

MIT EARTH RESOURCES LABORATORY
ANNUAL FOUNDING MEMBERS MEETING 2019



Student and Postdoc Introductions

Chen Gu

Current Students and Postdocs



STUDENTS

Al Nasser, Saleh
Al-Dajani, Omar
Aladwani, Mohammad
Alali, Ammar
Alghannam, Maryam Ali A
Alves da Silva, Josimar
Arzuaga García, Ignacio
Beaucé, Eric
Bolotskaya, Ekaterina
Chui, Jane
Clancy, Julien
de Saussure, Arabelle
Dwivedi, Aarti
Ely, Gregory
Florez Torres, Manuel
Golos, Eva
Jung, Na-Hyun (Ella)

STUDENTS

Kang, Hao
Li, Matthew T.C.
Li, Qiuyi Bing
Li, Wei
Mao, Shujuan
Matchette-Downes, Harry
Mighani, Saied
Montgomery, Justin B.
Pahlavan, Amir
Primkulov, Bauyrzhan
Ranganathan, Meghana
Raymond, Samuel
Rodríguez-Buño, Mariana
Salo, Lluís
Sun, Hongyu
Tyukhova, Alina
Togaibekov, Anuar
Yoon, Seonkyoo

POSTDOCS

Bharadwaj, Pawan
Fang, Hongjian
Fang, Zhilong
Gu, Chen
Haghighat, Ehsan
Mordret, Aurélien
Mukuhira, Yusuke
Rongier, Guillaume
Rude, Cody
Taus, Matthias
Trojer, Mathias
Villamor Lora, Rafael
Wang, Hua
Yang, Zhibing
Zhang, Chenguang

Current Students and Postdocs



Uncertainty &
Inversion

Imaging

Multi-phase
flow

Rock Physics
& Chemistry

Geomechanics



Recent Alumni

William Frank	Assistant Professor at the University of Southern California
Xiaojing Fu	Postdoc at Berkeley
Bruno Goncalves da Silva	Assistant Professor at New Jersey Institute of Technology
Niels Grobbe	Assistant Researcher at the University of Hawaii at Manoa
Elita Li	Assistant Professor at the National University of Singapore
Omid Moradian	Senior Research Associate and Lecturer at ETH Zurich
Saied Mighani	Postdoc at Stanford University
Stephen Morgan	Works at ExxonMobil
Anna Rogers	Geophysicist at Shell
Yuval Tal	Postdoc at CalTech
Haoyue Wang	Senior software engineer at Google
Bram Willemsen	Works at ExxonMobil
Elezhan Zhakiya	Working for a startup
Chunquan Yu	Associate Professor at the Southern University of Science and Technology

Recent Alumni on Google Map



SEG J. Clarence Karcher Award



- 2019 Xinding Fang
- 2018 Yunyue Elita Li
- 2015 Yingcai Zheng
- 2012 Alison E. Malcolm

Lubna Albarghouty

PhD student working with Prof. Morgan & Prof. Pěc
M.Sc, MIT, 2017
B.Sc, UT Austin, 2013

