EMERSON™

GeoSec

Structural Restoration, Balancing and Forward Modeling

GeoSec

Fast, accurate understanding of structural history

GeoSec is a comprehensive and field-proven geoscience tool that allows geoscientists and structural geologists to quickly incorporate structural geological analysis into exploration and production workflows. The resulting analyses reduce the risk of building incorrect interpretations of the subsurface, and facilitate the generation of geologically plausible models.
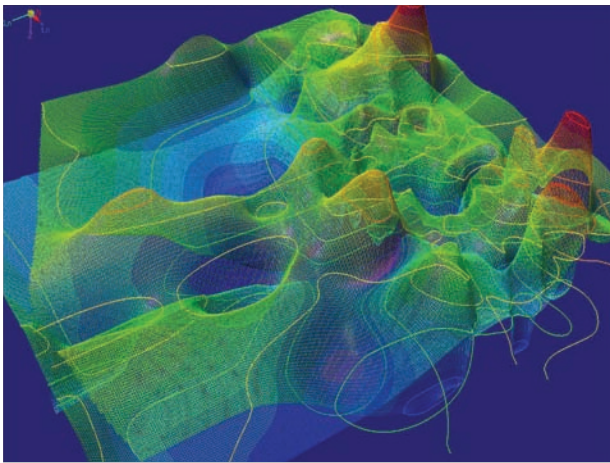
Using Prospect History to Enhance Understanding

Paradigm™ GeoSec™ is a multi-faceted structural geology application that provides geoscientists with valuable insights into the reservoir geometry and structural development of potential prospects. GeoSec can help determine the tectonic history and stages of evolution of subsurface structures. The use of GeoSec while interpreting can help you avoid the creation of non-structurally balanced, and therefore geologically impossible, subsurface models.

GeoSec is proven to add value to the interpretation workflow. It has assisted in the evaluation of numerous prospects and developmental regions, and has helped in the discovery and recovery of energy and mineral resources.

Interpretation in Locations with Minimal or Poor Data Availability and Quality

GeoSec is especially designed to enable the creation of structural sections in areas lacking support from quality 3D seismic data, such as onshore areas with complex subsurface geology. The ability to integrate 2D and 3D seismic interpretation data with well data and satellite imagery, and project this information accurately onto 2D sections, is an essential component of the forward modeling of the reservoir architecture.

Forward modeling tools include:

- Proportional/wedge projection of dip meter, well marker and outcrop data in support of seismic interpretations
- Fault Geometry Prediction
- Vertical/Oblique Shear
- Fault Bend Fold
- Fault Slip Fold
- Trishear

Structural Restoration and Fault Geometry Analysis

Restoration of the structures predicted using GeoSec for subsurface model building can help verify the models created through the techniques of structural balancing; and through this process, reveal details of trap formation timing. GeoSec provides multiple tools to assist in the analysis of complex tectonic regimes, including:

- Flexural Slip for use in contractional settings
- Vertical/Oblique Shear in extensional settings
- Decompaction algorithms for backstripping workflows
- Airy Isostasy

▲ GeoSec 2D exports 3D contours to create 3D structural models
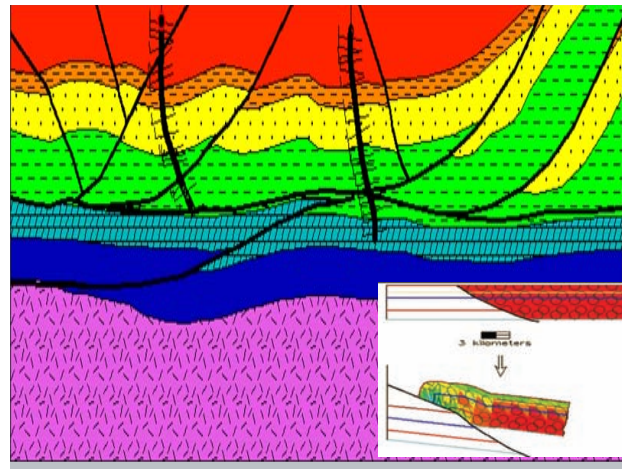
▲ Dip-constrained geological interpretation
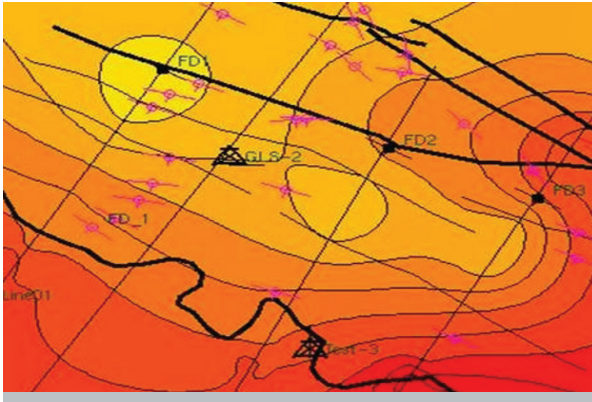
▲ GeoSec contour map

Multi-Z Values for Realistic Geological Models

Multi-Z values for formation boundaries are a necessity in compressional tectonic regimes, in which lithological units frequently overlap. GeoSec solves this problem by supporting multiple occurrences of the same horizon at any x-y location. It also enables stratigraphically linked geological fill patterns/solid shading with automated polygonal calculation using planimeter tools. This provides an accurate and comprehensive picture of the subsurface, even in very complex environments such as salt tectonic regimes with domes and intrusions.

