

# SHIHAO FU

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## EDUCATION

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**Ph.D. Applied geophysics and petrophysics Delft University of Technology Sep 2021 – Present**  
(Defense date: Feb 26, 2026)

- Thesis topic: Evolution of rock salt fracture geometry and mechanical properties during fluid-rock interactions
- Supervisors: Prof. D. Bruhn (promotor), Dr. A. Pluymakers and Dr. A. C. Dieudonné (co-promotors)
- PhD research on the mechanical-chemical evolution of rock salt fractures, combining experiments and numerical modeling to study fracture geometry evolution and mechanical healing. Findings contribute to the design of safer and more reliable rock salt caverns for large scale energy storage, supporting the energy transition.

**M.S. Petroleum Engineering China University of Petroleum, Beijing Sep 2018-June 2021**

- Thesis topic: Experimental and numerical investigation of hydraulic fracture initiation and propagation in deep coal measure shale reservoir
- Average score: 88.8/100 Rank: 3/60

**B.S. Petroleum Engineering Yangtze University, Wuhan Sep 2014-Jun 2018**

- Average score: 87.4/100 Rank: 20/148

## SKILLS

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<b>Language</b>	English: fluent, Chinese: mother tongue
<b>Software</b>	MATLAB, Fortran (programming); ABAQUS, COMSOL (geomechanics, multiphysics); SolidWorks, Avizo (image processing)

## RESEARCH EXPERTISE

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<b>Rock Mechanics</b>	UCS; Triaxial compression; Direct shear box; Brazilian Disc; Fracture toughness test
<b>Hydrodynamics</b>	Flow-through visualization experiments; Transport- reactive flow processes
<b>Porous Media</b>	Fracture model conceptualization; Permeability and porosity measurement
<b>Numerical Simulation</b>	Finite element method; Cohesive zone model; HMC coupled simulation

## ACADEMIC WORKS

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### Journal articles

1. Fu, S., David F. Bruhn., Dieudonné, A. C., Kai. L., Pluymakers, A.M., (2025). Visualization and quantification of dissolution and transport processes in rock salt channels. *Geoenergy Science and Engineering* (Submitted).
2. Fu, S., David F. Bruhn., Dieudonné, A. C., Kai. L., Pluymakers, A.M., (2025). Fracture healing and surface roughness evolution in rock salt. *rock mechanics and rock engineering* (Submitted).
3. Fu, S., Pluymakers, A.M., David F. Bruhn., Dieudonné, A. C., (2025). Analysis of rock salt healing within a cohesive zone modelling framework (In preparation)

4. Tan, P., Chen, Z., Fu, S. and Zhao, Q., (2023). Experimental investigation on fracture growth for integrated hydraulic fracturing in multiple gas bearing formations. *Geoenergy Science and Engineering*, 231, p.212316. <https://doi.org/10.1016/j.geoen.2023.212316>.
5. Fu, S., Hou, B., Xia, Y., Chen, M., Wang, S. and Tan, P., (2022). The study of hydraulic fracture height growth in coal measure shale strata with complex geologic characteristics. *Journal of Petroleum Science and Engineering*, 211, p.110164. <https://doi.org/10.1016/j.petrol.2022.110164>.

