PEA
PETROLEUM ENGINEERS ASSOCIATION

ACCREDITED

ISO 9001:2015

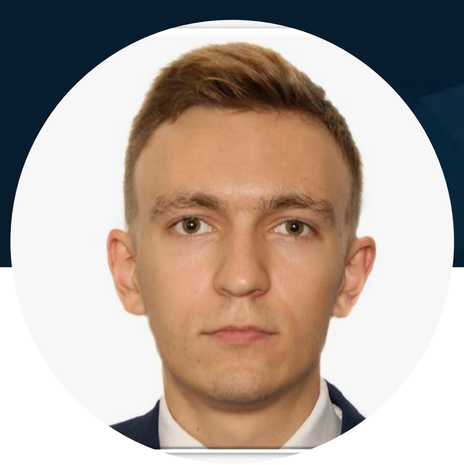
MICRO, SMALL & MEDIUM ENTERPRISES

10 DAYS ONLINE PRACTICAL TRAINING ON

APPLIED RESERVOIR GEOMECHANICS

MR. YAN YUSUPOV

10 Years Experience In
Reservoir Geomechanics



MR. YAROSLAV ZAGLYADIN

3 years Experience In
Reservoir Geomechanics

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ABOUT THIS TRAINING COURSE:

Designed for Absolute Beginners.

Geomechanics is for calculating the stress state, calibrating the profile of the minimum horizontal stress, estimation the mode and magnitude of the maximum horizontal stress

calculation of wellbore stability and risk assessment for the planned trajectory, estimation of modeling uncertainties

estimation of sand production rate; recommendations of maximum permissible pressures during drilling, bottomhole pressures during operation, etc., within the 1D geomechanical modeling

By end of the course participants will have an excellent knowledge of applied reservoir geomechanics

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SKILLS AND BENEFITS YOU WILL ACQUIRE

- Experience in Mechanical Earth Models from multidisciplinary data including rock elastic properties and stresses in 1D domains
- Estimation of rock mechanical properties from petrophysical logs and calibrate with core data
- Estimation of vertical stress, pore pressure, shear failure, losses and breakdown gradients, calibration on measurements in wells
- Analysis of the wellbore stability and calculation of a safe drilling window
- Wellbore trajectory optimization
- Sand production analysis
- Estimation of the depths of running casing shoes

WHAT YOU GET:

- Video Recordings on daily basis
- Study materials pdf
- Sample code files
- Companion data for the codes to work
- Certificate of Completion

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PRE REQUISITE:

- Zero Geomechanics Knowledge
- Basic knowledge of geology, physics and mechanics
- A working laptop

WHO CAN ATTEND:

- Reservoir Engineers
- Production engineers
- Chemical engineers
- Drilling engineers
- Geologists and petrophysics
- AL and workover engineers
- Undergraduate students

DURATION:

10 DAYS LONG (10 LECTURES | 3 HOURS PER LECTURE)

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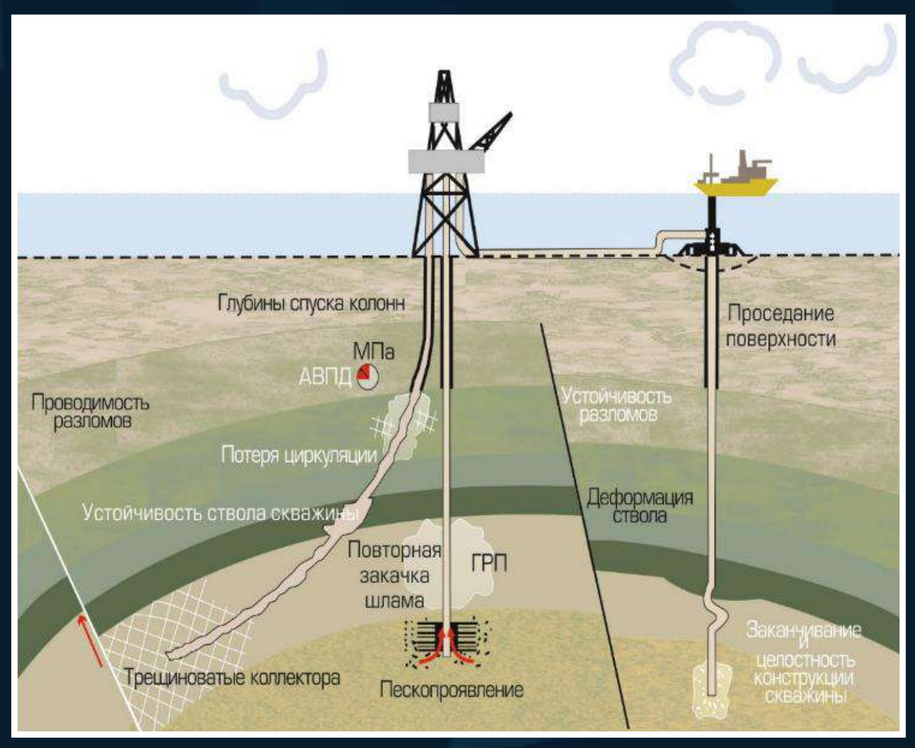
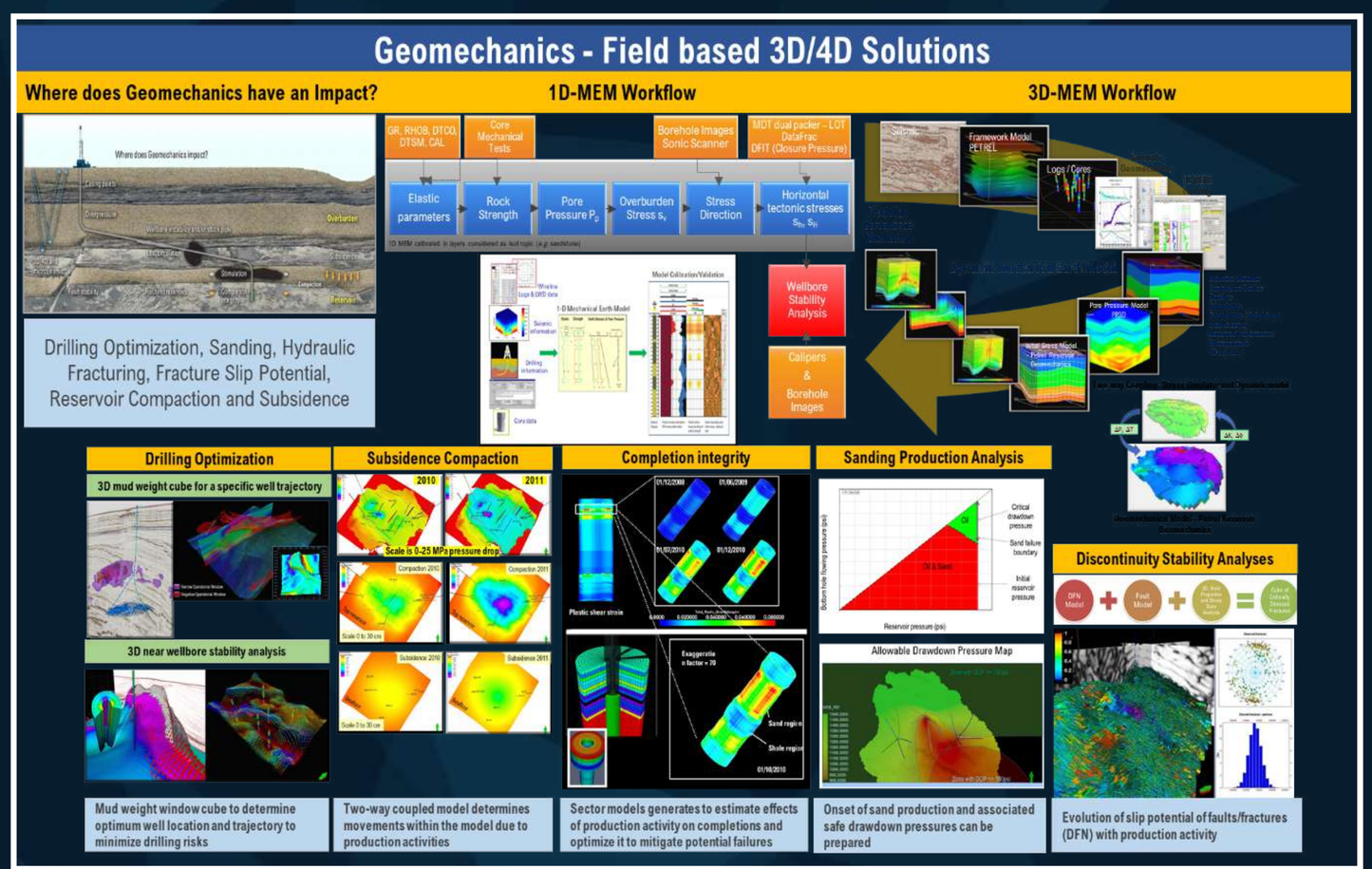
MODULE 1: INTRODUCTION TO GEOMECHANICS, CORE STUDIES, INITIAL DATA (1ST DAY)

