

# SeisSense™ SEGY QC Analyzer

Seismic Data Integrity at  
Every Trace

AI-Augmented Quality  
Control for SEGY Data

## What is SeisSense™ SEGY QC Analyzer?

- Enables rapid and automated QC of SEGY files with visualization-driven diagnostics.
- Evaluates trace amplitude, frequency spectrum, spatial coverage, and data completeness.
- Detects anomalies such as amplitude distortion, missing headers, coordinate inconsistencies, and noisy traces.

# Transforming SEG Y Validation with AI

- **SeisSense™ SEG Y QC Analyzer** is a lightweight yet powerful tool built to streamline seismic data validation. It automates the quality control process for SEG Y files using interactive visualizations and AI-based pattern detection.
- **Key Capabilities:**
  - Automatically parses SEG Y headers and trace data for completeness and compliance.
  - Identifies missing, corrupted, or misaligned traces and metadata.
  - Generates visual QC metrics for amplitude, frequency spectrum, offset, and spatial geometry.
  - Flags inconsistencies such as bad coordinate ranges, abnormal energy levels, and format mismatches.
  - Built for seamless integration into upstream seismic processing workflows.
  - Reduces manual QC effort while improving accuracy and turnaround.
- **Designed for:** Geophysicists, data managers, and seismic processing teams
- **Outcome:** Faster QC, fewer data errors, and greater trust in seismic interpretation results.

# SEGY QC Analyzer Features

Visualization

Data Analysis

Customizability

Certification  
Checks

Missing Header  
Compliance

Header Details

Data Integrity  
Checks

Unit  
Standardization

Metadata  
Validation

Reference Data  
Validation

Error Reporting

Audit Trail

# SEGY Files - PPDM Rules for QA/QC



QA/QC Category as per PPDM 3.9	Platform Outcomes
<p><b>Metadata Validation</b></p>	<ul style="list-style-type: none"> <li>• <b>Check for Required Fields:</b> Ensure that all required metadata fields are present in the binary file header and trace headers, such as Job ID, Line Number, Reel Number, and Data Trace Number.</li> <li>• <b>Format Validation:</b> Verify that the metadata fields follow the correct formats (e.g., numeric fields, date fields).</li> </ul>
<p><b>Data Consistency</b></p>	<ul style="list-style-type: none"> <li>• <b>Consistency Across Sections:</b> Ensure that the data in the binary file header, extended header, and trace headers are consistent.</li> <li>• <b>Cross-Referencing:</b> Cross-reference metadata fields to ensure there are no discrepancies between related data fields.</li> </ul>
<p><b>Unit Standardization</b></p>	<ul style="list-style-type: none"> <li>• <b>Verify Units:</b> Ensure that all measurements use standard units as defined by PPDM (e.g., meters for depth, microseconds for time).</li> <li>• <b>Unit Conversion:</b> Apply necessary unit conversions to maintain consistency across the dataset.</li> </ul>
<p><b>Reference Data Validation</b></p>	<ul style="list-style-type: none"> <li>• <b>Standard Codes and Values:</b> Use standard codes and values for reference data (e.g., seismic acquisition parameters).</li> <li>• <b>Lookup Tables:</b> Validate data against reference lookup tables to ensure correctness.</li> </ul>
<p><b>Data Completion</b></p>	<ul style="list-style-type: none"> <li>• <b>Missing Values:</b> Identify and flag missing values in the dataset.</li> <li>• <b>Required Data Points:</b> Ensure all required data points (e.g., trace headers) are present and complete</li> </ul>
<p><b>Trace Header Validation</b></p>	<ul style="list-style-type: none"> <li>• <b>Check Required Fields:</b> Validate that all required fields in the trace headers are present and correctly populated.</li> <li>• <b>Field Formats:</b> Ensure that fields in the trace headers follow the correct formats (e.g., numeric, date).</li> </ul>
<p><b>Data Range Validation</b></p>	<ul style="list-style-type: none"> <li>• <b>Validate Data Ranges:</b> Check that data values (e.g., amplitude, time) fall within expected ranges to ensure they are reasonable and valid.</li> </ul>
<p><b>Audit Trail &amp; Version Control</b></p>	<ul style="list-style-type: none"> <li>• <b>Audit Trail:</b> Maintain an audit trail of changes made to the data during the QA/QC process.</li> <li>• <b>Version History:</b> Track versions of the SEG Y file to document updates and revisions.</li> </ul>
<p><b>Error Handling</b></p>	<ul style="list-style-type: none"> <li>• <b>Error Detection:</b> Implement mechanisms to detect and flag errors in the dataset.</li> <li>• <b>Error Correction:</b> Provide guidelines for correcting identified errors.</li> </ul>

