdalena Valley, Colombia, and possible relation to fluid lubricated fault zones. Journal of South American Earth Sciences 153, 105359.
47. Schulte, L., Cardozo, N. and Batista, A. 2024. The well log and seismic expression of faults in the Wisting field, Barents Sea. Journal of Structural Geology 178, 105036.
46. Cardozo, N. and Hardy, S. 2023. cdem: A macOS program for discrete element modelling of tectonic structures. Geosphere, https://doi.org/10.1130/GES02647.1.

45. Oakley, D., Cardozo, N., Almendral Vazquez, A. and Røe, P. 2023. Structural geologic modeling and restoration using Ensemble Kalman inversion. Journal of Structural Geology, 171, 104868.

44. Marín, D., Cardozo, N. and Escalona, A. 2023. Compositional variation of the Zechstein Group in the Norwegian North Sea: implications for underground storage in salt caverns. Basin Research, https://doi.org/10.1111/bre.12761.

43. Volatili, T., Agosta, F., Cardozo, N., Zambrano, M., Lecomte, I. and Tondi, E. 2022. Outcrop-scale fracture analysis and seismic modelling of a basin-bounding normal fault in platform carbonates, central Italy. Journal of Structural Geology 155, 104515.

42. Cunningham, J., Cardozo, N., Weibull, W. and Iacopini, D. 2021. Investigating the PS seismic imaging of faults using seismic modelling and data from the Snøhvit field, Barents Sea. Petroleum Geosciences 28, petgeo2020-044.

41. Hardy, S. and Cardozo, N. 2021. Discrete Element Modelling of Sedimentation and Tectonics: Implications for the growth of thrust faults and thrust wedges in space and time, and the interpretation of syn-tectonic (growth) strata. Frontiers in Earth Science 9, 742204.

40. Cunningham, J., Cardozo, N., Townsend, C. and Callow, R. 2021. The Impact of seismic interpretation methods on the analysis of faults: A case study from the Snøhvit field, Barents Sea. Solid Earth 12, 741-764.

39. Pachón-Parra, L.F., Mann, P. and Cardozo, N. 2020. Regional subsurface mapping and 3D flexural modeling of the obliquely-converging Putumayo foreland basin, southern Colombia. Interpretation 8, 4, ST15-ST48.

38. Mostalenko, A., Khudoley, A. and Cardozo, N. 2020. Fault kinematics and paleostress analysis using seismic data: A case study from the Archinsk field, West Siberian Basin, Russia. Journal of Structural Geology 104194.

37. Rojo, LA., Koyi, H., Cardozo, N. and Escalona, A. 2020. Salt tectonics in salt-bearing rift basins: progradational loading vs. extension. Journal of Structural Geology 104193.

36. Mohammadrezaei, H., Alavi, S., Cardozo, N. and Ghassemi, M.R. 2020. Deciphering the relationship between basement faulting and polyphase folding in the Hendijan anticline, Northwestern Persian Gulf, Iran. Marine and Petroleum Geology 122, 104626.

35. Rojo, L.A., Marín, D.L., Cardozo, N., Escalona, A., Koyi, H. 2019. The influence of halokinesis on prograding clinoforms: insights from the Tiddlybanken Basin, Norwegian Barents Sea. Basin Research, 32, 979-1004.

34. Trede, C., Cardozo, N. and Watson, L. 2019. What is the appropriate size for strike and dip measurements? An evaluation from compass, smartphone, and LiDAR measurements. Norwegian Journal of Geology 99, 3, 1-14.

33. Rojo, L.A., Cardozo, N., Escalona, A. and Koyi, H. 2019. Structural style and evolution of the Nordkapp Basin, Norwegian Barents Sea. AAPG Bulletin 103, 2177-2217.

32. Cedeño, A., Rojo, L., Cardozo, N., Centeno, L. and Escalona, A. 2019. The impact of salt tectonics on the thermal evolution and the petroleum system of confined rift basins: insights from basin modelling of the Nordkapp Basin, Norwegian Barents Sea. Geosciences 9(7), 316.

31. Cardozo, N. and Oakley, D. 2019. Inverse modelling for possible rather than unique solutions. Journal of Structural Geology 125, 285-295.