- Input test
- Lectures:
  Geomechanical modeling: tasks, background, stages, reference data. Areas of use.
- The role of geomechanics in the search and development of oil and gas fields.
- A generalized process for creating a geomechanical model along wells (1D) and in region (3D – 4D).
- Examples of application of the calculation results of geomechanical models at different stages of the field life cycle.





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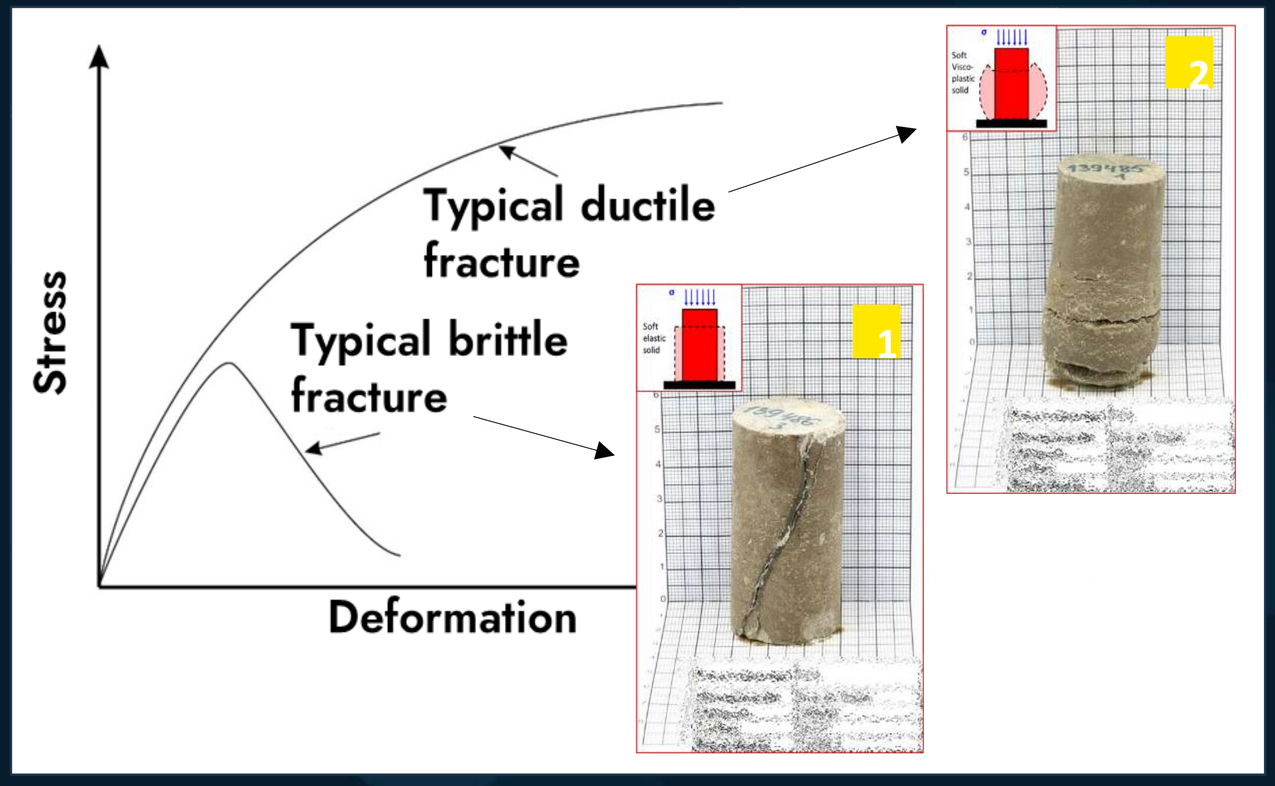
MODULE 1: INTRODUCTION TO GEOMECHANICS, CORE STUDIES, INITIAL DATA (2ND DAY)

Lectures

- Core, types of core studies (strains, Hooke's law, elastic moduli, tensile strength, fracture, fluidity, rock failure criteria, Mohr-Coulomb model, Biot coefficient, TWC test, correlation of mineral composition, texture, rock structure with mechanical properties