# SEGY QC Visualization Parameters

Visualization	Description	Significance
Trace Amplitude vs. Time	Plots amplitude variation for a single trace	Helps identify anomalies in the time domain.
Amplitude of Multiple Traces	Compares amplitudes of the first 10 traces	Validates consistency of amplitude across traces.
Frequency Spectrum	Plots the frequency content of a trace	Identifies frequency-based artifacts or issues.
Mean Amplitude Across Traces	Shows the mean amplitude across all traces	Ensures balanced amplitude distribution.
RMS Amplitude Across Traces	Shows the RMS amplitude across all traces	Detects abnormal energy distribution across traces.
Max Amplitude Across Traces	Plots maximum amplitude across all traces	Highlights traces with unusually high amplitude values.
Amplitude Histogram	Histogram of amplitude values across traces	Analyzes distribution and spread of amplitude values.
SNR (Signal-to-Noise Ratio)	Plots the SNR across all traces	Identifies traces with high noise levels.
Crossline vs Inline Grid	Scatter plot of crossline vs inline values	Ensures consistency in spatial data (3D seismic data).
Amplitude Spectrogram	Time-frequency spectrogram for a trace	Analyzes frequency variation over time.

# SEGY QC Visualization Reports



QC Parameter	Description	Significance
File Format	Specifies the file format (e.g., SEG-Y)	Critical for ensuring proper file format for processing.
Byte Order	Indicates the byte order (big-endian/little-endian)	Important for interpreting the binary data correctly.
Job ID	Job identifier for the seismic data acquisition	Used for data tracking and validation.
Survey Name	Name of the seismic survey	Essential for identifying the dataset.
Company ID	Company that conducted the survey	Relevant for ownership and tracking metadata.
Seismic Data Type	Type of seismic data (2D or 3D)	Differentiates between 2D and 3D data types.
Sampling Interval	Time interval between samples in microseconds	Impacts the time resolution of the seismic data.
Data Format	Encoding format for data (e.g., IBM Float)	Affects how the trace data is stored and read.
File Size	Total size of the SEG-Y file	Helps in validating the integrity of the file.
Checksum (CRC-32)	CRC-32 checksum of the file	Used to check file integrity and ensure no corruption.
Trace Number	Sequence number of each trace	Validates the trace order in the file.
Inline Number	Inline coordinate for 3D data	Spatial reference for the inline axis.
Crossline Number	Crossline coordinate for 3D data	Spatial reference for the crossline axis.
Source X, Y, Z	Coordinates of the source	Spatial data for source points.
Receiver X, Y, Z	Coordinates of the receiver	Spatial data for receiver points.
Offset	Distance between source and receiver	Important for seismic processing and analysis.
Elevation Source/Receiver	Elevation values of source and receiver points	Provides spatial elevation reference for data points.
Trace Length	Number of samples per trace	Ensures uniformity in trace data.
Mean Amplitude	Average amplitude of all traces	Ensures balanced energy distribution across traces.
RMS Amplitude	Root Mean Square amplitude of all traces	Helps detect abnormal energy levels in traces.
Max Amplitude	Maximum amplitude of all traces	Identifies outliers in the amplitude values.

## Trace Amplitude QC Analysis

Select a SEG-Y file for Trace Amplitude Analysis:

D:\segy\F3\_Dip\_steered\_median\_subvolume\_IL230-430\_XL475-675\_T1600-1800.sgy

Enter the folder path to save all QC reports:

Run Trace Amplitude Analysis

### SeisSense™ QC-Analyzer

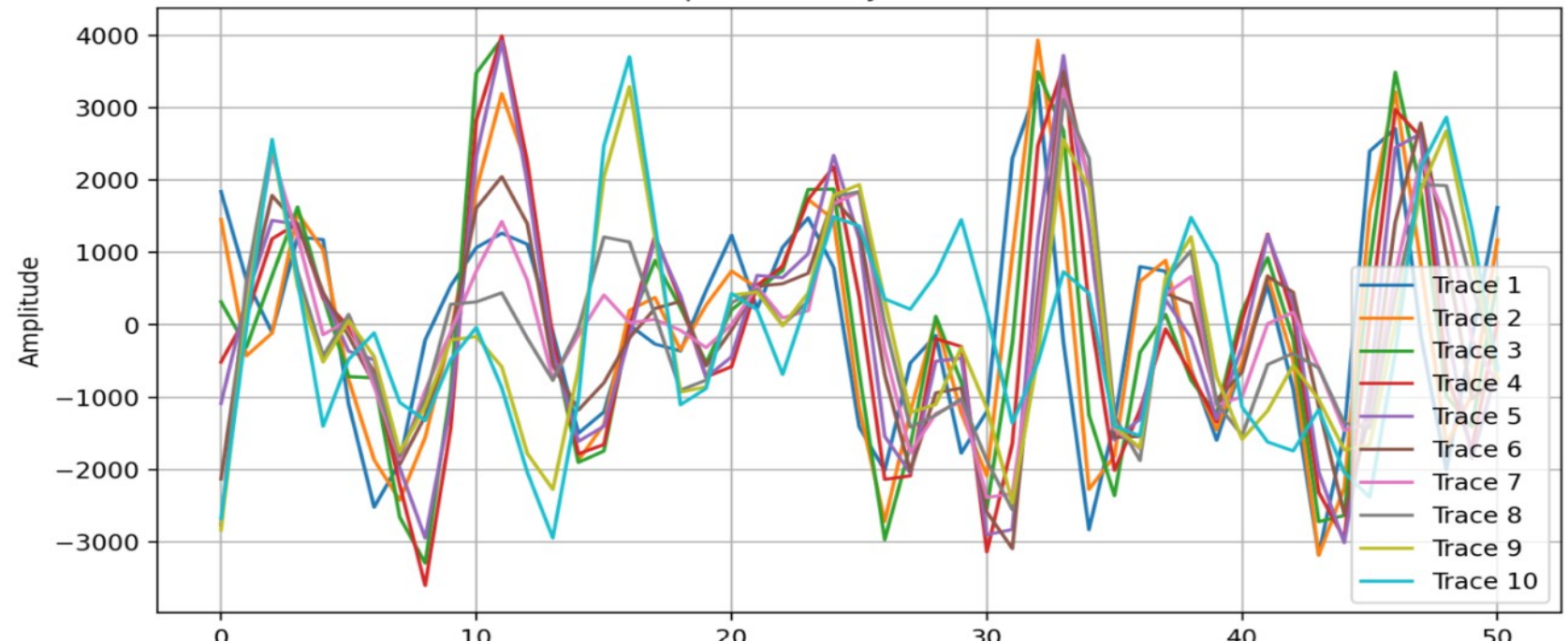
Analyze SEG-Y seismic data with multiple QC features.

Select a QC Feature:

- QC Analysis
- Trace Amplitude
- Noise & SNR
- Dead Traces & Gaps
- Seismic Energy & Frequency
- QC Reports
- Visualizations

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Trace Amplitude Analysis (First 10 Traces)



## SeisSense™ QC-Analyzer

Analyze SEG-Y seismic data with multiple QC features.