Strain Analysis and Stress Determination

Strain analysis in GeoSec allows the user to quantify the deformation within a deformed block or unit. The strain analysis tool is used to determine the orientation of stresses applied to the reservoir/ trap units throughout their geological history, helping to predict fracture density and habit within the units.

## A Fully Integrated Application

GeoSec is integrated into the Paradigm Epos™ environment through the SeisEarth™ multi-survey interpretation suite. Crooked section lines and interpretations can be opened from both Epos and third-party interpretation databases.

Flexible Input/Output

Seismic interpretation and well data can be loaded directly into GeoSec from a number of file formats. Data can originate from a variety of sources, such as satellite images, aerial photographs and digital elevation models. In addition, interpretations, including geological maps and time and depth sections, may be input directly from any commercial digitizing tablet, enabling the use of legacy data.

Connectivity to Paradigm Kine3D

GeoSec can work in tandem with the Paradigm Kine3D™ application for structural restoration and balancing, utilizing the Epos database. Kine3D can build 3D surfaces and solids from GeoSec data, and perform 3D volumetric restorations.
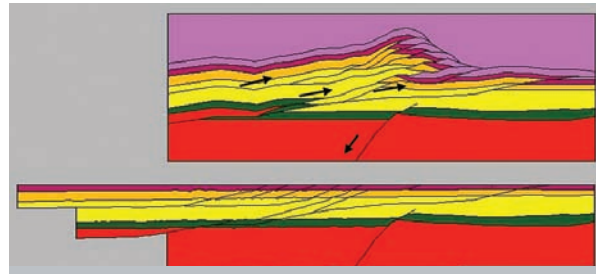
▲ GeoSec cross-section restoration

▲ Stratigraphic coloring overlaid on seismic image
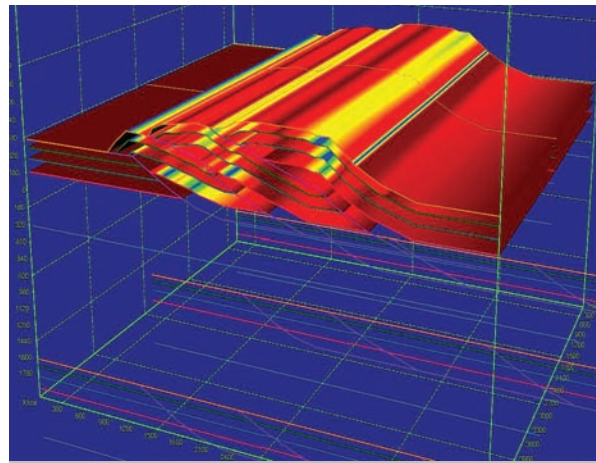
▲ 3D duplex structures created from GeoSec data, displayed in 3D Canvas

Key Features

- Direct access to Paradigm Epos and third-party datastores
- Multi-Z values for formation boundaries
- Interactive dipmeter and outcrop data-guided model building
- Algorithms for forward modeling of geological structure and structural restoration of geological sections to reveal tectonic history and trap evolution, including trishear fault propagation fold and trishear fold geometry modeling
- 3D multi-map contouring
- 3D data import/export
- Seismic and geologic image restoration
- Standardized ergonomic user interface with dynamic contextual help
- Animation, movie player and snapshots
- GIF, PostScript, DXF, CGM hardcopy

Interoperability

All Epos-based applications enable interoperability with third-party data stores, including:

- RESQML 2.0.1
- OpenWorks® R5000.10
- GeoFrame® 2012
- Petrel* 2017 & 2016
- Recall™ 5.4.2

(* a mark of Schlumberger)

System specifications

- 64-bit, for x64 architecture processors
- Red Hat® Enterprise Linux® 6.8 and above, 7.1 and above

The Paradigm Advantage

- A rich choice of structural analysis algorithms can be tailored to specific tectonic regimes.
- On a regional scale, GeoSec enables faster, more accurate understanding of the basin's geometry and structural history.
- Interactive, dip-guided model building delivers a more exact geological representation of the subsurface.
- Robust interoperability provides seamless access to third-party remote databases.

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