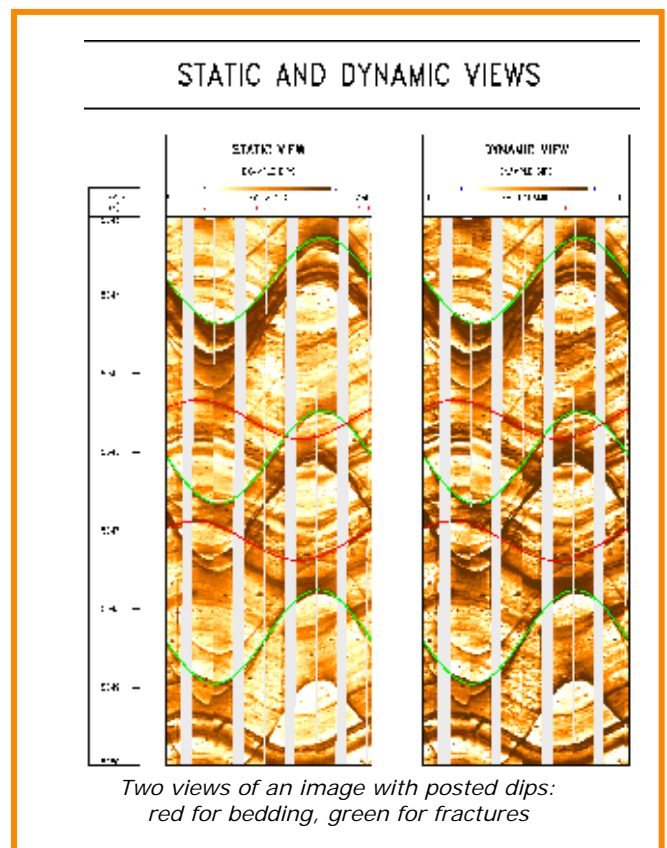


Petris Well Log Imaging Applications

The suite of imaging applications within PetrisWINDS Recall provide the greatest breadth of features overall of any product in the market for well log imaging. LOGSCAPE and SIGMA provide users with the best tools available for well log imaging, and are the acknowledged leader in this area. They are superb at integrating supporting borehole-related data. Their versatility allows a range of acquisition related problems to be effectively dealt with and overcome. Like all Petris products, LOGSCAPE and SIGMA are supported by a global team which is directly connected to the experts and developers of the products.

Key Features

- Supports all known imaging tools (wireline/pipe-conveyed & LWD)
- Robust and powerful algorithms for auto picking and speed correction
- Enables interactive depth matching of multiple images (including core photos)
- Versatile 'toolkit' of filters and enhancement options means no 'black boxes' are required – data is adjusted within the application itself.
- Provides full support for structural, sedimentological and stress-related feature analysis
- Sophisticated dip analysis options include directional statistics and rotation about arbitrary pole
- Uses breakout and tensile features in assessing critically stressed fractures and potential borehole stability



- Quantitative applications include threshold-based image statistics, fracture aperture estimation and fracture network statistics

Technical Features

Image Loading & Processing

- ▶ Loads data in DLIS, LIS, LAS formats
- ▶ Covers all known acoustic, resistivity (including OBM) and 'radioactivity' imaging tools, both wireline/pipe-conveyed & LWD
- ▶ Provides for scanned core slab photo input and depth registration
- ▶ Incorporates utilities for basic corrections, shifts, reconstructions and reference adjustments

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- ▶ Uses a sophisticated accelerometer correction
- ▶ Provides image normalization (static and dynamic) and equalization
- ▶ Incorporates cosmetic image enhancement, dud electrode repair
- ▶ Has a variety of image filtering options and calibration
- ▶ Automated dip picking on images

Interactive Image and Dip Interpretation

- ▶ User-controlled display of multiple images for interpretation (including core slab), plus supporting 'regular' data
- ▶ Interactive depth matching of multiple images (& core slab)
- ▶ Interactive filtering & re-normalization of image sections
- ▶ Interactive threshold picking on image data histograms
- ▶ Calculation of high-resolution image statistics curves from thresholds
- ▶ Interactive parameter selection for fracture aperture estimation
- ▶ Fracture aperture and fracture porosity calculation
- ▶ Feature picking includes full or partial sine waves (planar features), & breakout & tensile failures
- ▶ Optional 'apparent aperture/thickness' picking for sine waves
- ▶ Access to automatic dip picking algorithms for guided or unguided picks, optionally with constraints based on user-nominated direction
- ▶ Fracture network statistics (including borehole bias corrections)
- ▶ Interactive facies picking & characterization
- ▶ Dip population display & analysis on stereographic projections
- ▶ Identification and capture of structural dip or rotation axes
- ▶ Structural dip removal, & rotation of dips around user-specified axis
- ▶ Directional statistics on user-discriminated dip populations
- ▶ Plots to integrate images, dips, facies, zonations, regular log or core data (single or multi-well, single or multi-scale)

PetrisWINDS Recall LOGSCAPE is a unique interactive tool for the visualization and manipulation of borehole data. **LOGSCAPE** is able to instantly recalculate and redisplay data as a user 'drags' a threshold or a 'structural dip', so it is particularly useful as a training tool, as well as for sensitivity analyses.

LOGSCAPE provides interactive graphical editing and processing for all types of data stored in Recall. There is a range of input options and a toolbox of functions that can be combined into a specific user defined interactive application.

PetrisWINDS Recall SIGMA is the interactive borehole stability software package which can evaluate the stability of a potential borehole trajectory, or it can use observed breakout and tensile feature information to constrain the characteristics of the far-field stress tensor. It can also assess observed fractures and faults for critical stress. **SIGMA** is very tightly integrated with the image interpretation module, and they share characterization parameters for stress-related features such as breakouts.

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