CURRENT RESEARCH INTERESTS

- **GEOLOGICAL CO₂ STORAGE:**
- **EFFECT OF CARBONATE MINERALIZATION ON BRITTLE CREEP AND PERMEABILITY IN BASALTS**



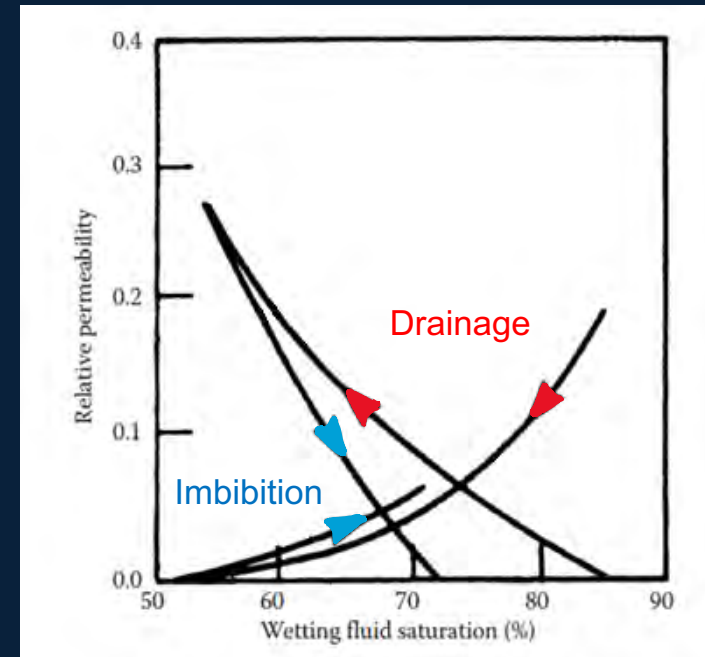
10 mm

(Image by Ali Seiphoori)



PAST RESEARCH INTERESTS

- **TWO-PHASE FLUID FLOW MODELING**



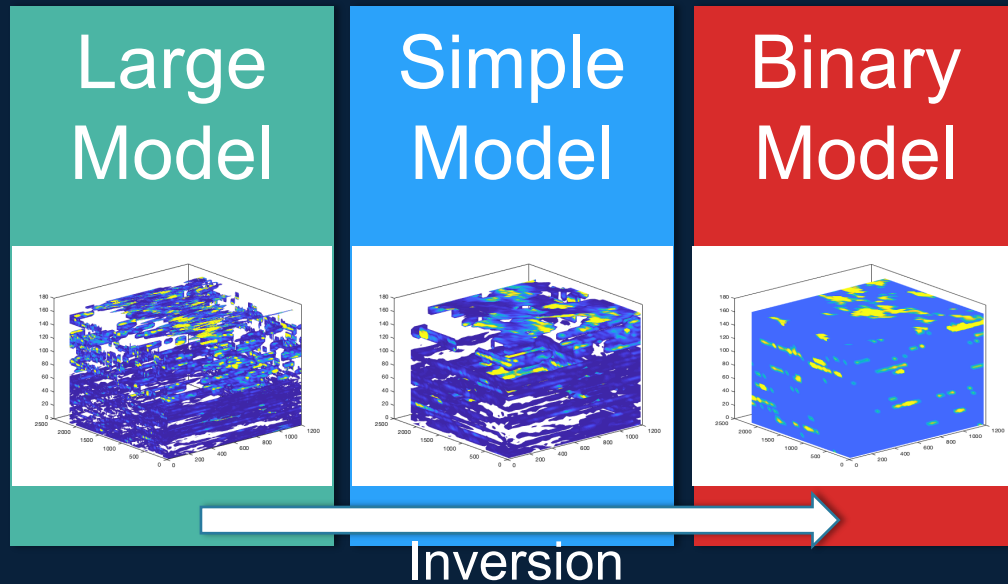
(Modified from Multiphase Flow Handbook, 2016)

Saleh AI Nasser

PhD Student working with Prof. Frank Dale Morgan
MSc, MIT, 2016
BSc, Leeds University