Tiab, Donaldson, 2009

Shubin, SPE, 2019

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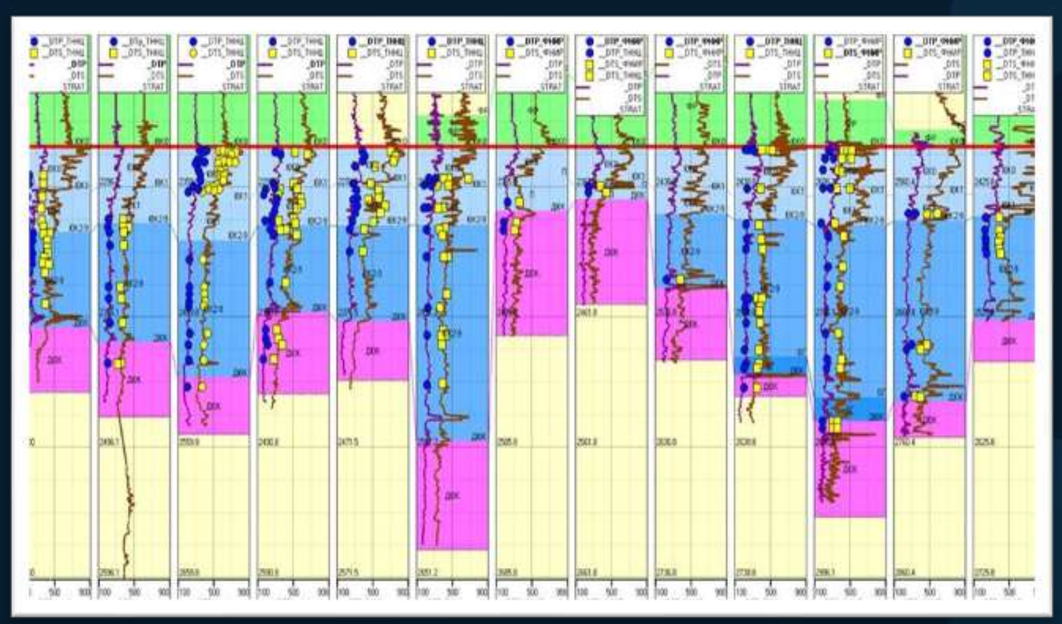
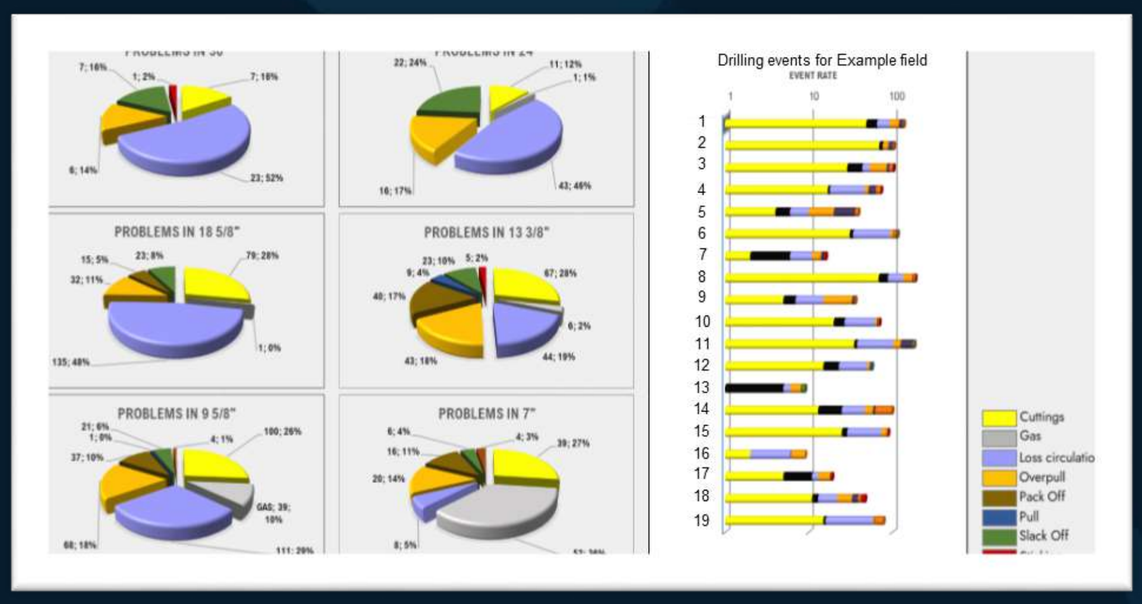
MODULE 1: INTRODUCTION TO GEOMECHANICS, CORE STUDIES, INITIAL DATA (3RD DAY)

Practice

Core, types of core studies (strains, Hooke's law, elastic moduli, tensile strength, fracture, fluidity, rock failure criteria, Mohr-Coulomb model, Biot coefficient, TWC test, correlation of mineral composition, texture, rock structure with mechanical properties





Lectures

- Analysis of initial data, issues, goals and objectives.
- Working with key data, hypothesis, analysis of potential uncertainties in calculations.
- Preparation of input for 1D modeling (synthesis, normalization, etc.).

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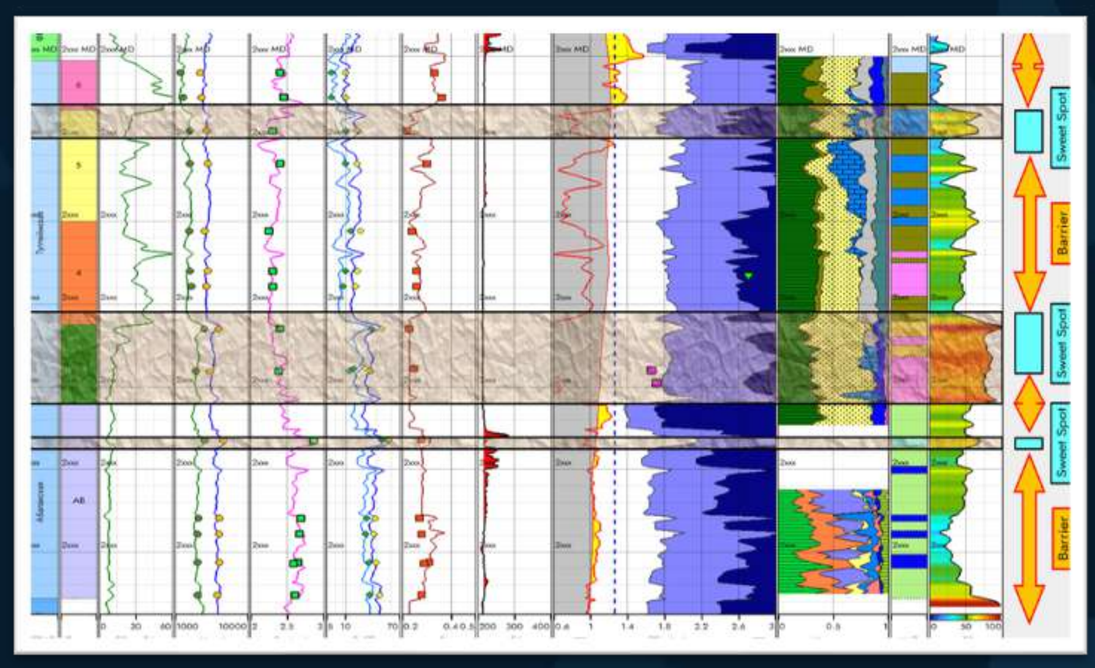
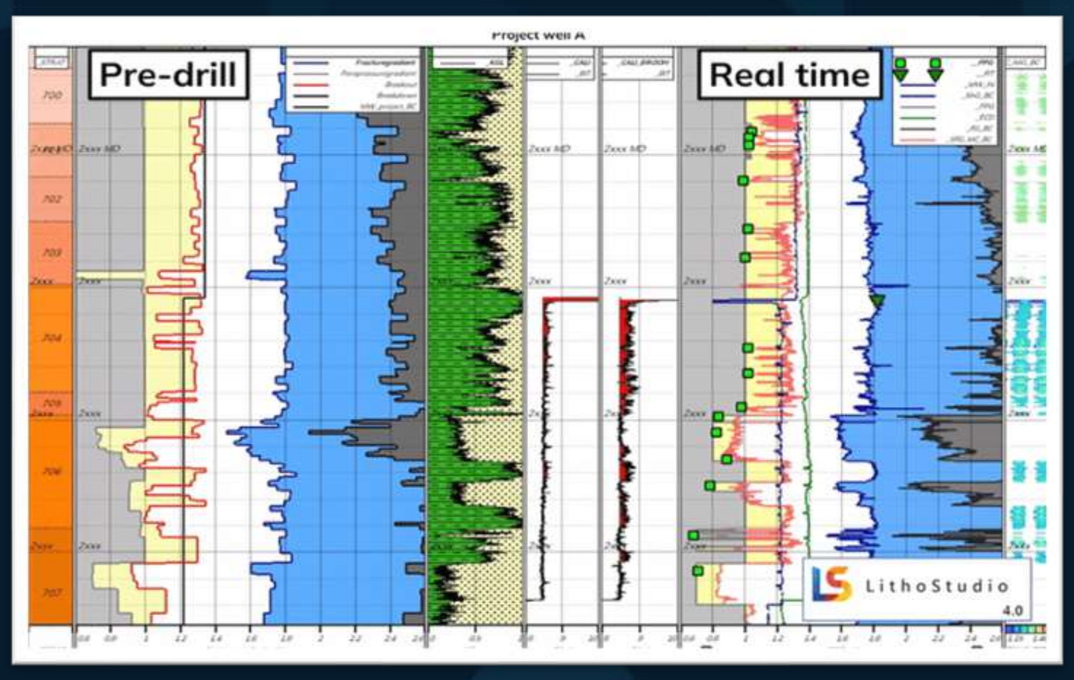
MODULE 1: INTRODUCTION TO GEOMECHANICS, CORE STUDIES, INITIAL DATA (4TH DAY)

