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Title:	Self-presentation during a visit to the University of Wisconsin-Madison as a potential PhD student
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Fractured Earth Lab
Los Alamos National Laboratory

March 22, 2024

Education & Experience

- 2013-2017: BEng in Civil Engineering, Nazarbayev University
- Summer, 2016: The University of Illinois at Urbana-Champaign, IL
- 2017-2019: MSc in Mining Engineering, Nazarbayev University
- 08.2019-01.2020: Geotechnical Engineer at Zhairem Mining & Concentrating Complex, Kazakhstan
- 02.2020-11.2022: Research assistant in the School of Mining & Geosciences, Nazarbayev University

NAZARBAYEV UNIVERSITY

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

During student years…

August – November 2015	Engineering supervision assistant
Nov 2015 – May 2016	Research assistant
March – May 2016	Technical manager assistant
June -September 2017	Protocol officer at EXPO-2017
May – June 2018	Mining engineering intern
July 2018	Summer school in China
August – December 2018	Research assistant
February 2019	ISFiT, Norway
July 2019	Summer school in Germany

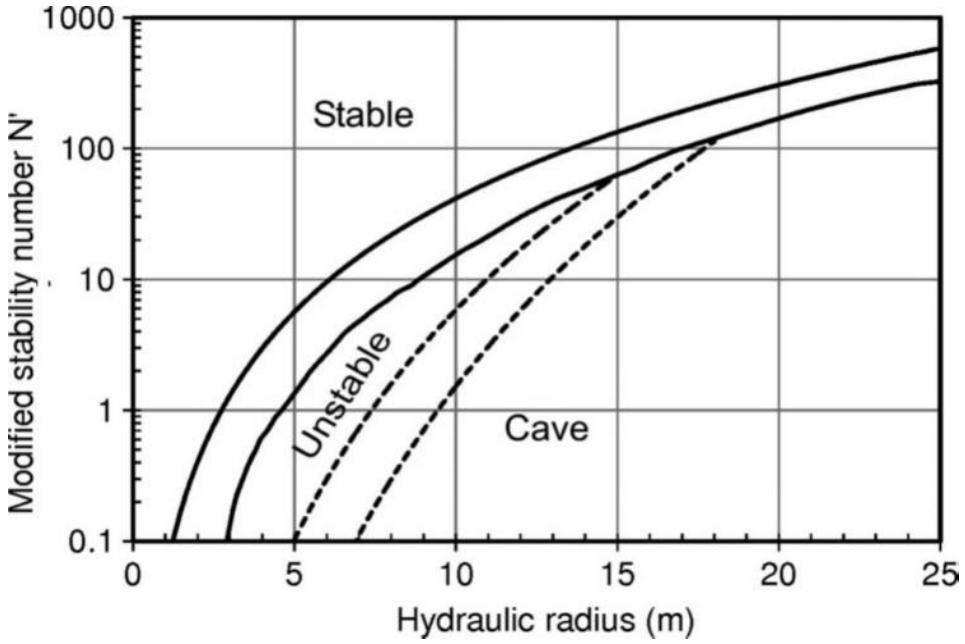
Research experience

Research projects	
Nov 2015 – May 2016	Investigation on soil-pipe interaction in conjunction with Oxford, Cambridge Universities, and Nazarbayev University
August -December 2018	Empirical stope design in Kazakhstan underground mines: improving the Mathews stability graph method
February – June 2020	Multivariate Mapping of Geometallurgical Variables with Complex Cross-Correlation Characteristics
July 2020 – November 2022	1. Development of an automated smart open stope design tool 2. Application of machine learning techniques for open stope stability assessment 3. Design of unconventional underground mine pillars
December 2022 – present	Shear fracture caging

Research interests:

- Experiments and numerical modeling of shear fracture caging
- Triaxial direct-shear tests to measure fracture hydro-thermo-mechanical properties
- Induced seismicity, rockbursts, earthquakes, AE

