

Kine3D

Structural Restoration and Balancing

Kine3D, together with SKUA-GOCAD modeling solutions, has completely revolutionized the 3D restoration world. Together, they've enabled us to better understand the history of our basin and the migration of hydrocarbons in it.

Validating Structural Interpretation

Paradigm™ SKUA™ Kine3D™, a member of the SKUA-GOCAD™ suite of sophisticated structural analysis tools, provides a workflow approach that helps geoscientists restore 3D models in complex areas where 3D seismic data is scarce or of poor quality. Specialists and non-specialists alike rely on the unique features of SKUA Kine3D to restore basin or reservoir models to their desired undeformed state using geologic, lithologic and geomechanical parameters.

A Full Suite of Restoration Tools

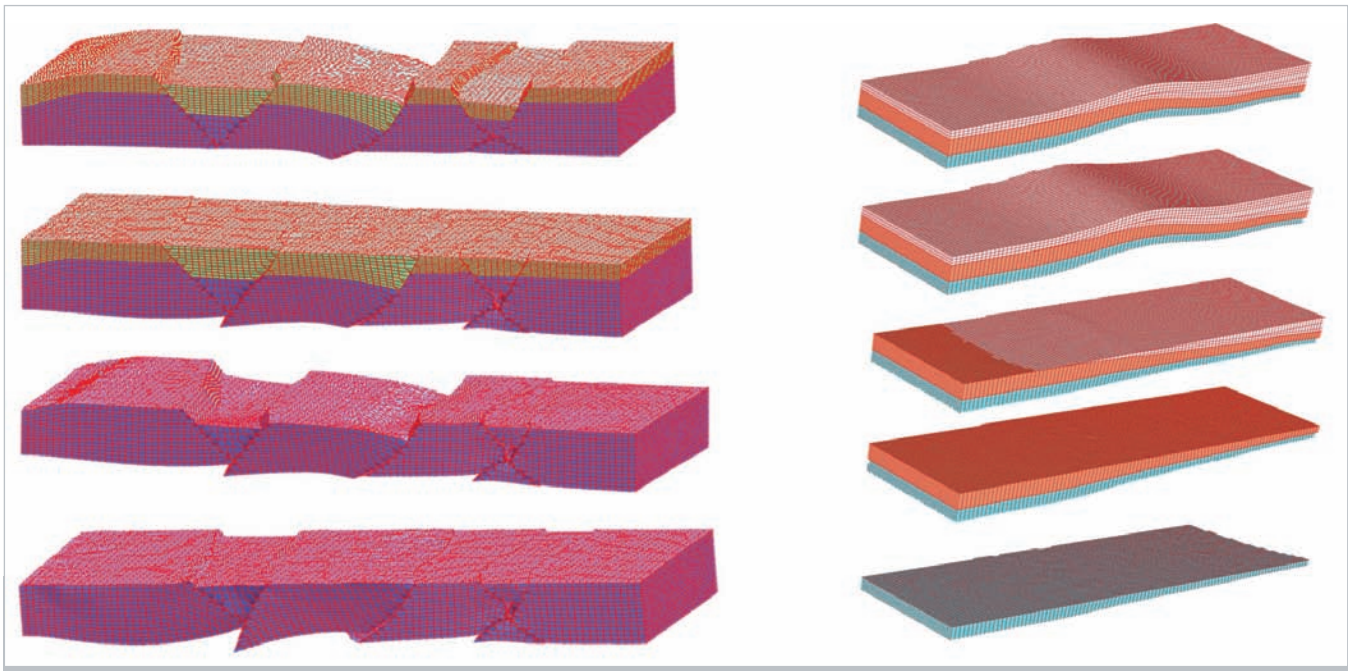
Kine3D-1 helps highlight incoherencies based on top-bottom geometrical relationships, fault-horizon incompatibilities, and strain evolution that might be missed in classic 2D interpretation. Kine3D-2 performs multi-surface restoration as well as cross-section restoration. Kine3D-3 performs 3D volume restoration of the subsurface layers.



3D Restoration

The SKUA Kine3D workflow adds geomechanical constraints to a SKUA model, and sequentially restores the subsurface model using a finite element (FE) geomechanical code. The output enables reconstruction of the source rock burial environment, as well as the geometry of carrier beds, structures versus time and strain/stress field for fracture modeling. Kine3D also interfaces with TemisFlow™, an essential step in the quantification of the petroleum system.

Combining Kine3D-3 and SKUA not only greatly simplifies the creation of the layered model, but also enables the construction of 4D basin modeling grids, including decompaction and re-incorporation of eroded volumes. Such thorough analysis of the petroleum system is integral to play assessment and averting risks when making drilling decisions for complex structures.