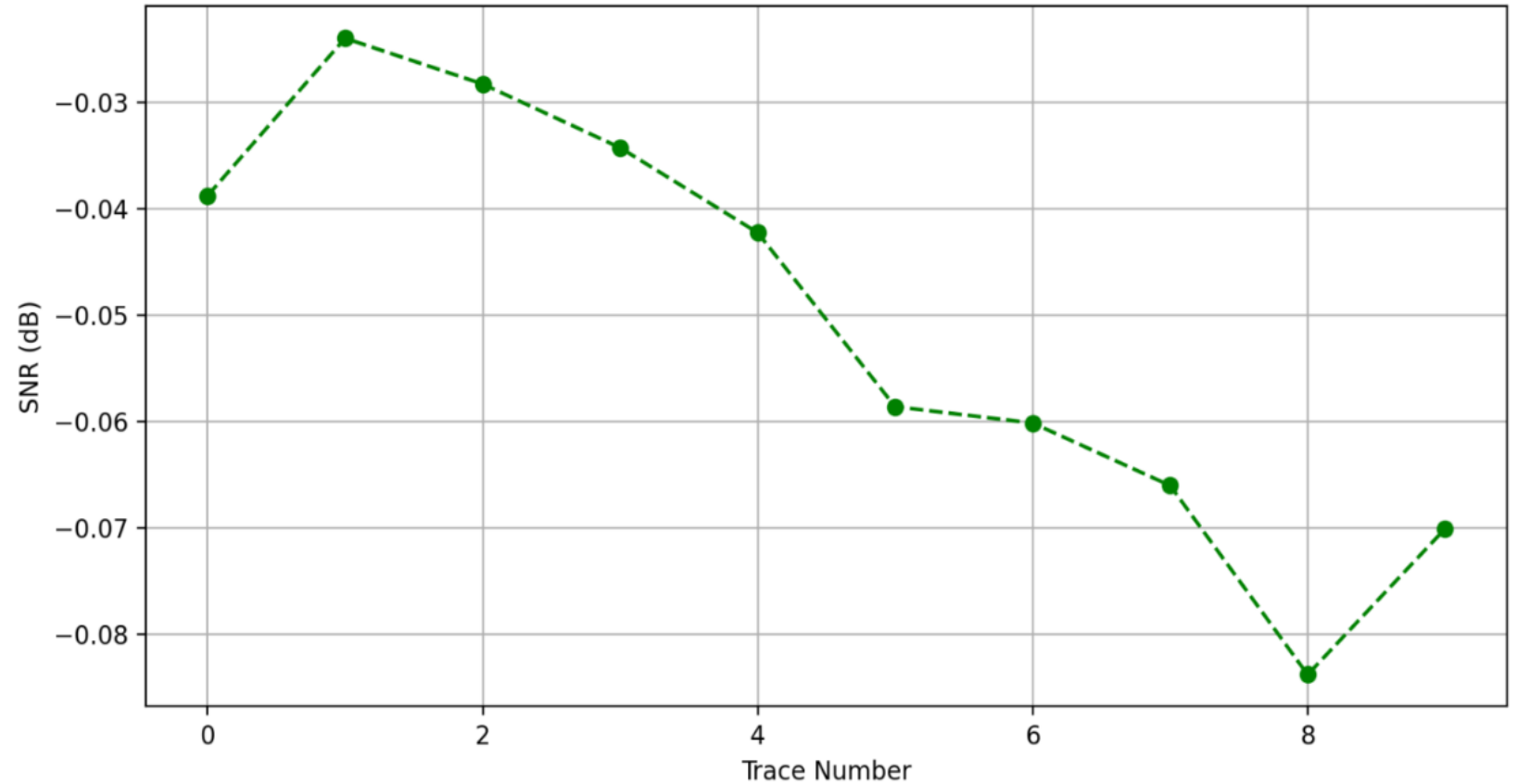
Select a QC Feature:

-  QC Analysis
-  Trace Amplitude
-  Noise & SNR
-  Dead Traces & Gaps
-  Seismic Energy & Frequency
-  QC Reports
-  Visualizations