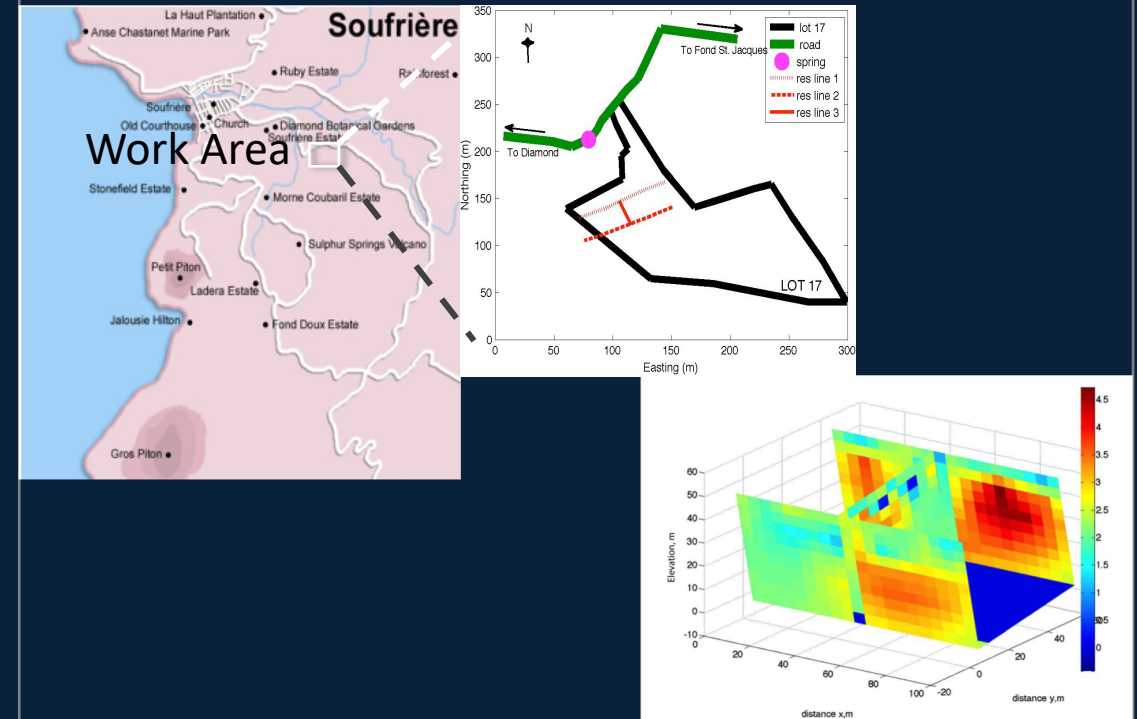
CURRENT RESEARCH INTERESTS

REDUCING COMPLEXITY OF FLUID-FLOW MODEL



PAST RESEARCH INTERESTS

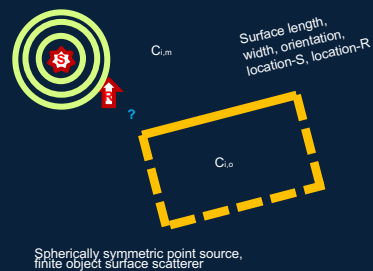
INVESTIGATIONS INTO GROUNDWATER FLOW



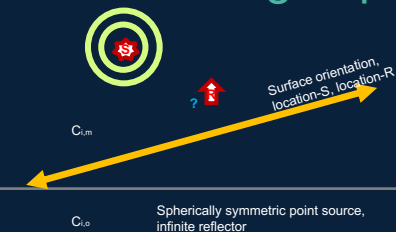
Samiya A. Alkhairy

DETERMINING & UTILIZING FREQUENCY-DEPENDENCE OF SCATTERED SEISMIC SIGNALS FOR FINITE OBJECTS

- Conventional scatterer theory has limitations
- Determine frequency and parameter conditions for conventional scatterer theory
- Develop *frequency-dependent* theory to account for conventional scatterers and also handle finite objects (less idealized)

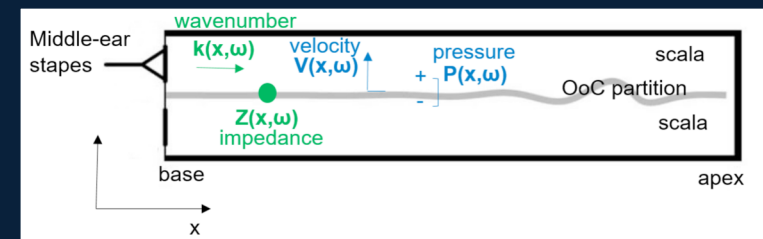


- Analytic modeling, numerical testing
- May be useful for determining depth and dip angle of layer

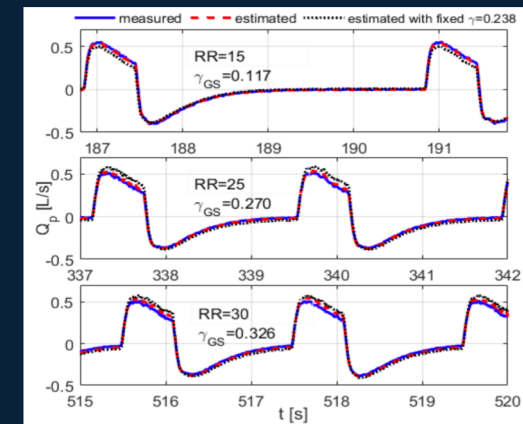


ANALYTIC MODELING AND MODEL-BASED ESTIMATION AND CHARACTERIZATION OF TRANSPORT SYSTEMS

- Analytic model of the cochlea and functional interpretations



- Model-based estimation of respiratory-ventilator parameters and latent variables



