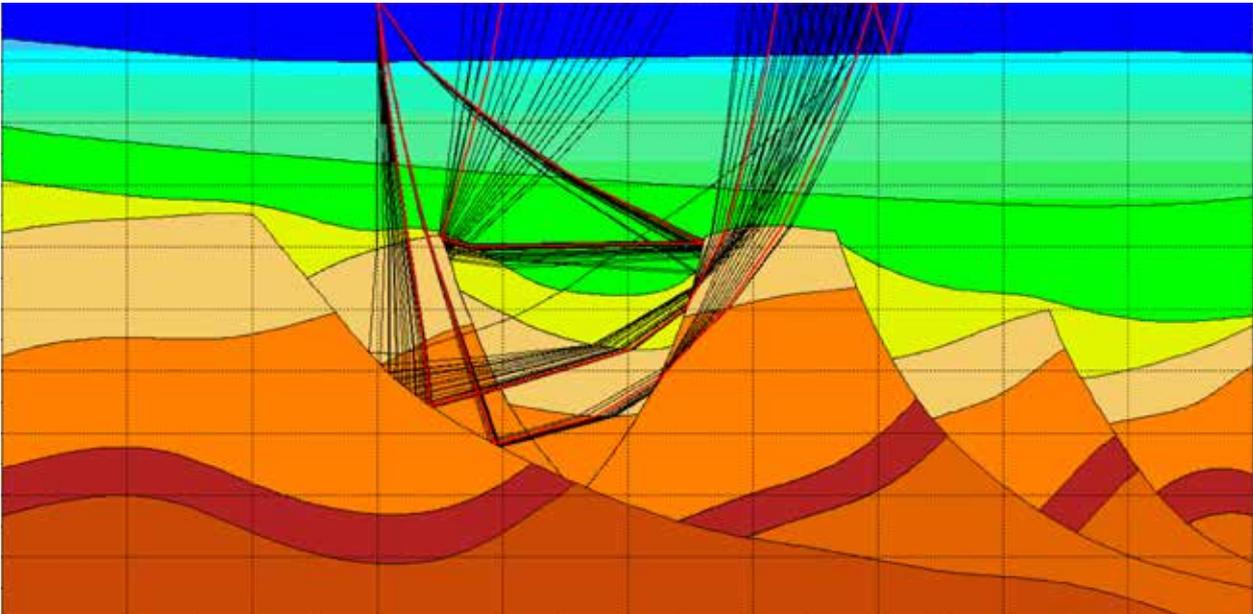


NORSAR-2D



Insight Through Modelling

- *What structures do the waves propagate through?*
- *Will multiples interfere with the primaries?*
- *Why is there a shadow zone in the seismic section?*
- *How does attenuation affect the amplitudes?*
- *How much does the amplitude vary with offset?*

Find the answers with NORSAR-2D

– The industry standard seismic ray-modelling platform



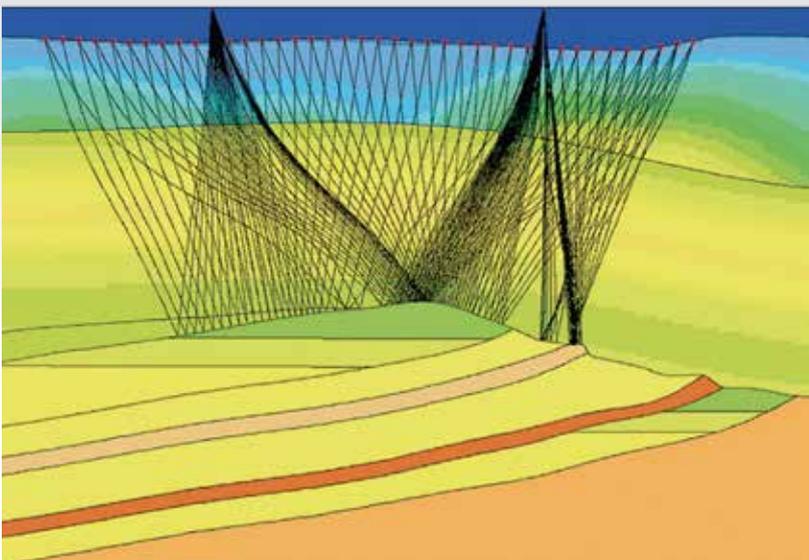
NORSAR-2D Ray-Modelling is the powerful, industry standard tool for 2D ray-trace modelling to understand seismic wave propagation.