Lectures

1D geomechanical model: description of standard graph construction and calibration





Practice

- Analysis of initial data, issues, goals and objectives
- Working with key data, hypothesis, analysis of potential uncertainties in calculations
- Preparation of input for 1D modeling (synthesis, normalization, etc.)
- 1D geomechanical model: description of standard graph construction and calibration.

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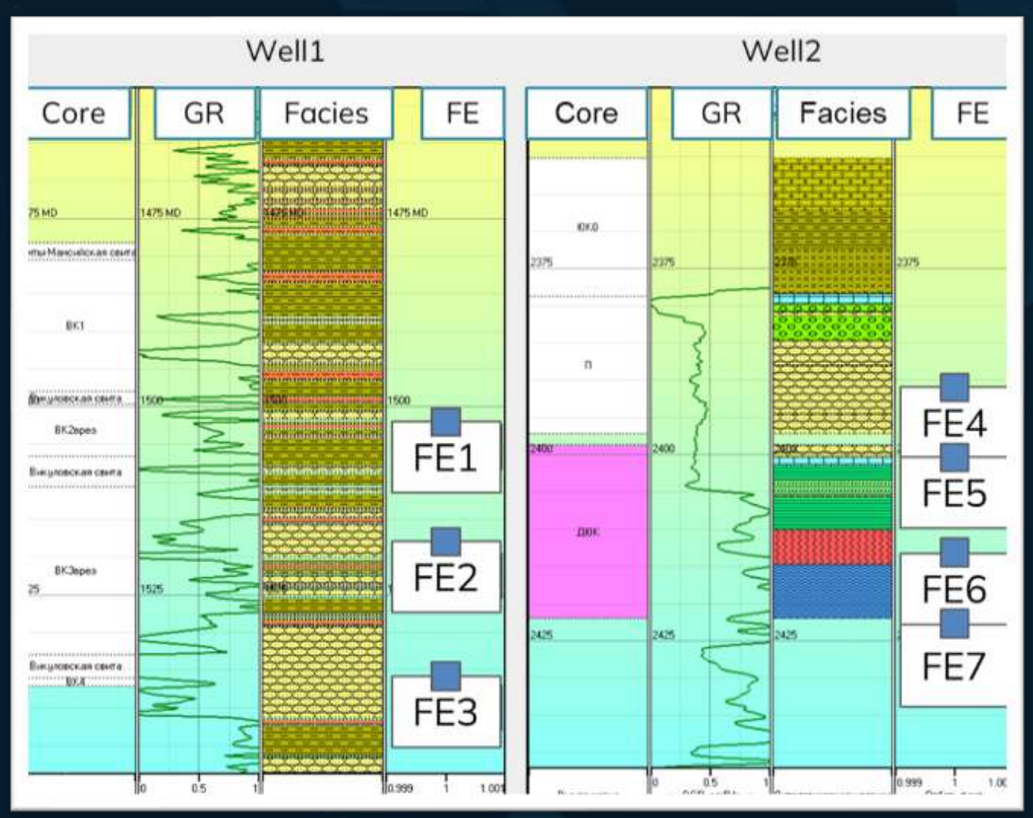
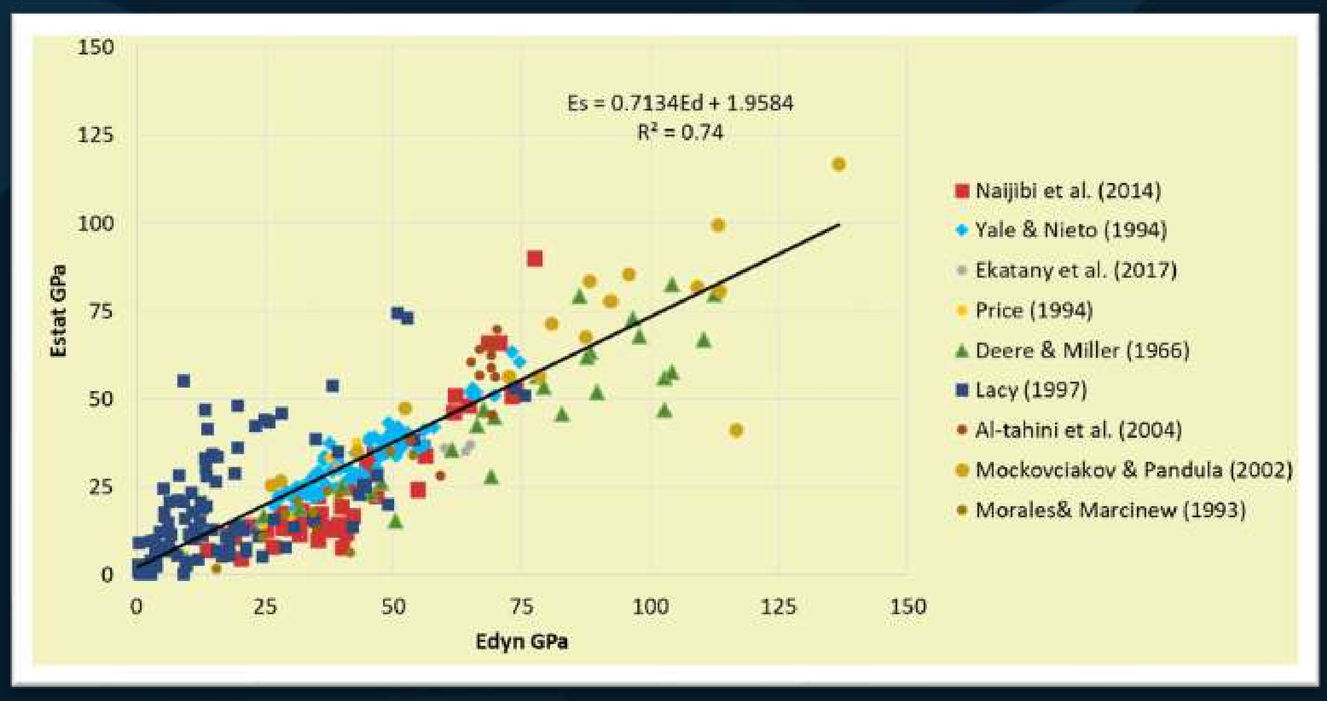
MODULE 2: WORK SCHEDULE FOR 1D MODELING.

