Outline

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USE OF ADVANCED DATA PROCESSING TECHNIQUES IN THE IMAGING OF THE COSO GEOTHERMAL FIELD

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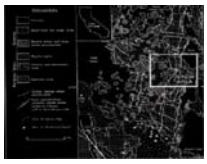
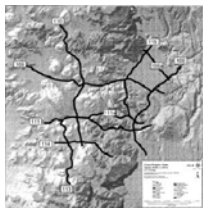
Introduction

- **The advanced data processing methods are used to :-**
- constrain the down-dip geometry of tectonic structures
- characterizing features that are potentially significant for evaluating subsurface permeability;
- imaging deeper structures and assessing their relationship to faults and fractures controlling reservoir production.

Introduction

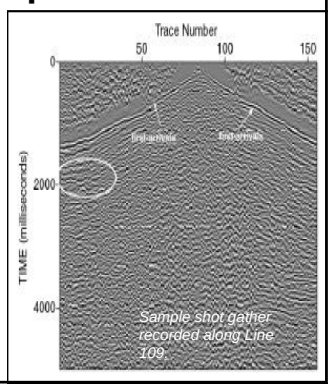
- Volcanic Terrain
- The Coso Geothermal Field, Inyo County, California
- 32 miles of seismic data
- To make effective use of advanced data processing methods
  - Nonlinear velocity optimization
  - Pre-stack Kirchhoff migration





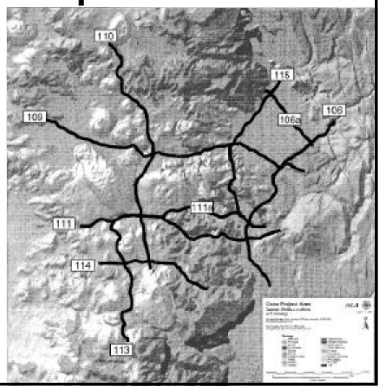
Data Acquisition

- At first the nonlinear optimization method were used to obtain high-resolution velocity models from picking the seismic first arrivals and using these models in a pre-stack Kirchhoff depth migration to image subsurface structures.
- automatic gain control was applied to the data in order to enhance the reflections.



Data Acquisition

- The lines were set out primarily along open roads in rough terrain
- Collect 2D as well as 3D data
- All stations were active during data acquisition
- The source is the vibroseis
- shot spacing 440 feet
- geophone spacing 220 feet



Methods Used

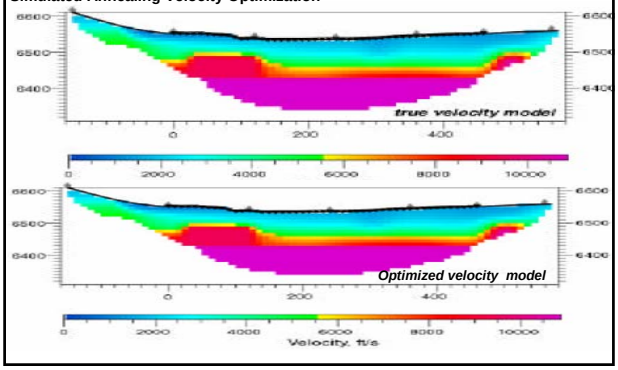
- **Simulated Annealing Velocity Optimization**
  - can match P-wave (or Swave) arrival times to a velocity model
- **SeisOpt® @2D™ to obtain the velocity models for the project**
  - This is done by testing several models (***Synthetic***) constructed from the same first arrivals

Methods Used

- Two processing techniques were used for processing
  - A nonlinear optimization method, called simulated annealing: used to derive high-resolution velocity models from seismic first arrivals picked off raw data.
  - Pre-stack Kirchhoff depth migration to directly image subsurface structures.