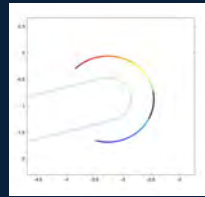
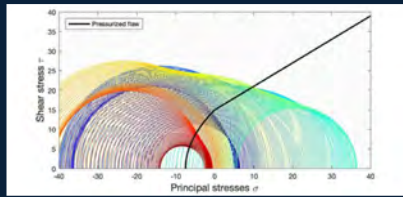
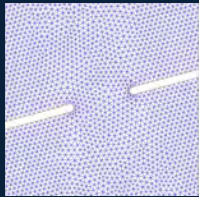
Michela CASANOVA

Visitor Research Student,
working with Prof. H.H. Einstein
BSc, EPFL, 2017

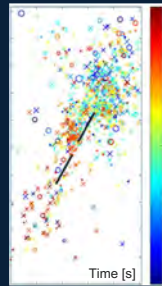
CURRENT RESEARCH INTERESTS

HYDRO-SHEARING IN BARRE GRANITE

Numerical Study



Laboratory Study



Acoustic Emissions

Crack Paths

PAST RESEARCH INTERESTS

SEMESTER PROJECTS AT EPFL



In The Swiss Construction Industry

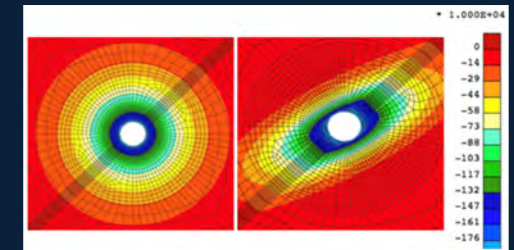
..in Swiss Engineering Consulting Firms

Risk Management..

Geotechnics

Compilation of Frictional Studies in Granite

Tunneling in Fault Zones

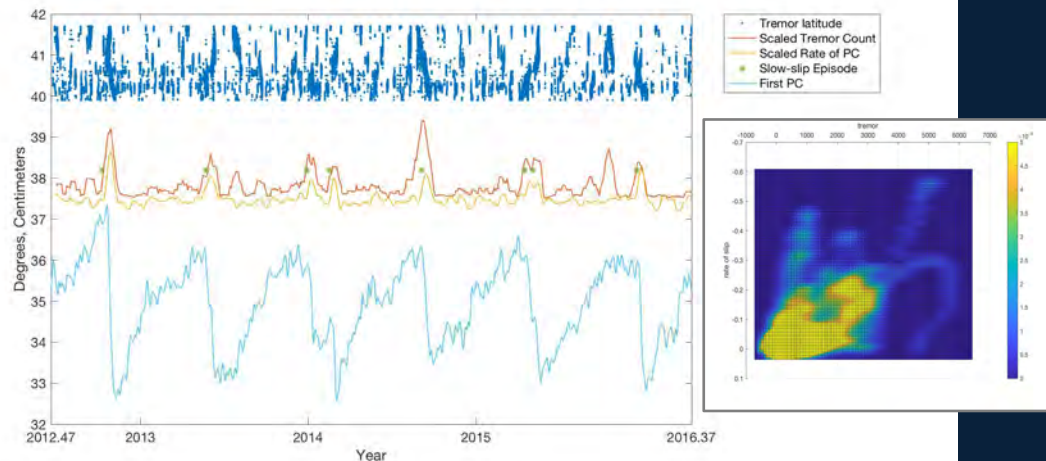


Aarti Dwivedi

Grad Student working with Prof. Herring
Integrated M.Tech Geophysics, IIT Roorkee,
2016