BUILDING A 1D GEOMECHANICAL MODEL (5TH DAY)

Lectures

- Modeling of elastic and strength properties.
- Existing correlations and their application in case of missing data.
- Summarizing of calibration information.
- Clustering of the section into mechanical facies.





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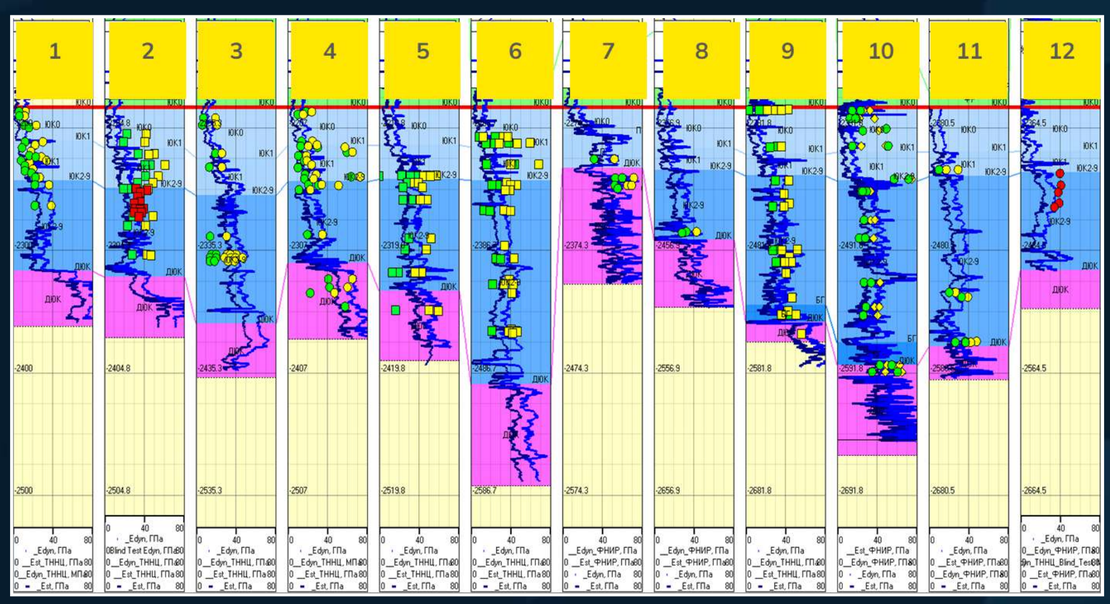
MODULE 2: WORK SCHEDULE FOR 1D MODELING.

BUILDING A 1D GEOMECHANICAL MODEL (6TH DAY)

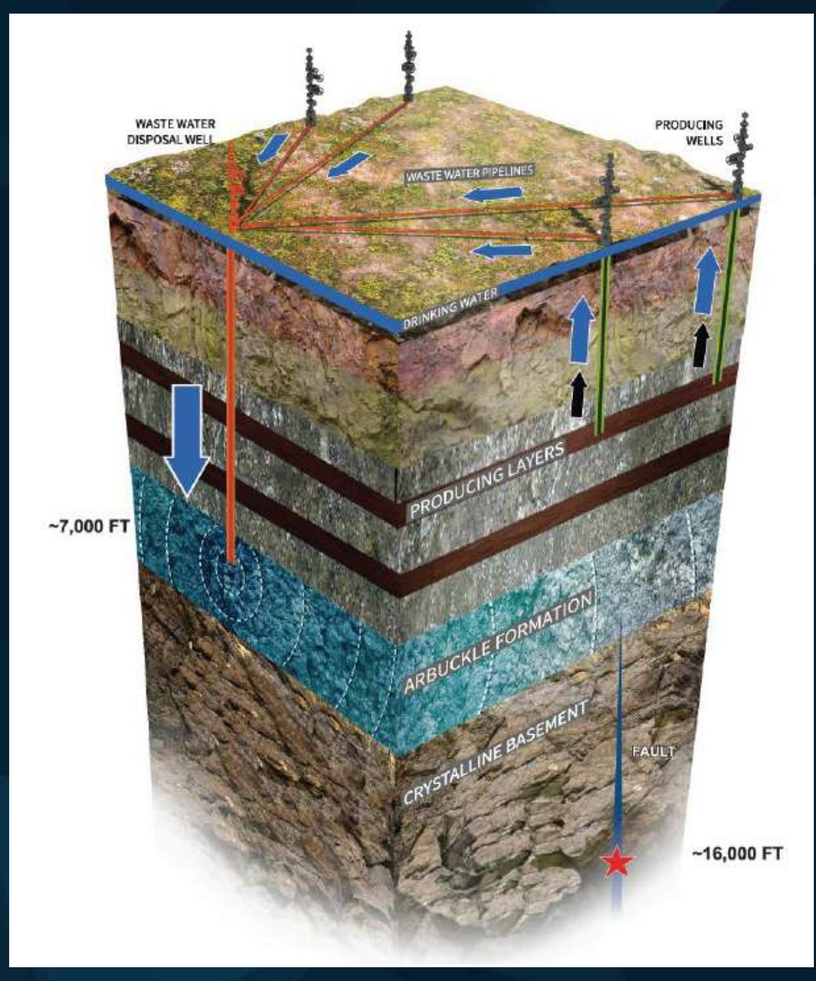
Practice

- Modeling of elastic and strength properties.
- Existing correlations and their application in case of missing data.
- Summarizing of calibration information.
- Clustering of the section into mechanical facies.