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Run Noise & SNR Analysis

Signal-to-Noise Ratio (SNR) Across Traces



## SeisSense™ QC-Analyzer

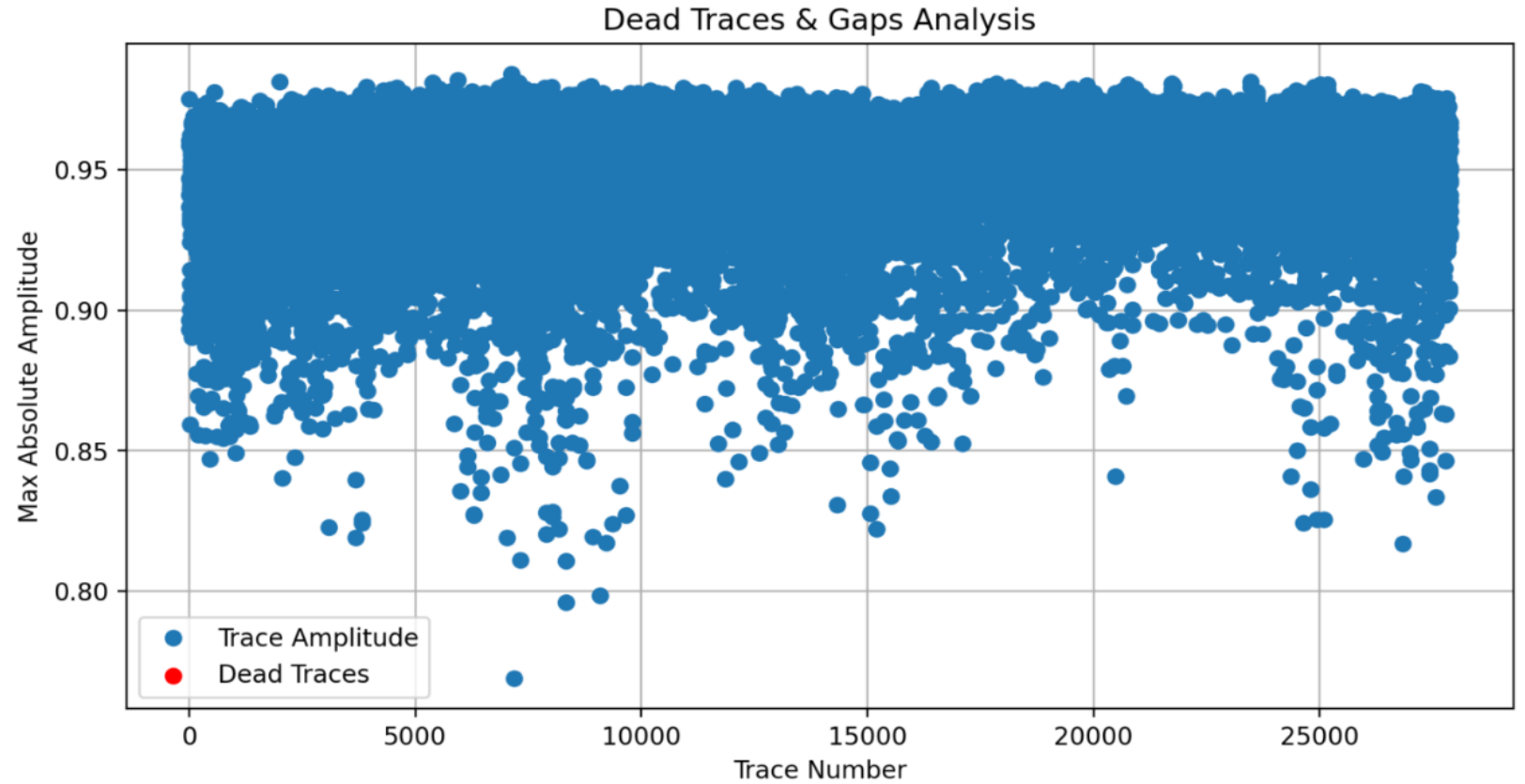
Analyze SEG-Y seismic data with multiple QC features.

Select a QC Feature:

- QC Analysis
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- Noise & SNR
- Dead Traces & Gaps
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- QC Reports
- Visualizations

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Run Dead Traces & Gaps Analysis



No dead traces detected.