CURRENT RESEARCH INTERESTS

1. SLOW-SLIP EVENTS IN NORTHERN CALIFORNIA.
2. INSIGHTS INTO THE RELATIONSHIP BETWEEN GPS AND TREMOR IN NORTHERN CALIFORNIA USING MACHINE LEARNING



PAST RESEARCH INTERESTS

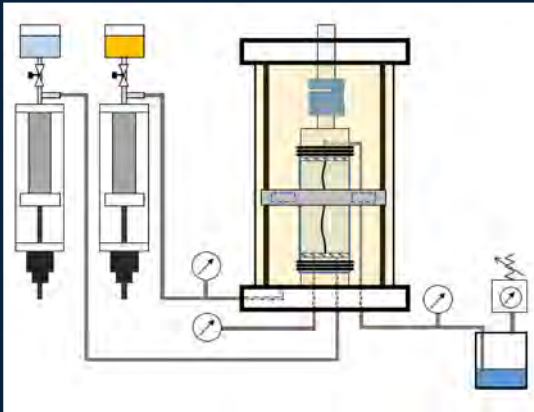
1. INTELLIGENT SEGMENTATION ALGORITHM FOR THIN SECTIONS, CATALYST IMAGES, CORROSION ANALYSIS.
2. INVERSION OF EM DATA USING IMMERSSED INTERFACE METHOD
3. CRUSTAL DEFORMATION OF ANTARCTICA
4. CHARACTERIZATION OF TSUNAMIGENIC SOURCES USING REAL TIME WATER LEVEL INVERSION

Hao Kang

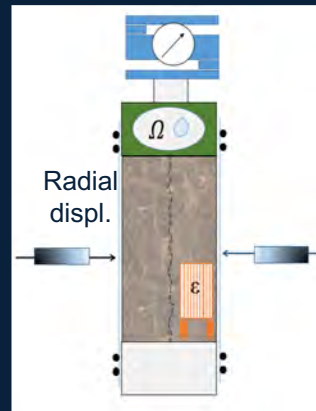
PhD Candidate working with Prof. Herbert Einstein
 MSc. MIT, 2016
 BSc. (Eng.), University of Hong Kong, 2014