Lectures

- Overburden pressure, calculation methods
- Pore pressure, calculation methods
- Mechanisms of formation and prognosis of high pore pressure zones



Zoback, Kohli, 2019

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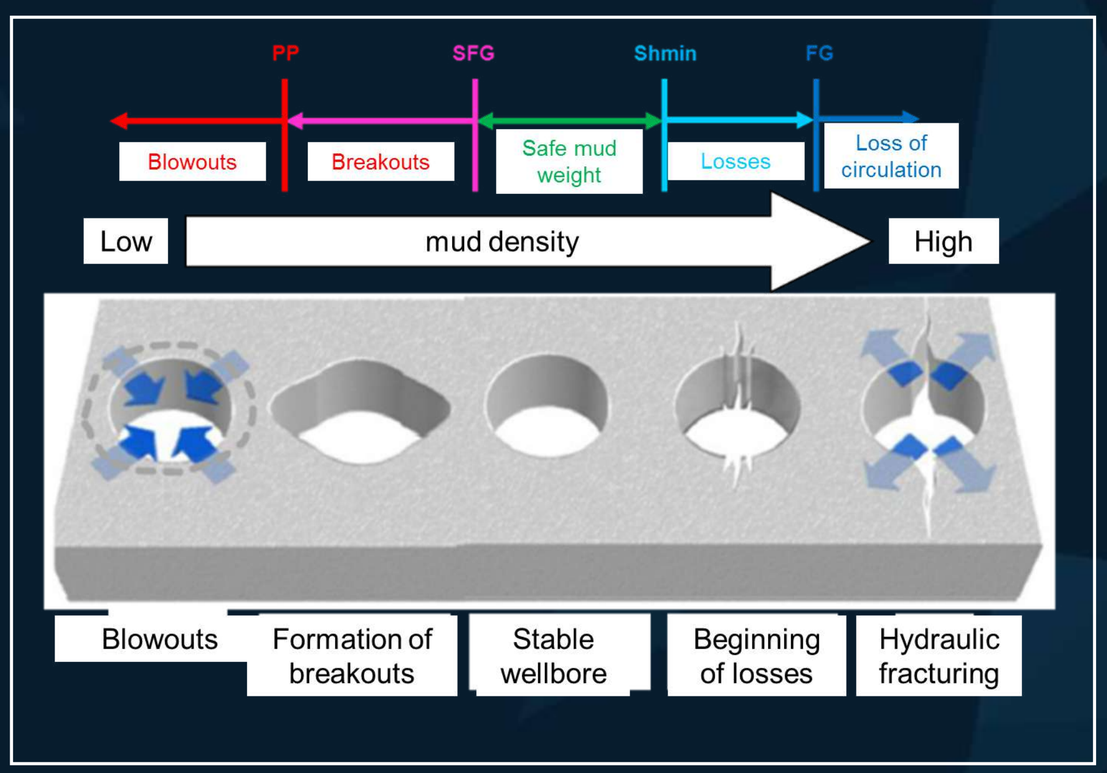
MODULE 2: WORK SCHEDULE FOR 1D MODELING.

BUILDING A 1D GEOMECHANICAL MODEL (7TH DAY)

Lectures

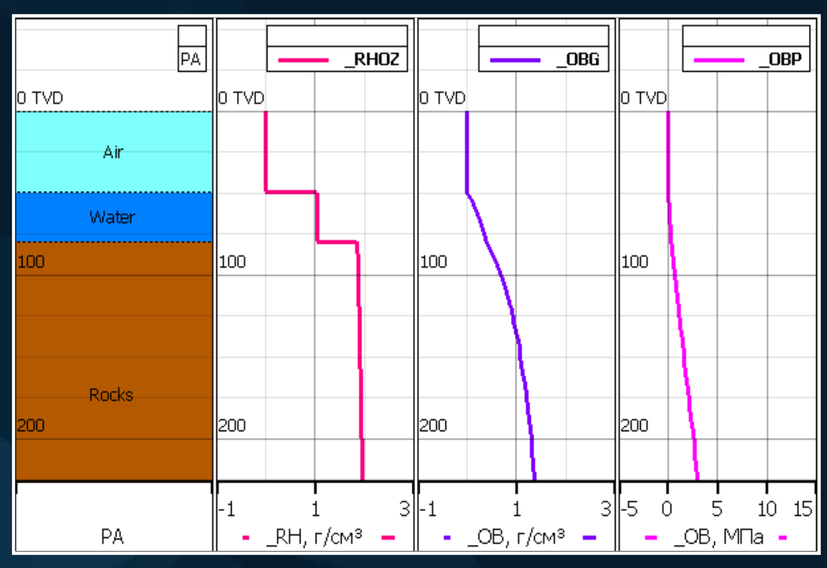
- Simulation of reservoir depletion
- Calibration of the calculated profile based on measurement results, well testing and indirect information
- Wellbore stability prediction
- Stability of the wellbore for drilling



Practice

- Overburden pressure, calculation methods

  Pore pressure, calculation methods
- Mechanisms of formation and prognosis of high pore pressure zones
- Simulation of reservoir depletion
- Calibration of the calculated profile based on measurement results, well testing and indirect information



