भारतीय प्रौद्योगिकी संस्थान
(भारतीय खनि विद्यापीठ)
धनबाद

IIT ISM

INDIAN INSTITUTE OF TECHNOLOGY
(INDIAN SCHOOL OF MINES)
DHANBAD

GPC510 - Well logging

Semester - Winter 2023; Case study

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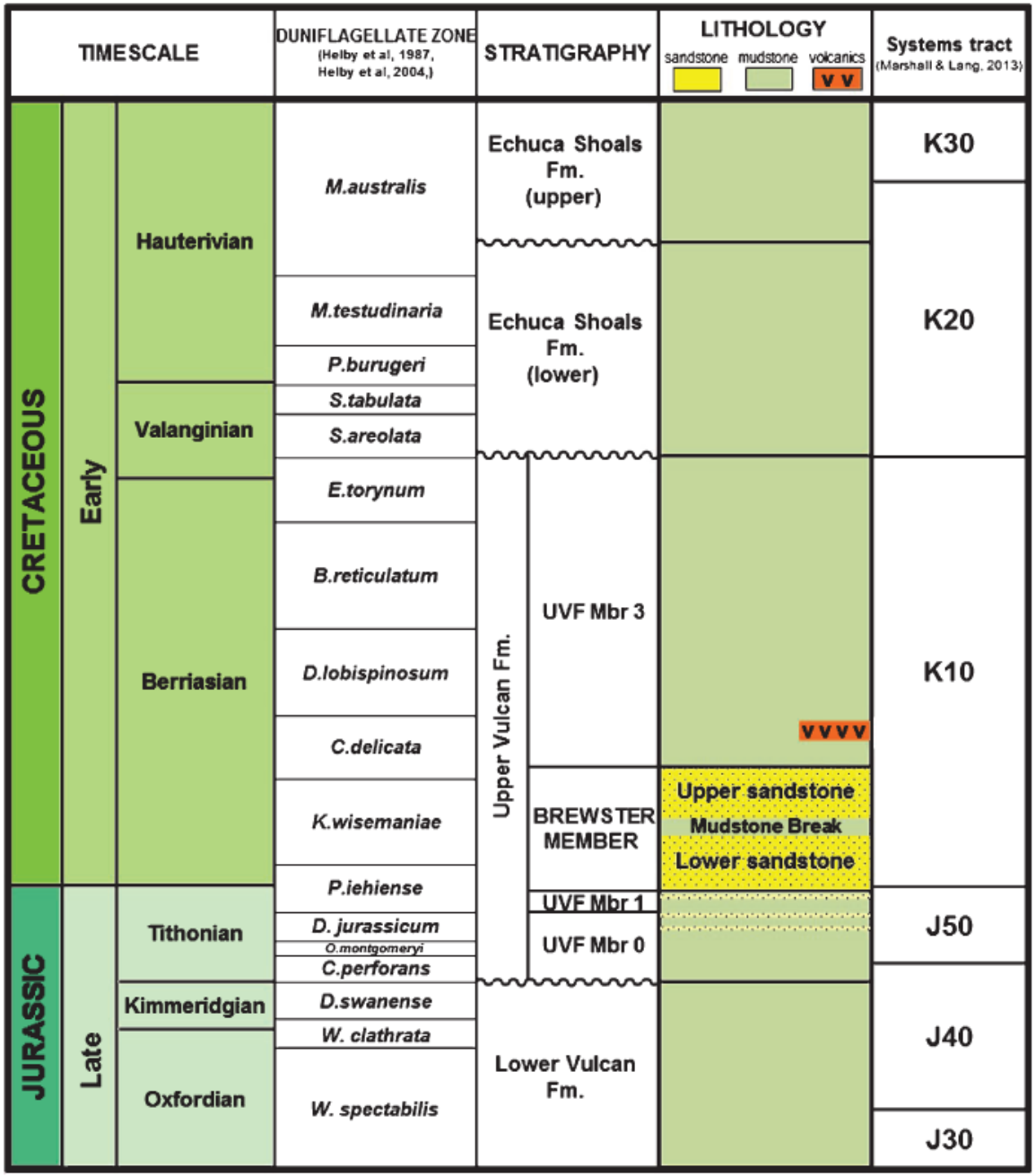
PROBLEMS TO BE SOLVED

1. Propose necessary instrumentation requirements to design a gamma ray tool if the department wants to build one.
2. Perform quality control of wireline logs and marked obvious outlier in the basic well logs.
3. Calculate total porosity from the density and neutron combination and mark the zone with the highest porosity.
4. Plot velocity depth profile (compressional and shear) colour coded with Volume of shale.
5. Calculate water saturation (S_w) with Archie's method and generate a reservoir flag where the volume of shale, V_{sh} <= 0.4 and S_w <= 0.7.
6. Report total porosity, water saturation, and V_{sh} with a standard deviation of the reservoir zone.