30. Kairanov, B., Marín, D., Escalona, A. and Cardozo, N. 2019. Growth and linkage of a basin-bounding fault system: Insights from the Early Cretaceous evolution of the northern Polhem Subplatform, SW Barents Sea. Journal of Structural Geology 124, 182-196.

29. Medina-Cascales, I., Koch, L., Cardozo, N., Martín-Rojas, I., Alfaro, P. and García-Tortosa, F.J. 2019. 3D geometry and architecture of a normal fault zone in poorly lithified sediments: A trench study on a strand of the Baza Fault, central Betic Cordillera, south Spain. Journal of Structural Geology 121, 21-45.

28. Cunningham, J., Cardozo, N., Townsend, C., Iacopini, D. and Wærum, G.O. 2019. Deformation, seismic amplitude and unsupervised fault facies analysis of normal faults, Snøhvit field in the Barents Sea, Norway. Journal of Structural Geology 118, 165-180.

27. Sydnes, M., Fjeldskaar, W., Løtveit, I., Grunnaleite, I. and Cardozo, N. 2018. The importance of sill thickness and timing of sill emplacement on hydrocarbon maturation. Marine and Petroleum Geology 89, 500-514.

26. Guerriero, L., Bertello, L., Cardozo, N., Berti, M., Grelle, G. and Revellino, P. 2017. Unsteady sediment discharge in earth flows: A case study from the Mount Pizzuto earth flow, southern Italy. Geomorphology 295, 260-284.

25. Botter, C., Cardozo, N., Tveranger, J., Qu, D. and Kolyukhin, D. 2017. Seismic characterisation of fault facies models. Interpretation, 5(4), SP9-SP26.

24. Botter, C., Cardozo, N., Lecomte, I., Rotevatn, A. and Paton, G. 2017. The impact of faults and fluid flow on seismic images of a relay ramp over production time. Petroleum Geosciences 23, 17-28.

23. Botter, C., Cardozo, N., Hardy, S., Lecomte, I., Paton, G. and Escalona, A. 2016. Seismic characterisation of fault damage in 3D using mechanical and seismic modelling. Marine and Petroleum Geology 77, 973-990.

22. Cardozo, N., Montes, C., Marín, D., Gutierrez, I. and Palencia, A. 2016. Structural analysis of the Tabaco anticline, Cerrejón open-cast coal mine, Colombia, South America. Journal of Structural Geology 87, 115-133.

21. Botter, C., Cardozo, N., Hardy, S., Lecomte, I. and Escalona, A. 2014. From mechanical modeling to seismic imaging of faults: A synthetic workflow to study the impact of faults on seismic. Marine and Petroleum Geology 57, 187-207.

20. Cardozo, N. and Brandenburg, J.P. 2014. Kinematic modeling of folding above listric propagating thrusts. Journal of Structural Geology 60, 1-12.

19. Grothe, P.R., Cardozo, N., Mueller, K. and Ishiyama, T. 2014. Propagation history of the Osaka-wan blind thrust, Japan, from trishear modeling. Journal of Structural Geology 58, 79-94.

18. Vidal-Royo, O., Muñoz, J.A., Hardy, S., Koyi, H. and Cardozo, N. 2013. Structural evolution of the Pico del Águila anticline (External Sierras, Southern Pyrenees) derived from sandbox, numerical and 3D structural modelling techniques. Geologica Acta 11, 1-26.

17. Cardozo, N. and Allmendinger, R.W. 2013. Spherical projections with OSXStereonet. Computers and Geosciences 51, 193-205.

16. Allmendinger, R. W., Cardozo, N., and Fisher, D. 2012. Structural Geology Algorithms: Vectors and Tensors. Cambridge University Press.

15. Vidal-Royo, O., Cardozo, N., Muñoz, J., Hardy, S. and Maerten, L. 2012. Multiple mechanisms driving detachment folding as deduced from 3D reconstruction and geomechanical restoration: The Pico del Águila anticline (External Sierras, Southern Pyrenees). Basin Research 24, 295-313.

14. Cardozo, N., Jackson, C.A. and Whipp, P. 2011. Determining the uniqueness of best-fit trishear models. Journal of Structural Geology 33, 1063-1078.