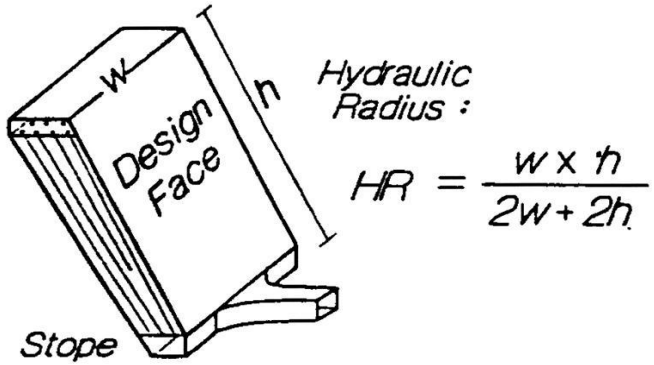
The Stability Graph for Open Stope Design



$$N' = Q' \times A \times B \times C$$

$$Q' = \frac{RQD}{J_n} \times \frac{J_r}{J_a}$$

$$HR = \frac{Area}{Perimter}$$

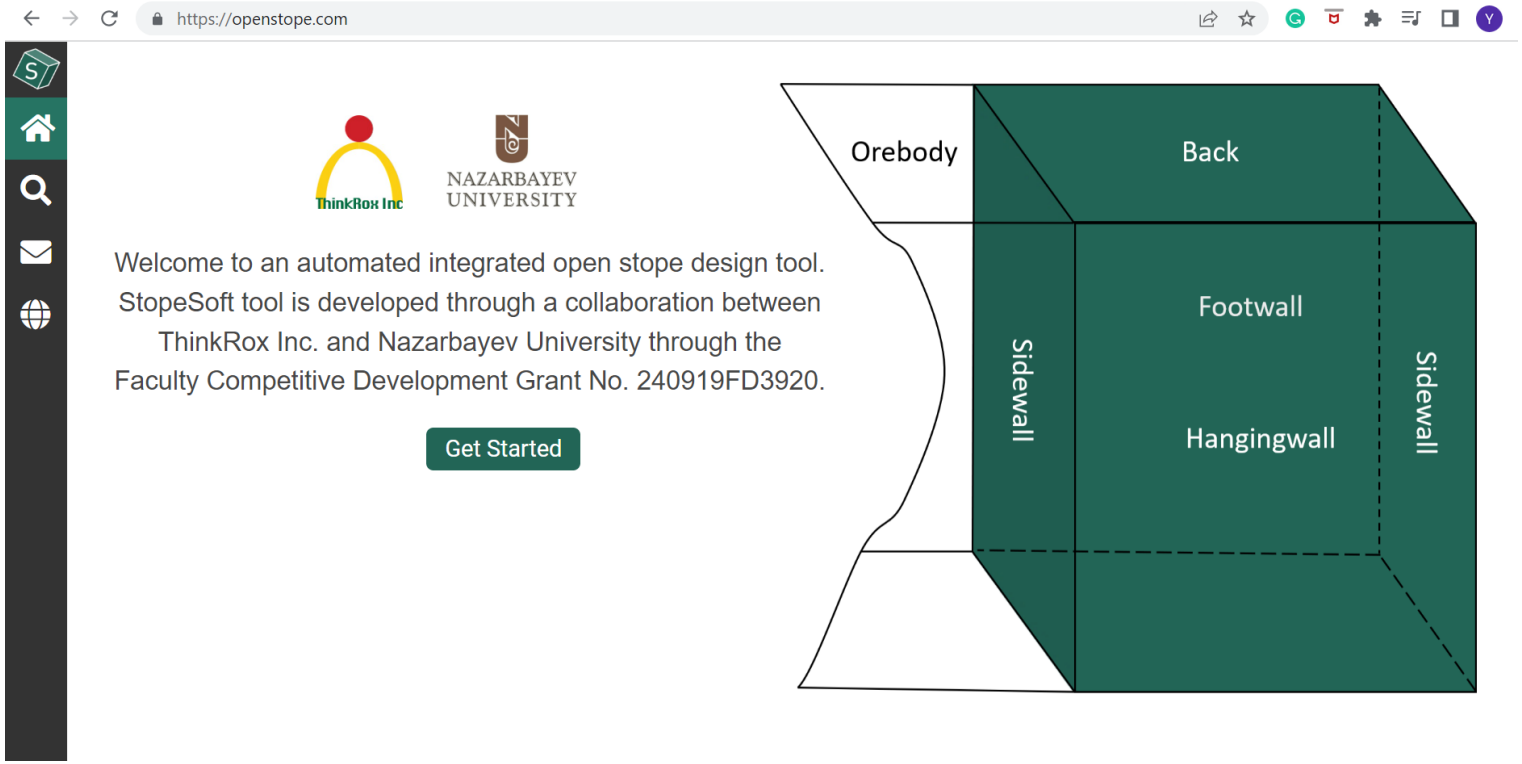


N' – Modified Stability Number
HR – Hydraulic Radius
Q' – Modified tunneling quality index
RQD – Rock Quality Designation
Jn – Joint set number
Jr – Joint roughness number
Ja – Joint alteration number
A – Stress factor
B – Joint defect factor
C – Gravity factor

An automated web-based tool for open stope stability prediction