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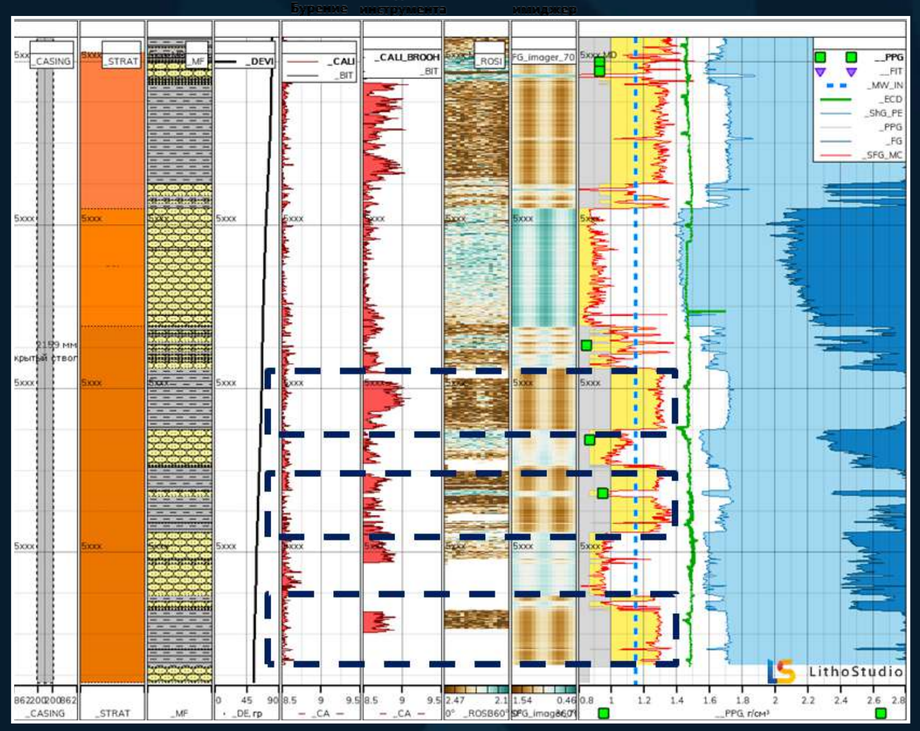
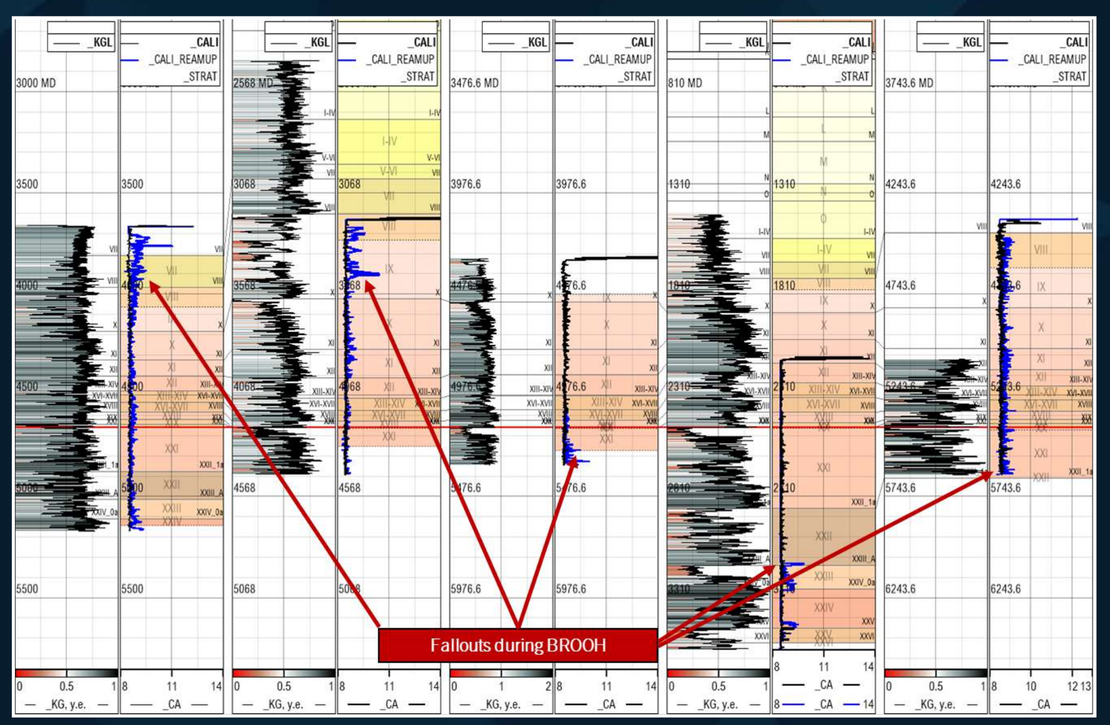
MODULE 2: WORK SCHEDULE FOR 1D MODELING.

BUILDING A 1D GEOMECHANICAL MODEL (8TH DAY)

Lectures and practice

- Wellbore stability to estimation fault stability
- Wellbore stability for sand production calculation
- Calculation of risks for the planned trajectory, estimation of modeling uncertainties
- Recommendations on maximum safe pressures during drilling, bottomhole pressures during operation
- Estimation of sand production rate
- Uncertainty analysis of input parameters





+Practice

- Wellbore stability prediction
- Stability of the wellbore for drilling

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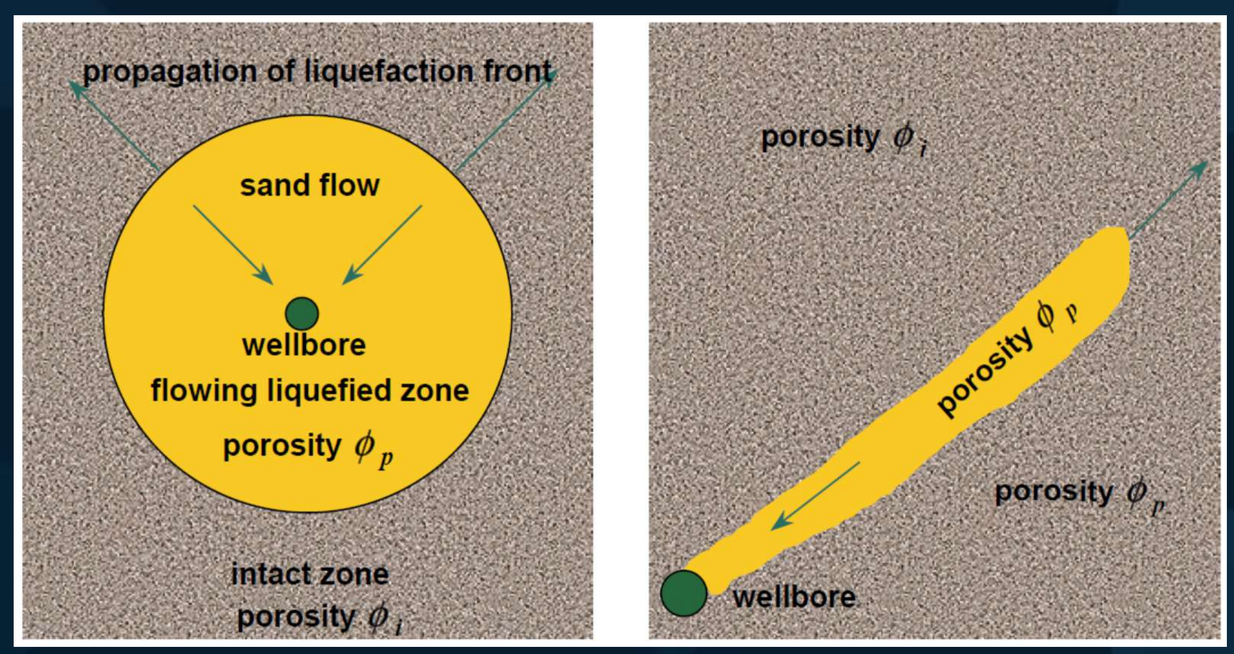
MODULE 2: WORK SCHEDULE FOR 1D MODELING.

BUILDING A 1D GEOMECHANICAL MODEL (9TH DAY)