FLUID FLOW IN ROCK FRACTURES

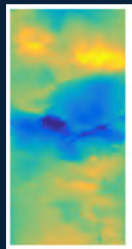
EXPERIMENT SCHEMATIC



EXPERIMENT SCHEMATIC

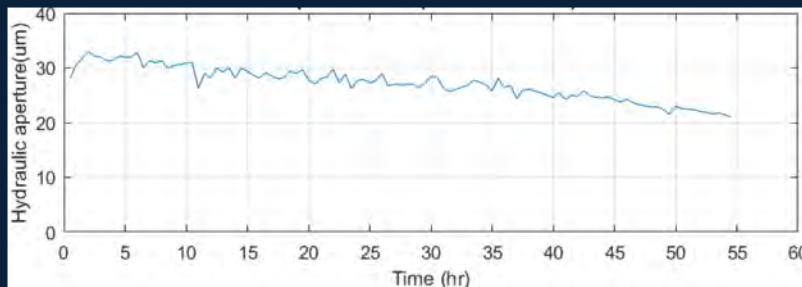


FRACTURE TOPOGRAPHY



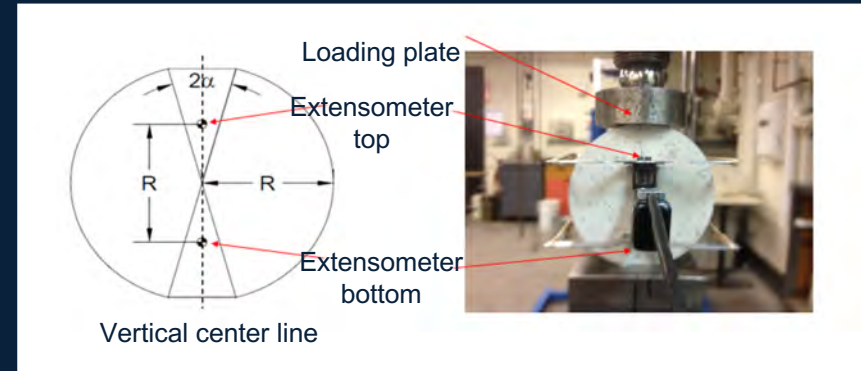
1 inch

CREEP OF HYDRAULIC APERTURE

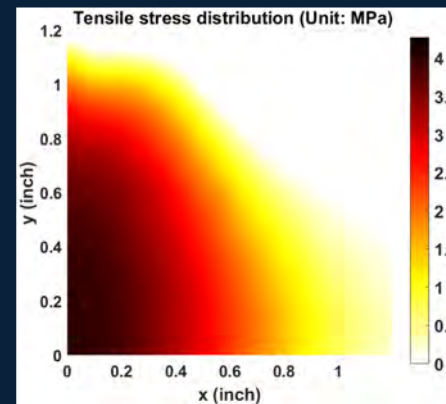


FRACTURE MECHANICS

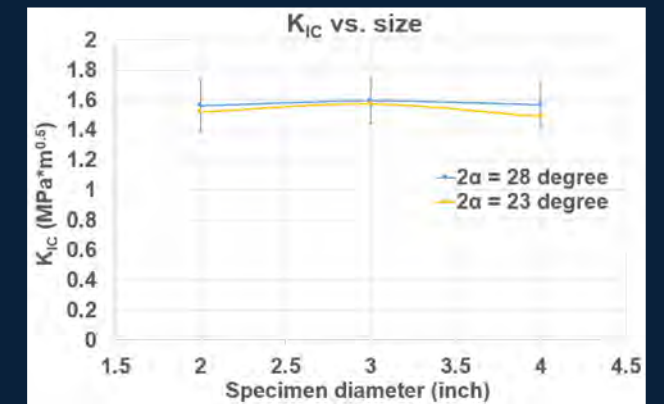
EXPERIMENT SCHEMATIC



STRESS DISTRIBUTION



FRACTURE TOUGHNESS VS. SIZE

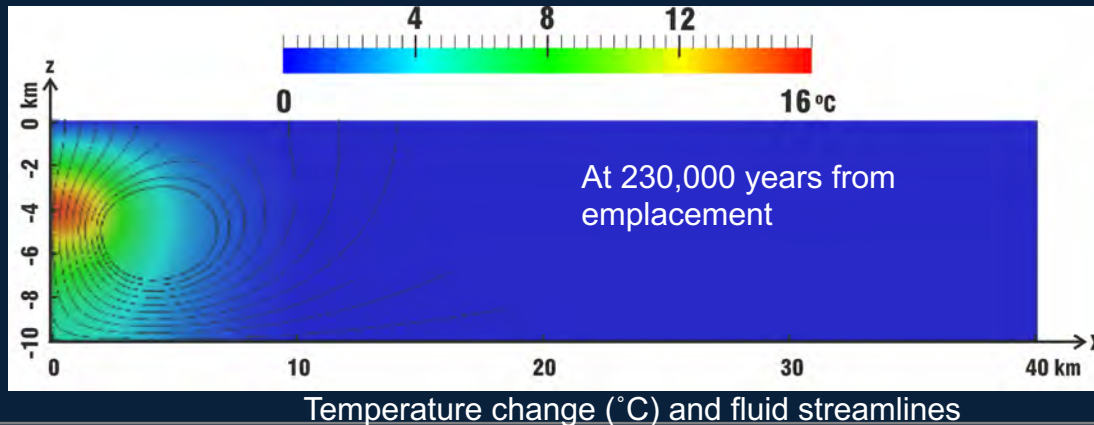
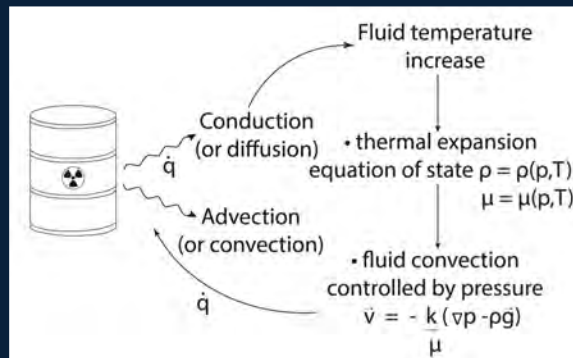