13. Fachri, M., Tveranger, J., Cardozo, N. and Pettersen, Ø. 2011. The impact of fault envelope structure on fluid flow: A screening study using Fault Facies. In Press. American Association of Petroleum Geologists Bulletin 95, 619-648.

12. Braathen, A., Tveranger, J., Fossen, H., Skar, T., Cardozo, N., Semshaug, S.E., Bastesen E. and Sverdrup E. 2009. Fault Facies and its applications to sandstone reservoirs. American Association of Petroleum Geologists Bulletin 93, 891-917.

11. Cardozo, N. and Aanonsen, S.I. 2009. Optimized trishear inverse modeling. Journal of Structural Geology 31, 546-560.
10. Cardozo, N. and Allmendinger, R.W. 2009. SSPX: A program to compute strain from displacement/velocity data. Computers and Geosciences 35, 1343-1357.
9. Fredman, N., Tveranger, J., Cardozo, N., Braathen, A., Soleng, H., Røe, P., Skorstad, A. and Syversveen, A.R. 2008. Fault facies modelling: Technique, and approach for 3D conditioning and modeling of faulted grids. American Association of Petroleum Geologists Bulletin 92, 1457-1478.
8. Cardozo, N., Røe, Per, Soleng, H., Fredman, N. Tveranger, J. and Schueller, S. 2008. A methodology for efficiently populating faulted corner point grids with strain. Petroleum Geoscience 14, 205-220.
7. Cardozo, N. 2008. Trishear in 3D: Algorithms, implementation, and limitations. Journal of Structural Geology 30, 327-340.
6. Cardozo, N., Allmendinger, R.W., Morgan, J.K. 2005. Influence of mechanical stratigraphy and initial stress state on the formation of two fault propagation folds. Journal of Structural Geology, 27, 1954-1972.
5. Cardozo, N. 2005. Trishear modeling of fold bedding data along a topographic profile. Journal of Structural Geology, 27, 495-502.
4. Gómez, E., Jordan, T.E., Allmendinger, R.W., and Cardozo, N. 2005. Development of the Colombian foreland-basin system as a consequence of diachronous exhumation of the northern Andes. Geological Society of America Bulletin, 117, 1272-1292.
3. Cardozo, N., Bhalla, K., Zehnder, A.T., Allmendinger, R.W. 2003. Mechanical models of fault propagation folds and comparison to the Trishear kinematic model. Journal of Structural Geology, 25, 1-18.
2. Cardozo, N., Jordan, T. 2001. Causes of spatially variable tectonic subsidence in the Miocene Bermejo foreland basin, Argentina. Basin Research, 13, 335-357.
1. Jordan, T., Schlunegger, F., and Cardozo, N. 2001. Unsteady and spatially variable evolution of the Neogene Andean Bermejo foreland basin, Argentina. Journal of South American Earth Sciences, 14, 775-798.

Computer Programs

cdem: 2D discrete element modeling of geological structures (with Stuart Hardy, ICREA)
Stereonet3D: Stereonet with 3D visualization (with Richard Allmendinger, Cornell University)
GeoKalk: Structural geology calculator
SSPX: Inverse strain modeling (with Richard Allmendinger, Cornell University)
Trishear3D: 3D forward modeling of fault related folds
Backstrip: Backstripping of sedimentary rocks
Flex2D: 2D flexural modeling

These programs are for macOS and are available on my website, this repository and on the Mac App Store.

Popular Repositories

Matlab scripts and Xcode playgrounds for Structural Geology and Basin Analysis available on my website. The Matlab scripts are also available in this repository.

Computational Geosciences: A book on Computational Geosciences with Python code included. I wrote this together with students, and as an educational project funded by the TN faculty.

Python for subsurface applications: A book adapted from a one-week course on Python at ConocoPhillips Stavanger (May, 2025).

Python for Geosciences course: A one-week Python course. This is part of a Python and ML for geosciences course funded by NFIP.

Structural Geology: A collection of Jupyter Notebooks for Structural Geology.

3D models from geological maps: Geologic maps to 3D models using GemPy. A great resource for teaching map interpretation.

Online Lectures

Structural Geology YouTube playlist: Lectures from my Bachelor Structural Geology Course at the University of Stavanger.