NORSAR-2D

Is a powerful package for ray-based seismic modelling and depth conversion.

Is flexible, fast, accurate, and user-friendly.

Is ideal for training, teaching, research, as well as industry-scale projects.

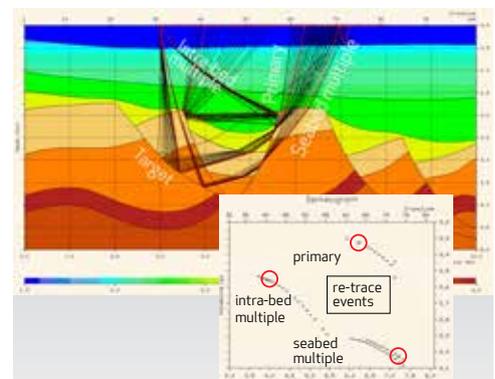


SOME OF THE APPLICATIONS:

- Build and depth-convert 2D models.
- Plan and evaluate surveys.
- 2D illumination studies.
- Ray path, event, and attribute analysis.
- AVO/AVA analysis.
- Understand reflections in seismic sections.
- Understand shadow zones in seismic sections.
- 2D seismic processing support.

Model building features

- One or more 2D lines in either a 2D or 3D project environment.
- Time to depth conversion of interfaces by vertical stretching or image rays.
- Interval velocity estimation from inversion of stacking velocities.
- Import of external horizon and elastic property data in simple ASCII or standard SEG-Y formats.
- Digitizing of horizons from SEG-Y data or bitmap images.
- Pre-processing, resampling, and editing of sampled interface or property data using smoothing recommendations as provided by the software.
- Interactive model building, modification, and update by mouse control.
- Generation and assignment of property fields and lateral/vertical gradients.
- Integration and upscaling of well logs for property field generation.
- Inclusion of overhang structures, truncations, salt, faults, and other model complexities.
- Multiple property field options independently for each layer in the model, including velocity, density, and attenuation as constants, gradients, and spline functions.
- Extension for rock physics modelling (VelRock).
- Model export as 2D property grid files for external FD modelling.

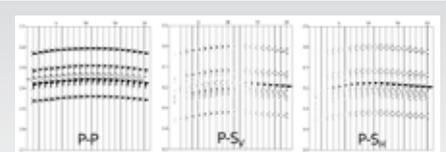
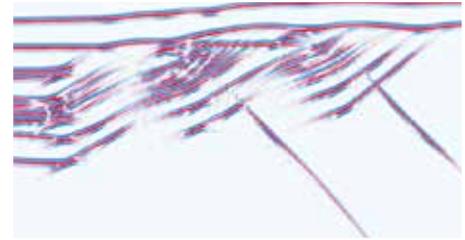


Ray Path Analysis:

Improve your understanding of ray propagation in isotropic or anisotropic models. Identify and analyse primaries, multiples, and multiple ray paths using re-tracing functionality.

Ray-based seismic simulation

- Shots and/or receivers can be anywhere in the model, e.g. at the surface, at constant depth, along wells, along horizons, or along towed cables.
- Simple test shooting for defined take-off directions.
- Easy simulation of stacked sections and time-migrated sections.
- Modelling of common-shot gathers for selected targets.
- Inclusion of edge diffracted rays
- Anisotropic ray-modelling for TI media.
- Wavefront construction for efficient generation of travel-time tables.
- Automatic generation of direct and primary ray codes as well as mode conversions.
- No limitation for complex ray code generation (multiples).
- Recording of multiple ray paths, turning rays, and multiple receiver components.
- Control of ray tracing parameters for balancing accuracy and efficiency of each modelling run.



