Seismic Velocities and Depth Conversion - SVDC

COURSE

About the Course

Seismic data is acquired in time - the time taken for the sound to travel from the source to reflectors and to return to receivers. However, wells are drilled in depth, not time. Variations in velocity can distort the depth, size, and shape of possible reservoirs. Therefore, conversion from time to depth is needed for a clear picture of the prospect and the risks involved. This course will teach you how to use velocity information and structural inputs to build a consistent velocity model and/or calibrate ones that have been created during seismic data processing.

In the last decade or two, large strides have been made in seismic processing, especially in PreStack Depth Migration. Routinely used advanced migration algorithms now require more accurate velocity models. Better tools have been developed to ascertain the velocity, and more time and effort are now spent in velocity analysis by the seismic processors. This has greatly improved current velocity models. The interpreter, however, still needs to know how the models are made, how to quality control them, and how to modify and correct them when needed. This class is designed for the interpreter so that he or she understands the theory and practice of how to estimate depths from older time-migrated data, as well as how to quality control (QC) and calibrate newer PSDM data. Also covered in this class are when to reprocess the data and how to communicate with the processor in order to produce the best velocity model and depth image.

As a foundation class, the instruction starts with the basics and proceeds to more complex topics. The student should have a basic understanding of geophysics such as offered in PetroSkills' Basic Geophysics course. Little advanced math (calculus) is used, but algebra and lots of diagrams are applied to explain the needed concepts.

"Vivid presentation of the topics, complicated problems were explained very well and easy to understand." - Participant, Germany

Target Audience

Early-career geoscientists and engineers, especially seismic interpreters, and anyone who needs to understand the basic theory and procedures for creating velocity models and converting seismic data from time to depth. This is a foundation level course. It is neither designed nor paced for the experienced velocity modeler or processor.

You Will Learn

Participants will learn how to:

- Understand the various types of velocities, their calculation, and the validity of their interpolation and extrapolation
- Compare, quality control, smooth, and combine the various velocity types into an integrated velocity model
- Validate model quality by examining the changes in velocity needed to tie the seismic
- Use the model to convert horizons, faults, and seismic data from time to depth
- Understand at an introductory level, how velocity models are used for other studies such as forward modeling and pore-pressure prediction

Course Content

- Velocity: definition and comparison of the many types of velocity including average, interval, RMS, stacking, migration, P-wave, and S-wave
- Velocity Inputs: accuracy and regional extent of each, including check shots, VSPs, sonic logs, time/depth functions, well picks and pseudo velocities, seismic velocities, and horizons for structural control
- Synthetic Seismograms: creation, upscaling, and tie to seismic data. Advanced synthetics including synthetic gather creation, Zoeppritz equations, AVA, and AVO
- Matching Synthetics to Seismic: calibrating the seismic data to the well data
- Seismic Velocities: semblance analysis, velocity picking, multiples, and how seismic velocities differ from well velocities
- Migration and Migration Velocities: introduction to pre- and post-stack algorithms, tomography, and iterative velocity analysis
- Velocity Model Building: workflows to integrate stacking velocities, time/depth curves, well picks associated with seismic horizons (pseudo-velocities), and structure from horizons
- Time-to-Depth Conversions: vertical stretch, inverse raytracing, migration, and uncertainty
- Introduction to Advanced Topics: anisotropy, pore-pressure prediction, geostatistics, and forward modeling

Product Details

Categories: Upstream

Disciplines: Geophysics

Levels: Foundation

Product Type: Course

Formats Available: In-Classroom

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