- Can be explored at openstope.com.

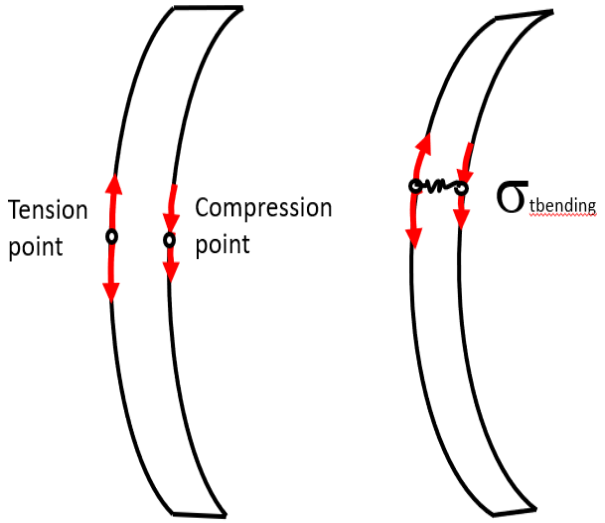
- Key features include:
  - Stability prediction of all stope surfaces
  - Probabilistic stability prediction of open stopes
  - Incorporation of the stability graph variations
  - Inclusion of fault factor and time factor
  - Stress and sensitivity analyses
  - Case history data sharing



Unconventional Underground Mine Pillars: Tall Pillars

	Squat pillar	Intermediate pillar	Slender pillar	Tall pillar
W/H	>10	4 – 10	4 – 0.2	0.125 – 0.17
H/W	> 0.1	0.1 – 0.25	0.25 – 5	6 – 8