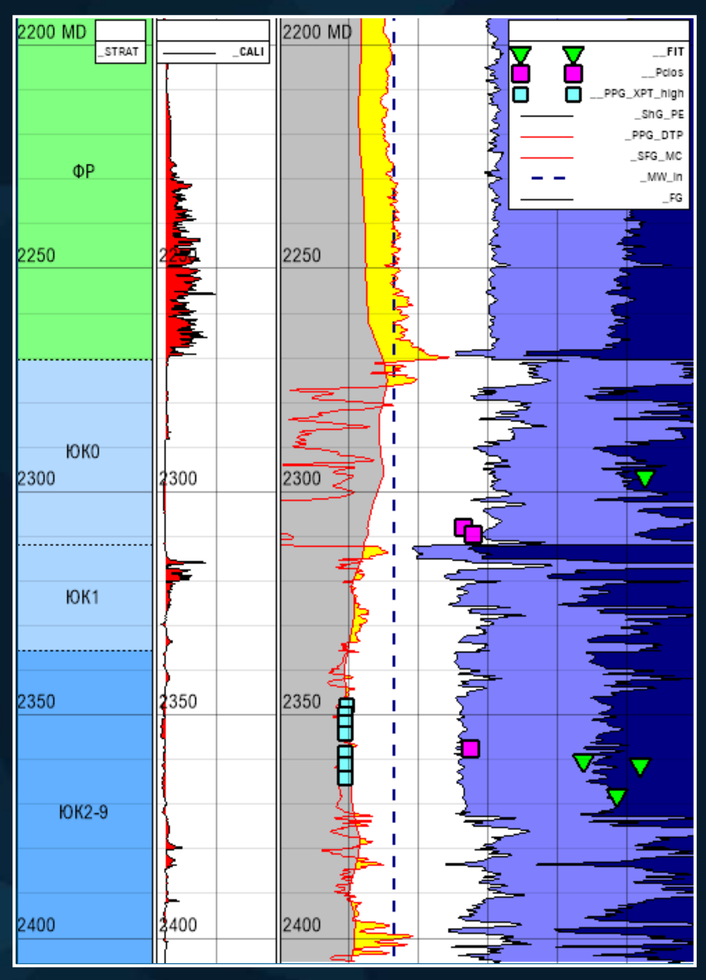
Lectures and practice

- Assessment of sand production
- Uncertainty Analysis of Input Parameters



+Lectures

- Calculation of a 1D geomechanical model for a reference well: from constructing a mechanical facies model to calculating wellbore stability
- Calibration of calculations based on the results of research, measurements, comparison with drilling events



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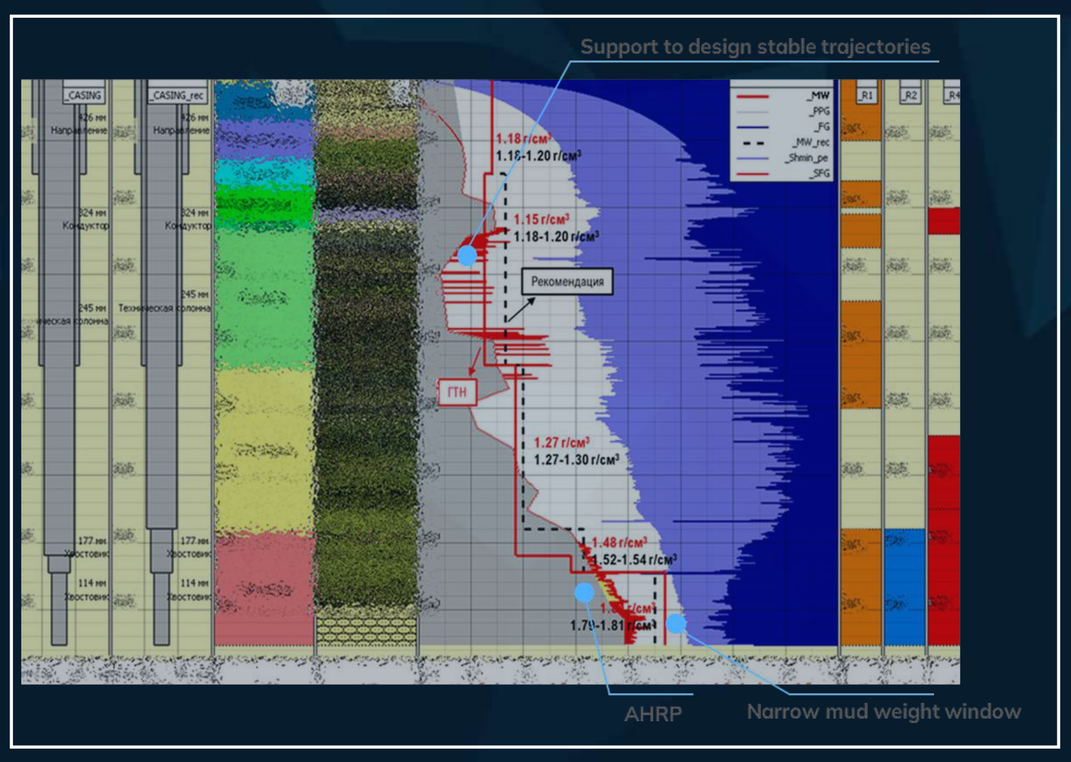
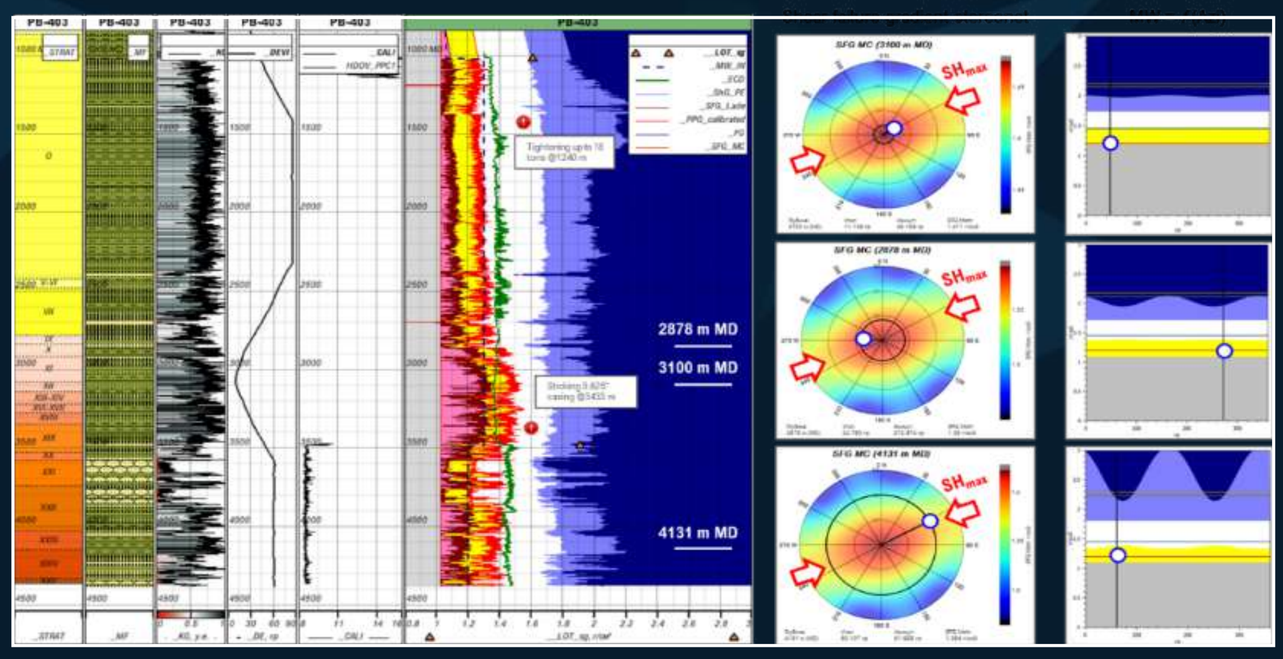
MODULE 2: WORK SCHEDULE FOR 1D MODELING. BUILDING A 1D GEOMECHANICAL MODEL (10TH DAY)

Lectures and practice

- Calculation of a 1D geomechanical model for a reference well: from constructing a mechanical facies model to calculating wellbore stability
- Calibration of calculations based on the results of research, measurements, comparison with drilling events





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