## SeisSense™ QC-Analyzer

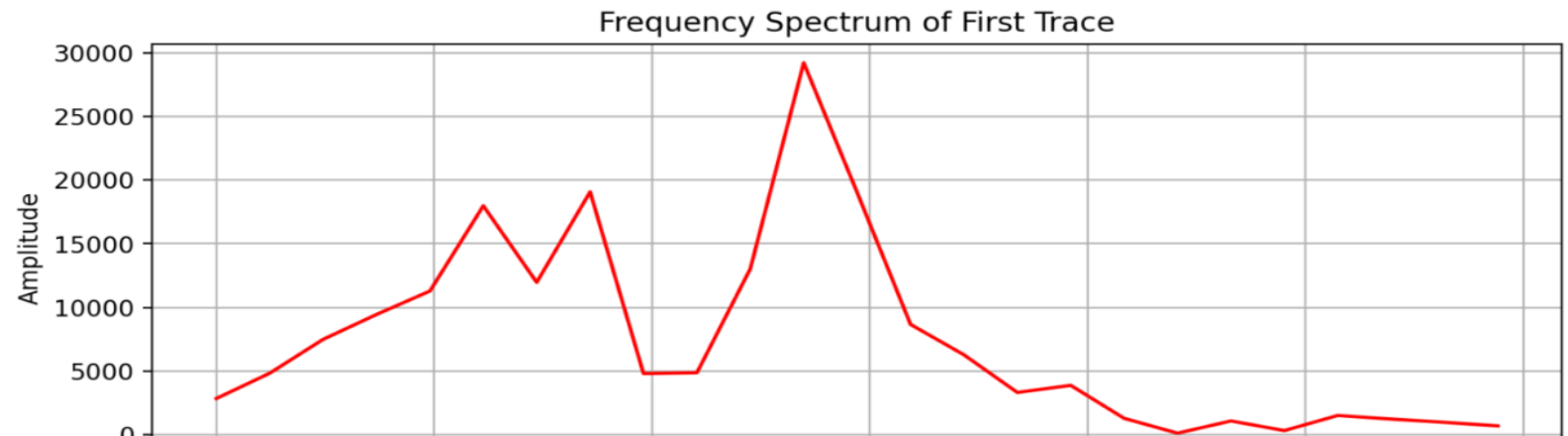
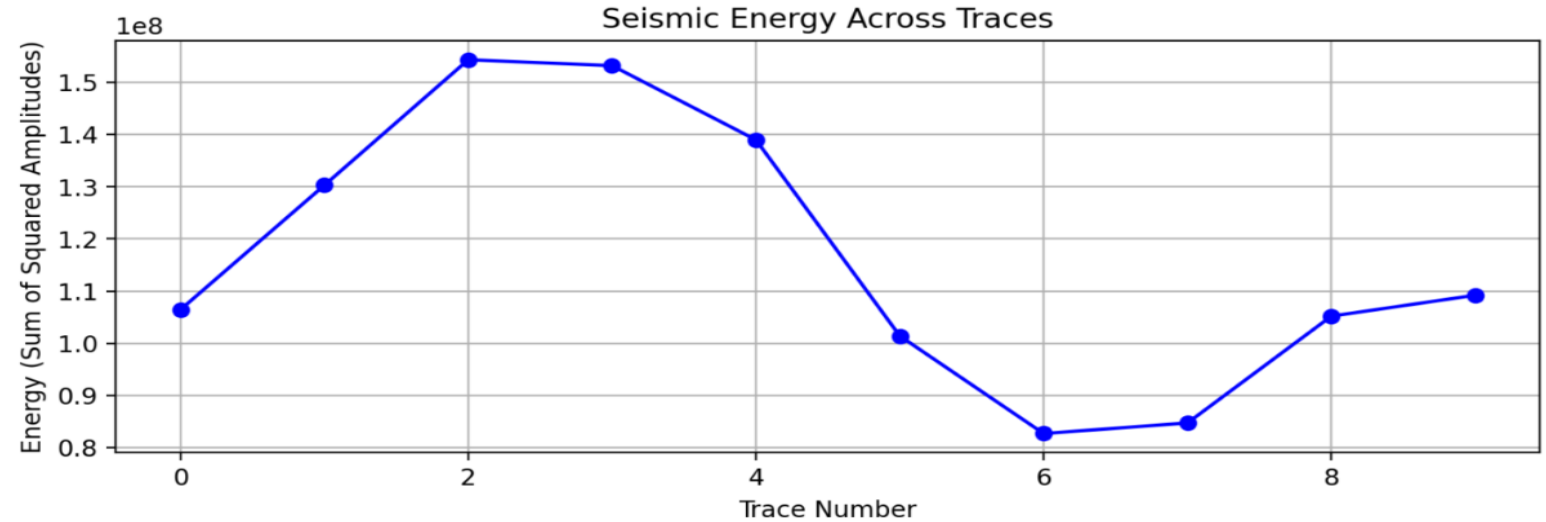
Analyze SEG-Y seismic data with multiple QC features.

Select a QC Feature:

- QC Analysis
- Trace Amplitude
- Noise & SNR
- Dead Traces & Gaps
- Seismic Energy & Frequency
- QC Reports
- Visualizations

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Run Seismic Energy & Frequency Analysis



## SeisSense™ QC-Analyzer

Analyze SEG-Y seismic data with multiple QC features.