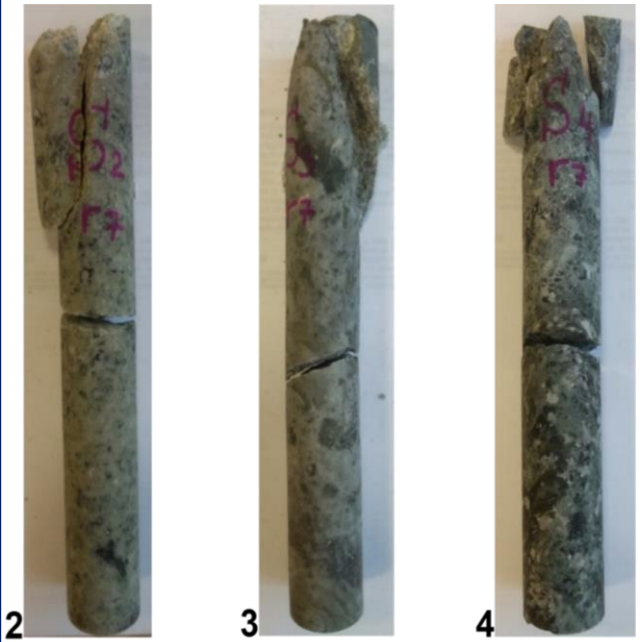
Failure mechanism



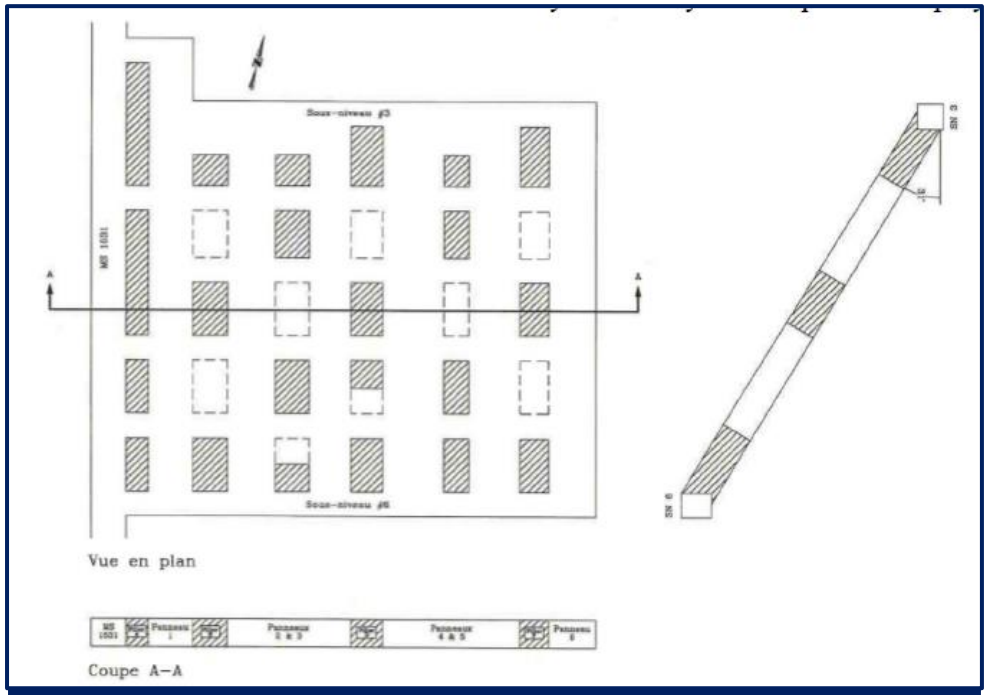
Underground mine pillars with h/w ≥ 6 fails in tension by bending