STRATIGRAPHY



HOW TO IDENTIFY OUTLIERS

- Identify basic logs required for the case study
- Plot histogram and pair-plot diagram
- Generate bad hole flag based on bit size and caliper log response

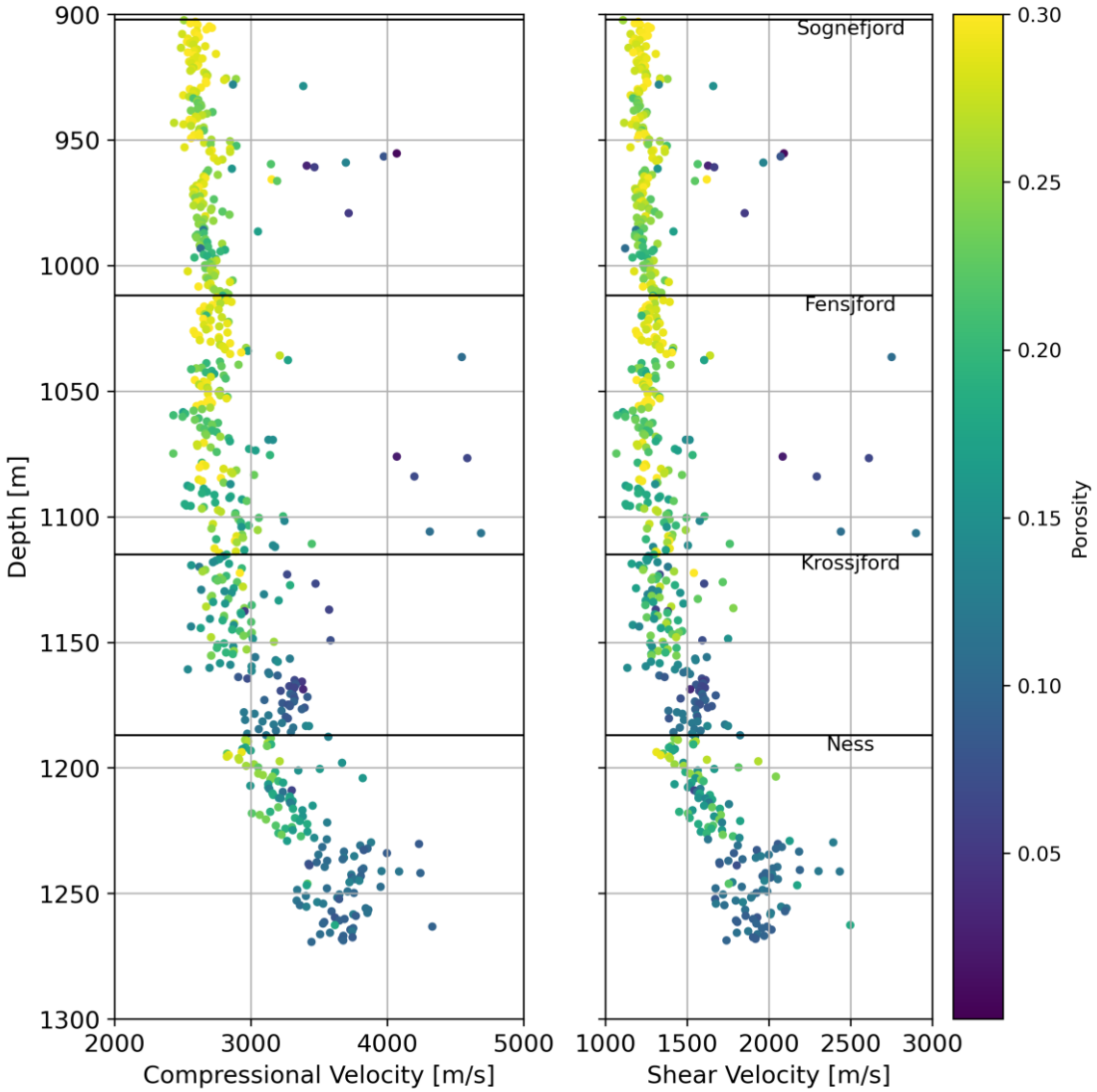
TOTAL POROSITY

- Use density log to compute density porosity (require matrix density, fluid density)
- Combine neutron and density porosity to get total porosity
- No shale correction is required