Select a QC Feature:

- QC Analysis
- Trace Amplitude
- Noise & SNR
- Dead Traces & Gaps
- Seismic Energy & Frequency
- QC Reports
- Visualizations

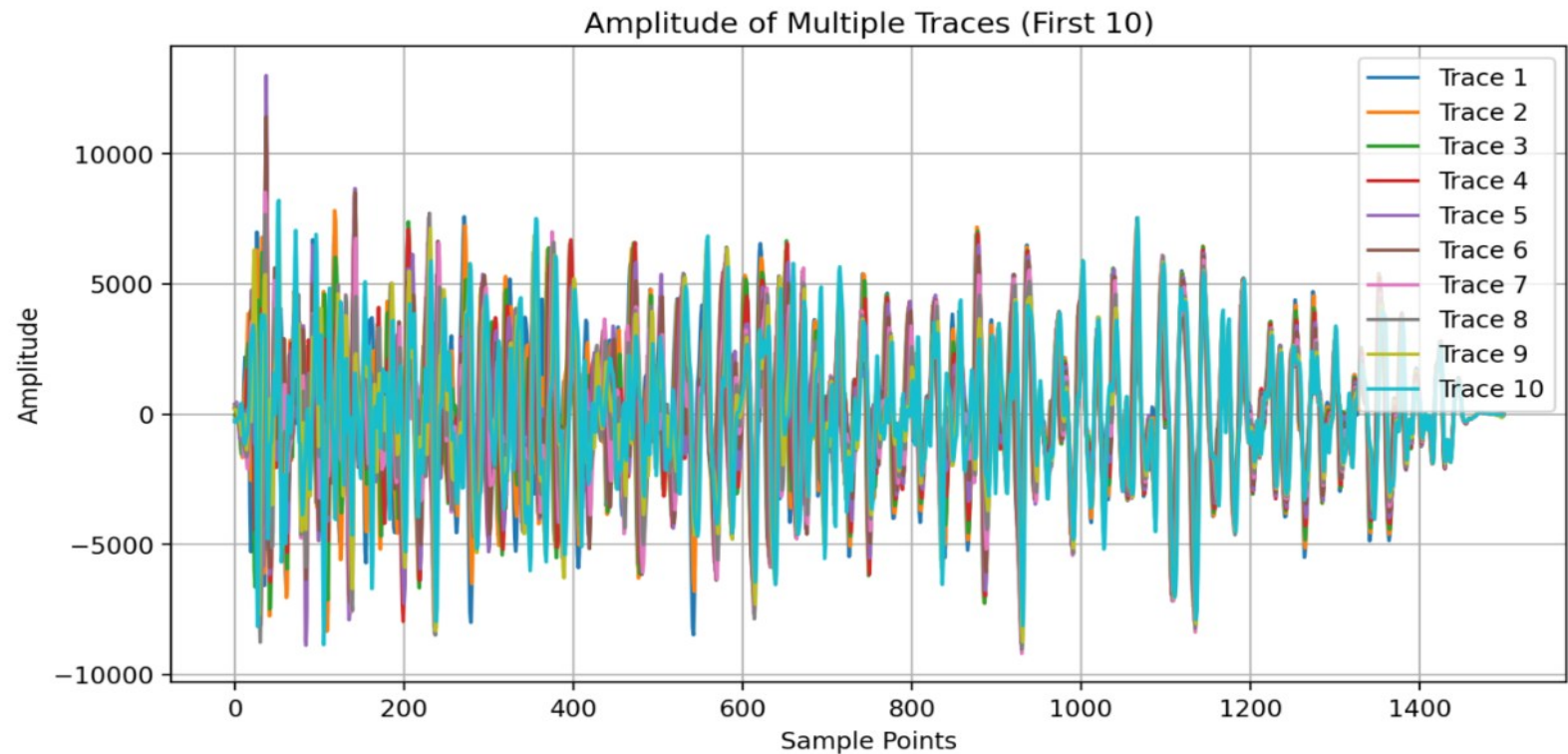
SeisSense™ QC-Analyzer | Powered by AI & Geoscience

## QC Visualizations

Select a SEG-Y file for Visualizations:

D:\segy\file19.sgy

Generate QC Visualizations



# Deployment & Integration

## Deployment Options:

Cloud-based AI Processing.  
On-premise HPC Integration.  
Hybrid AI Model Deployment.



## Integration Capabilities:

Connects with Petrel, OpendTect, DecisionSpace.  
Supports SEG-Y, LAS, and other geophysical formats.  
Custom APIs for seamless data ingestion.

# Thank You

**Driven by Data. Designed for Industry.**