## Conference proceedings

1. Fu, S., Dieudonné, A. C., Bruhn, D. F., Pluymakers, A. M. (2025). Experimental study on the shear strength recovery of healed rock salt fractures. *Deep Geo-Energy conference*, Conference presentation, Beijing, China.
2. Fu, S., Dieudonné, A. C., Bruhn, D. F., Pluymakers, A. M. (2025). Shear strength recovery of rock salt fractures following healing process. *8th International Conference on Coupled THMC Processes*, Conference presentation, Nicosia, Cyprus.
3. Fu, S., Dieudonné, A. C., Bruhn, D. F., Kai, L., Pluymakers, A. M. (2025). Healing behaviour of rock salt fractures with varying surface roughness. *SaltMech XI*, Poster presentation (online), New Mexico, United States.
4. Fu, S., Kai, L., Dieudonné, A. C., Bruhn, D. F., Pluymakers, A. M. (2025). Visualization and quantification of dissolution and transport processes in rock salt channels. *NAC Conference*, Conference presentation, The Netherlands.
5. Fu, S., Dieudonné, A. C., Bruhn, D. F., Kai, L., Pluymakers, A. M. (2024). Experimental research on the dissolution and transport process in a rock salt fracture. *15th Euroconference on Rock Physics and Rock Mechanics*, Conference presentation, The Netherlands.
6. Fu, S., Dieudonné, A. C., Bruhn, D. F., Kai, L., Pluymakers, A. M. (2022). Interplay between flow and dissolution under stress in rock salt. *SaltMech X*, Poster presentation, The Netherlands.
7. Fu, S., Chen, M., Xia, Y., Zhou, S. and Qiu, X., (2021) Experimental investigation on fracture propagation for vertical well fracturing in coalbed and shale interbedded reservoir. In *ARMA US Rock Mechanics/Geomechanics Symposium*, (pp. ARMA-2021). ARMA.

## PROJECTS

### Study of Sealing and Healing Behaviour of Rock Salt Fractures

PhD, Sep 2021-Present

Research funded by the Chinese Scholarship Council for Doctoral Education (Grant No. 202106440022) and the Cementegrity Project under the ACT program (Accelerating CCS Technologies) through the Horizon 2020 framework (Grant No. 691712).

- Designed and conducted flow-through experiments to study how fluid concentration, flow rate, and initial geometry influence the transition between diffusion- and advection-dominated regimes in rock salt fracture dissolution. Used Matlab and Avizo for image processing, MeshLab and SolidWorks for surface extraction, and COMSOL for reactive-transport simulation.
- Conducted long-term healing experiments (up to one year) of rock salt fractures, followed by direct shear to evaluate shear strength recovery, with a focus on internal friction angle and stick-slip behaviour. Used microscopy to examine microstructural evolution before and after healing.
- Extended an elastic-plastic constitutive model incorporating the healing behaviour of rock salt fractures, implemented through user-defined Fortran subroutines in ABAQUS for simulation.

### Fracture Initiation and Propagation Geometry in Coal Measure Shale Reservoir, Longtan Formation, Sichuan Basin

Master, Dec 2018 – Jan 2021

Research supported by the project "Fracture Propagation Mechanism of Complex Coal-Bearing Shales" funded by the National Natural Science Foundation of China (NSFC), Grant No. 51904318.

- Tested the mechanical properties of various lithological rocks using GCTS equipment, and characterized vertical variations in lithology, in-situ stress, and mechanical parameters.
- Investigated fracture propagation in coal measure shale using true triaxial fracturing experiments on  $30 \times 30 \times 30$  cm samples, focusing on the influence of interlayer in-situ stress differences on fracture geometry.
- Developed a three-dimensional hydraulic fracture model in Abaqus, incorporating geological features through a coupled seepage–stress–damage approach using a Cohesive Zone Model.

## TEACHING EXPERIENCE

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**Co-supervisor, TU Delft, Faculty of Civil and Geosciences** 2025

Supervised undergraduate experiments and provided guidance on lab reports and course papers

**Teaching Assistant, TU Delft, Faculty of Civil and Geosciences** 2022–2024

Assisted in undergraduate laboratory sessions

**Organising Committee Member, EUROCONF23 (The Netherlands)** 2023

Contributed to planning and coordination of conference activities.

## AWARDS

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**Chinese Scholarship for Doctoral Education, China** 2021–2025

Total amount awarded: € 96,000

**Scholarship granted by China University of Petroleum, Beijing** 2018 / 2019 / 2020

Awarded annually: € 2,000 /year

**China National Scholarship for Postgraduates** Oct. 2020

Total amount award: € 3,000

## REFERENCES

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**Prof. dr. David Bruhn**

Faculty of Civil Engineering and Geosciences, TU Delft

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