Synthetic seismic:

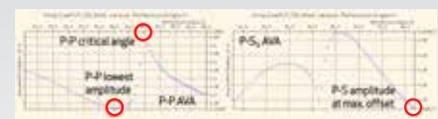
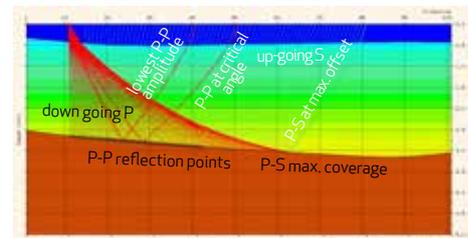
Generate full elastic simulations of shot gathers and zero-offset sections. Take diffractions and mode conversions into account, and simulate multi-component recording.

Synthetics

- Generation of synthetic seismic data from modelling events and a chosen seismic source pulse.
- Option for including/excluding attenuation, geometrical spreading, phase shifts, reflection and transmission effects.
- Integrated seismogram viewer for wiggle or variable area display, allowing for an overlay of modelled events.
- Output of synthetics in SEG-Y format for external use.

Comprehensive ray and event analysis

- Event filtering and detailed sub-selection.
- Flexible attribute cross-plotting.
- Re-tracing of events for ray identification, display, and analysis.
- Display and mapping of reflection points.



Interaction with other tools

- Export filtered or sub-selected event attributes, shot and receiver locations, reflection points, and angle dependent reflection coefficients in ASCII format, for communication with any external tool.
- Export synthetic seismograms on SEG-Y, for input in any processing or interpretation package.
- Make 2.5D models in NORSAR-3D from single NORSAR-2D lines.
- Make 3D models in NORSAR-3D from several NORSAR-2D lines.
- Make NORSAR-2D models from inlines or cross-lines through NORSAR-3D models.

Seismic Event Analysis:

Analyse event attributes including AVA and AVO behaviour using cross-plotting, re-tracing, event sub-selection, and ASCII event export.

Quality and Excellence

NORSAR is an independent research foundation recognised internationally for its scientific research and innovation. NORSAR's seismic modelling division has been at the forefront of software solutions for seismic oil and gas prospecting since the release of our first commercial seismic ray modelling package in 1991.

Software Products

The core applications for NORSAR Seismic Modelling packages are 2D and 3D seismic ray modelling, survey planning, time lapse studies, reservoir analysis, and Green's functions for PSDM.

NORSAR software products are used by the leading E&P and O&G service companies throughout the world. The products are supported by experienced sales, services, and support teams from our main office in Norway. For your convenience, additional support centers are located in Houston and Beijing.

Research and Development

Research and development is the foundation upon which NORSAR's software products are built. Through the development of a world class research centre, NORSAR is able to provide its clients with a product that evolves as new, innovative solutions are developed to meet the needs of a dynamic industry.

Microseismic Research and Services

Since 2000, NORSAR has been engaged in research and development of advanced software solutions for microseismic data analysis and interpretation. Over the years NORSAR has been leading numerous research projects and consultancy studies.

Support and Maintenance

At NORSAR we pride ourselves on the level of support offered to our customers. We value client feedback as a vital ingredient for the continued improvement and evolution of the software. Therefore, software support is an integral aspect of the software package we offer to our customers.

The maintenance service includes telephone support, on-line support, software updates, and new releases as they become available.

Consulting services

Our Services division undertakes commercial projects in survey evaluation, Illumination analysis, 4D-studies, and reservoir monitoring. The scope of this group is to use NORSAR Seismic Modelling Software to provide tailored solutions and independent advice to our clients.

Training Courses

Whether you are a new user or an experienced one, we provide training that will reduce the uptake time and improve your application of our software. We are offering both public and private training courses. Booking a private course enables you to tailor the course content to suit the application of your company.

Exploring the Earth

NORSAR

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RIO DE JANEIRO

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