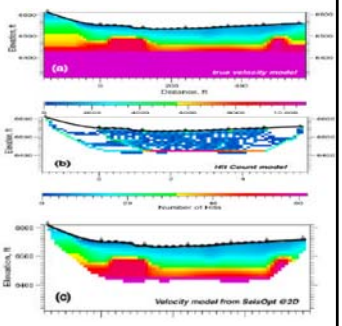
Methods Used

Simulated Annealing Velocity Optimization



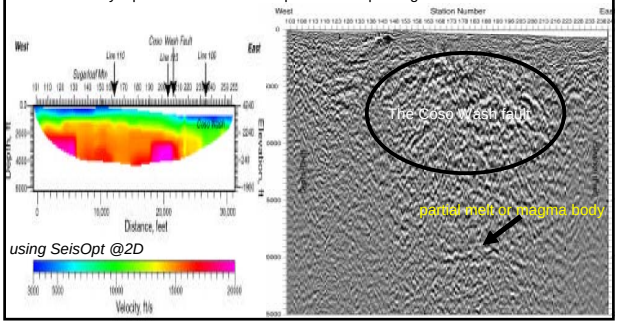
Methods Used

- **Synthetic example**
- ***(a). True velocity model used for the synthetic test. The objective is to determine if the optimization reconstructs this model.***
- ***(b). First-arrival rays through this model.***
- ***(c). Output of SeisOpt @2D. The algorithm only displays regions that have been constrained by the first arrival times recorded at the surface.***



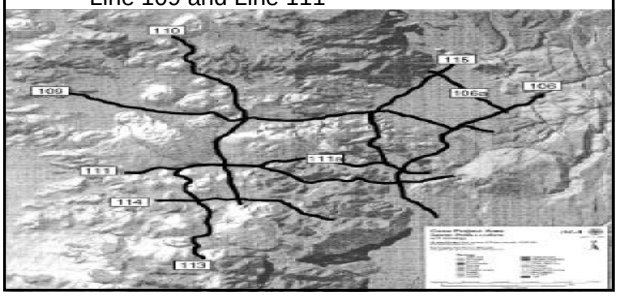
Results

- Velocity Optimization &Kirchhoff pre-stack depth migration Line 109

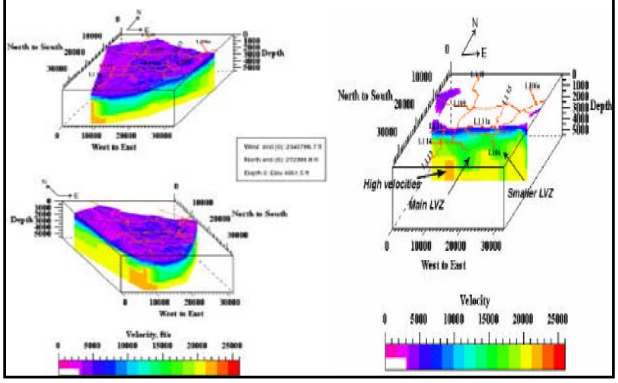


Results

- Providing two of the seismic profiles,
  - Line 109 and Line 111

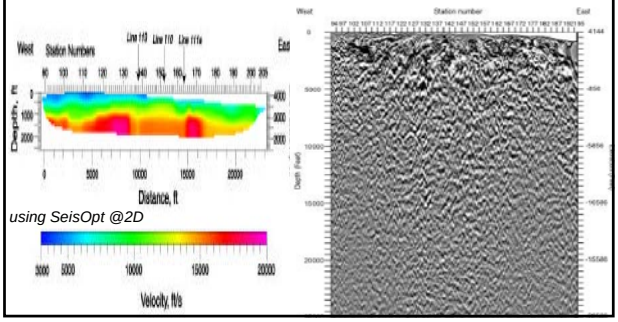


Results



Results

- Velocity Optimization &Kirchhoff pre-stack depth migration Line 111



using SeisOpt @2D

Conclusion

Comparsion between the Kirchhoff pre-stack depth migration and the conventional seismic data processing techniques along line 109