



N224: Methods for Quantifying and Communicating Uncertainty in Depth Conversion and Volumetrics

Instructor(s): Ashley Francis

Format and Duration

Classroom - 3 Days

Virtual - 5 Sessions

Summary

This advanced course takes an in-depth, quantitative look at the sources of error and uncertainty in the construction of depth maps from seismic data, and the resulting impact on reservoir volumetrics. Worked examples will illustrate the key issues encountered at various stages of the asset life-cycle, from data-sparse exploration settings to the relatively data-rich appraisal and development phases. The course will start from basic geostatistical theory and work through the depth conversion elements toward a stochastic simulation and probabilistic volumetric maps.

Learning Outcomes

Participants will learn to:

1. Construct depth maps that include accompanying uncertainty measures.
2. Perform geostatistical workflows, with the ultimate goal of providing a more tightly-constrained volumetrics calculation.
3. Integrate well-constraints into the process of depth conversion.
4. Validate and rate objectively depth maps and volumetric estimates generated by others.

Training Method

A classroom or virtual classroom course comprising lectures, discussion, demonstrations, and practical exercises.

Who Should Attend

This course should be of interest to all geophysicists and interpreters working in areas with demanding depth conversion challenges and complex imaging problems.

Course Content

The course content is divided broadly into the following topics:

1. Introduction

- Simple depth grid / 2D and 3D seismic problems
- Accuracy, precision, error, and uncertainty
- GRV basics

2. Velocity, time, and depth

- Interval or average velocity



N224: Methods for Quantifying and Communicating Uncertainty in Depth Conversion and Volumetrics

Instructor(s): Ashley Francis

Format and Duration

Classroom - 3 Days

Virtual - 5 Sessions

- Velocity functions
- Error propagation
- Single layer depth and time practical

3. Statistics

4. Stochastic theory and variograms

5. Estimation with kriging

6. Stochastic simulation

- Depth estimation vs. volume estimation
- Closure & isoprobability closure maps
- Volumes proved up by well
- Multiple closures and merging volumes
- Partial contact information – water-up-to (WUT) and oil-down-to (ODT)

7. Multivariate geostatistics

- Stationarity and trends
- External drift, colocated methods, and Markov-Bayes
- Stacking velocities
- Combining depth and time uncertainty

8. Deviated wells and multilayer depth conversion

- Multi-layer depth conversion practical
- Kriging with inequalities

9. DHI and amplitude constraints

- Amplitude maps and tuning
- Amplitude conformance with structure