Experiment

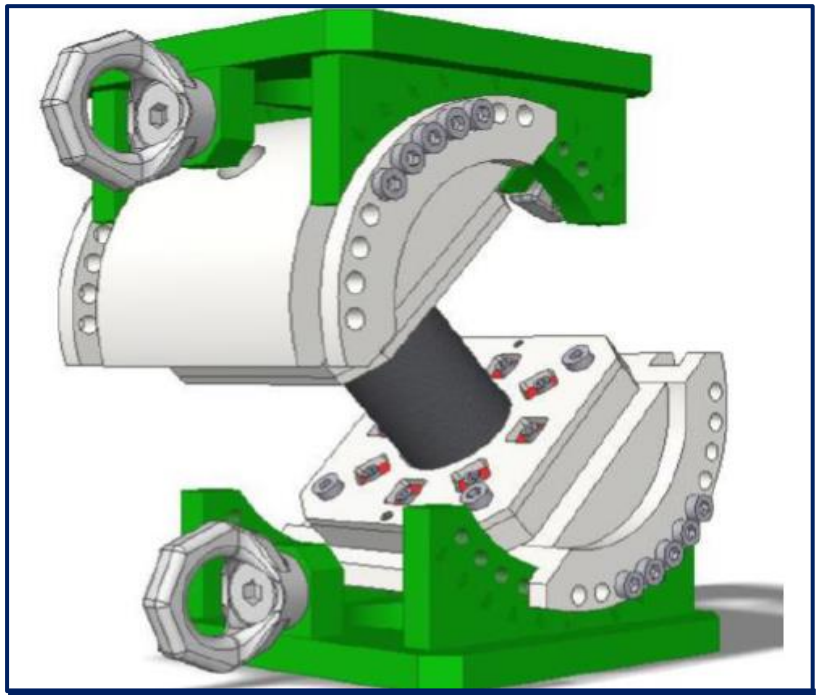
Results



Unconventional Underground Mine Pillars: Inclined Pillars



Francoeur room-and-pillar gold mine in Quebec showing how inclined pillars were used (Suorineni and Vasak, 2011).



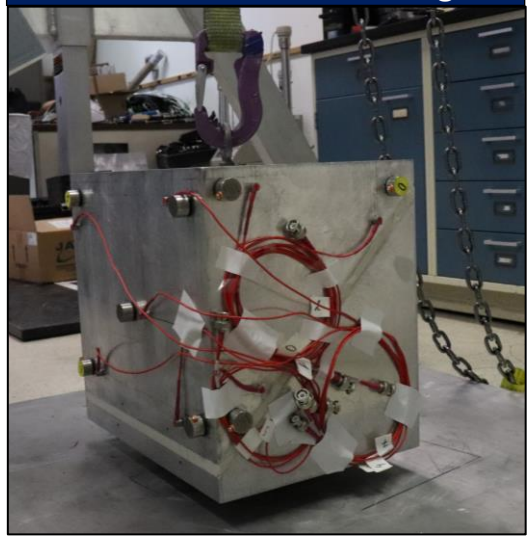
Combined compression & shear test – C-CAST system. The inclined angle ranges from 0º to 45º.

Rock sample testing at 25 º inclination using C-CAST system.

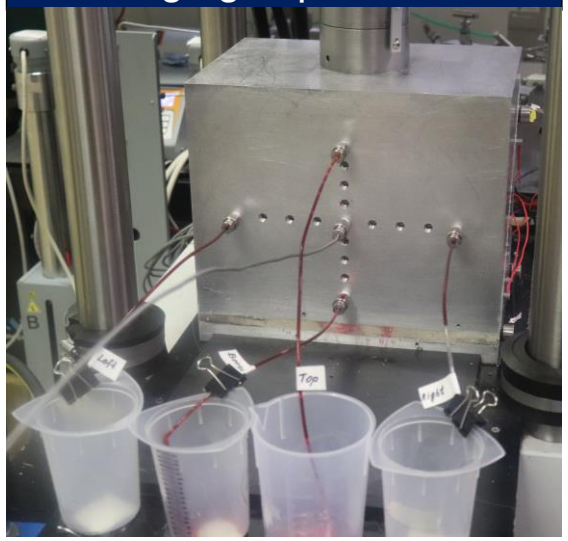
Shear Fracture Caging Experiments at LANL