Mariana Rodríguez Buño

PhD Candidate working with Prof. Einstein
MSc., MIT, 2014
Civil Engineer

CURRENT RESEARCH INTERESTS

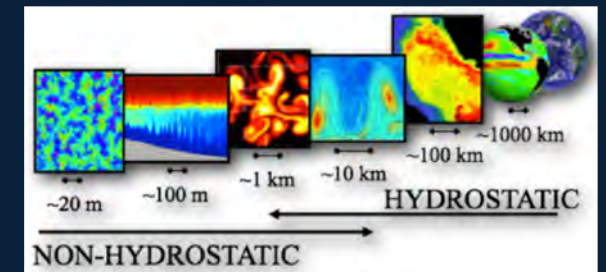
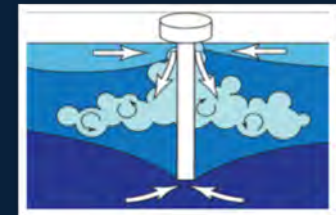
MODELING MULTIPHYSICS:
Thermal-hydraulic-mechanical response of high-level nuclear waste disposal in deep boreholes in granite



PAST RESEARCH INTERESTS

MODELING THE EXTERNAL FLUID MECHANICS OF OCEAN THERMAL ENERGY (OTEC) POWER PLANTS

OTEC plants produce renewable energy from the natural thermal gradient of the ocean



Anuar Togaibekov

Masters Student working with Professor Thomas Herring
MS in Geodesy, Kazakh National Technical University, 2013
BEng in Geodesy, Kazakh National Technical University, 2011

2007-2018:
43 GPS sites
3 GPS permanent stations
78 gravimetric/levelling sites



CURRENT RESEARCH INTERESTS

PROJECT AIMS:

- Characterize production-induced subsidence and uplift
- Geomechanical modeling of processes
- Other fields

DATA SETS:

- GPS (periodic and continuous)
- InSAR (Cosmos-SkyMed X band)
- Gravimetry
- Levelling
- Seismology

Chenguang Zhang

PDA working with Prof. Demanet
PhD from Louisiana State University, 2017
MS in Computer Science & MS in Physical
Oceanography

CURRENT RESEARCH INTERESTS

LARGE SCALE SCHEDULING PROBLEM IN OIL & GAS INDUSTRY

MIXED-INTEGER LINEAR/NONLINEAR PROGRAMMING & EFFICIENT SOLVERS

MACHINE LEARNING FOR OPTIMIZATION

POTENTIAL APPLICATIONS:

- OIL & GAS UP/DOWNSTREAM
- MANUFACTURING
- NETWORK OPTIMIZATION
- TRAFFIC OPTIMIZATION

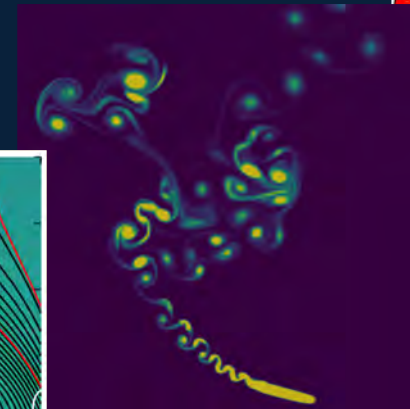
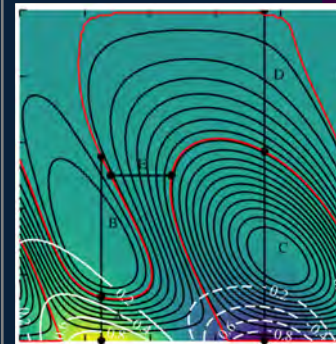
PAST RESEARCH INTERESTS

THEORETICAL FLUID DYNAMICS

COMPUTATIONAL FLUID DYNAMICS (ESP. IMMERSED BOUNDARY METHOD)

THERMALLY DRIVEN FLOW

PARTICLE-LADEN FLOW



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Earth
Resources
Laboratory

| **Thank you!**