VELOCITY (COMPRESSIONAL AND SHEAR)

- Use compressional sonic DT and shear sonic log DTS to derive corresponding compressional velocity Vp and shear wave velocity Vs
- VELOCITY (m/s) = 304800/DT if DT is in us/ft unit
- Generation depth profile of Vp and Vs colour coded with total porosity

VELOCITY PLOT



- Plot of Vp and Vs colour coded with total porosity.
- You need to mark the zone with highest porosity

WATER SATURATION AND RESERVOIR FLAG

- Use Archie's equation to derive water saturation Sw. List know parameters
- What are the unknown parameters?
- Create reservoir flag with an if-else condition where

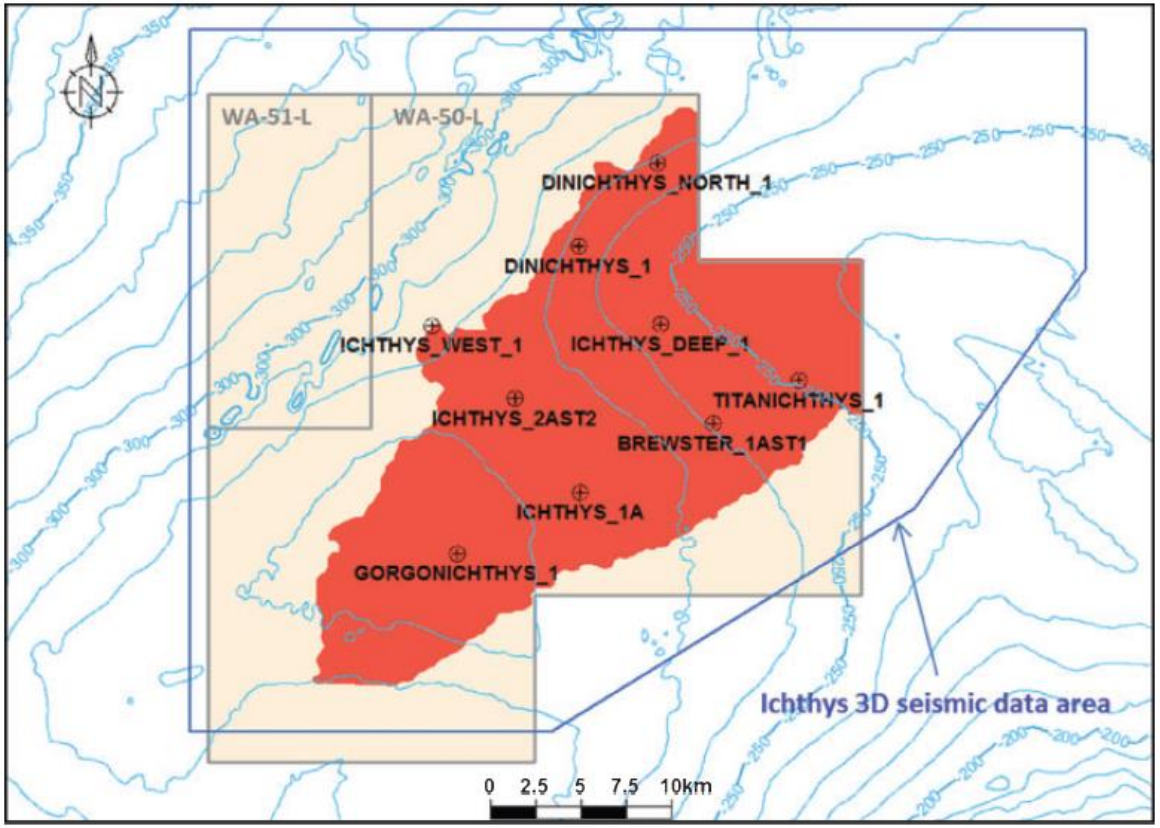
If Vsh <=0.4 and Sw <=0.7 , Res_Flag =1, else 0

STATISTICS OF RESERVOIR ZONE

- Create a separate dataframe where res_flag=1 and then compute statistics of those data points along with standard deviation. You need to choose Vsh, porosity, and Sw only for the statistical analysis.

DATA FINDING AND WELL-COMPLETION REPORT

- https://wapims.dmp.wa.gov.au/WAPIMS/



END OF LECTURE