Sample prep process

Shear block hoisting



Caging experiment

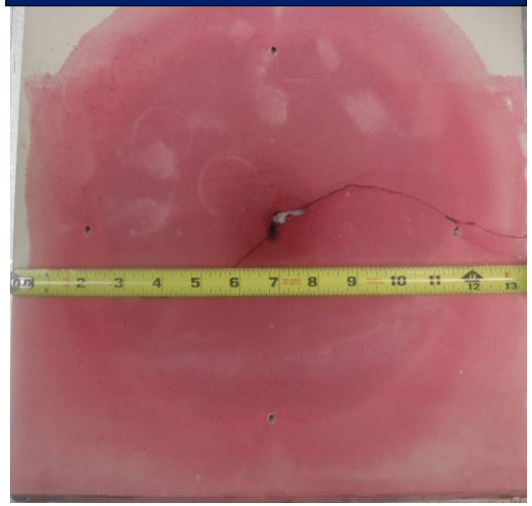


Sheared block

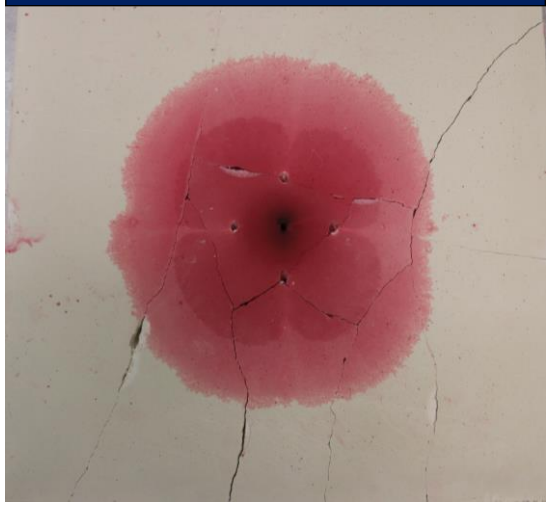
Top block with injection well

Bottom block

Partially caged fracture



Fully caged fracture



Peer-reviewed journal & conference proceeding publications

- Kalmurzayev, K., & Madenova, Y. (2023). Ground Penetrating Radar Application to Detect the Watertight Clay Layer at Tailing Dump. Mining, Metallurgy & Exploration, 40(1), 337-345. doi.org/10.1007/s42461-023-00731-3.
- Madenova, Y., & Madani, N. (2021). Application of Gaussian Mixture Model and Geostatistical Co-simulation for Resource Modeling of Geometallurgical Variables. Natural Resources Research, 30(2), 1199-1228. doi.org/10.1007/s11053-020-09802-4.
- Madenova, Y. & Suorineni, F. (2020). On the question of original versus modified stability graph factors – a critical evaluation. Journal of Mining Technology. Published online: 03 February 2020. doi.org/10.1080/25726668.2020.1721996.

- Madenova, Y., Suorineni, F. T. & Xu, S. (October 2023). Automated and digitized web tool for open stope design. *In: Proceedings of the ISRM 15th International Congress on Rock Mechanics and Rock Engineering & 72nd Geomechanics Colloquium. Schubert, W. & Kluckner, A. (eds)*, Salzburg, Austria.
- Madenova, Y., Suorineni, F. T., & Mukhamedyarova, Z. (June 2023). Seismic source wave propagation analysis using laboratory AE monitoring system. *In*: *57th US Rock Mechanics / Geomechanics Symposium*. Atlanta, Georgia, USA.
- Madenova, Y., Suorineni, F. T., & Mukhamedyarova, Z. (June 2023). Effects of fractures on seismic wave propagation path: laboratory studies. AE monitoring system. *In:57th US Rock Mechanics / Geomechanics Symposium*. Atlanta, Georgia, USA.
- Suorineni, F. and Madenova, Y. (June 2022). The Qualitative Stability Graph for Open Stope Design – Recent Developments. *In: 56th US Rock Mechanics / Geomechanics Symposium*. Santa Fe, New Mexico, USA.
- Madenova, Y. and Suorineni, F. (May 2022). Open Stope Stability State Classification using Artificial Intelligence Techniques". *In*: *CIM 2022 Convention*. Vancouver, Canada.
- Madenova, Y. and Suorineni, F. (February 2022). Novel approach to the design of unconventional underground mine pillars. *Online International Symposium* held by Akita University, Japan.

Hobbies

- Reading books (*The Martian* by Andy Weir)
- Qigong
- Salsa
- Running
- Swimming
- Hiking
- Hot springs
- Climbing
- Also, would love to learn Japanese and Spanish as well as playing a guitar