▲ Examples of sequential restorations of a grid defined inside a SKUA model

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Cross-section Interpretation and Restoration

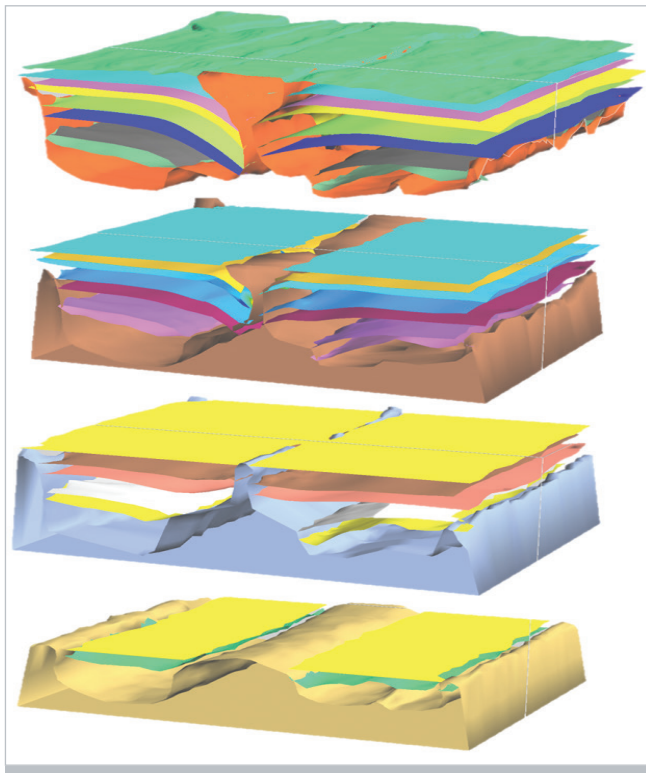
In complex 3D areas such as foothill zones, seismic data may be scarce or local. Building regional cross-sections is still the primary means to construct a structural model. Kine3D-1 allows users to project available data onto a cross-section, construct and/or correct structurally consistent horizons in 2D, and report the improvement in the 3D model. Kine3D-2 allows the restoration of these regional cross-sections for further validation. The unfolding methods in Kine3D-2 include simple shear, fault shear, flexural slip, isopach, anisopach, pin line, and free.

Surface Restoration of Multiple Layers

Kine3D-2 surface restoration allows users to restore a series of layers by restoring the top surface of each layer sequentially and letting other surfaces of the model honor the same deformation. The top layer is restored using simple shear or minimal deformation flattening methods.

Enhanced Efficiencies through Integration

The Paradigm interpretation modeling offering also includes the SeisEarth™ multi-survey interpretation suite and SKUA-based modeling applications. The multi-platform capabilities of SKUA Kine3D give geoscientists the tools to assess basin fluid migration, fracture distribution within the reservoir model and the validity of the subsurface model, all in a single integrated environment. Seamless integration both saves valuable time and increases the reliability of assessment information.



▲ Evolution of salt dome during surface restoration

Features

- Cross-section interpretation and restoration
- 2D surface restoration
- 3D volume restoration
- 4D basin model grid construction
- Strain/stress computation

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

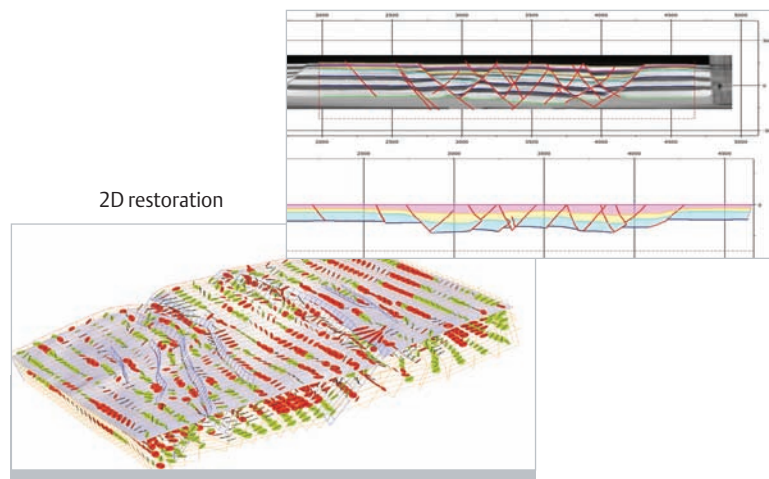
(*is a mark of Schlumberger)

System specifications

- Microsoft® Windows® 7, 8.1, 10
- 64-bit Red Hat® Enterprise Linux® 6.8 and subsequent minor releases, and 7.1 and subsequent minor releases

The Paradigm Advantage

- Extends understanding of the basin through unique 4D basin modeling.
- Validates structural interpretations and geometries with embedded geologic constraints.
- Uses the unique SKUA modeling technique to significantly simplify and accelerate the 3D restoration process.



▲ Deformation ellipsoid computed by Kine3D-3 restoration



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