Writing a lab manual on 3D processing of land data: Can an old dog learn new (Wiki) tricks?

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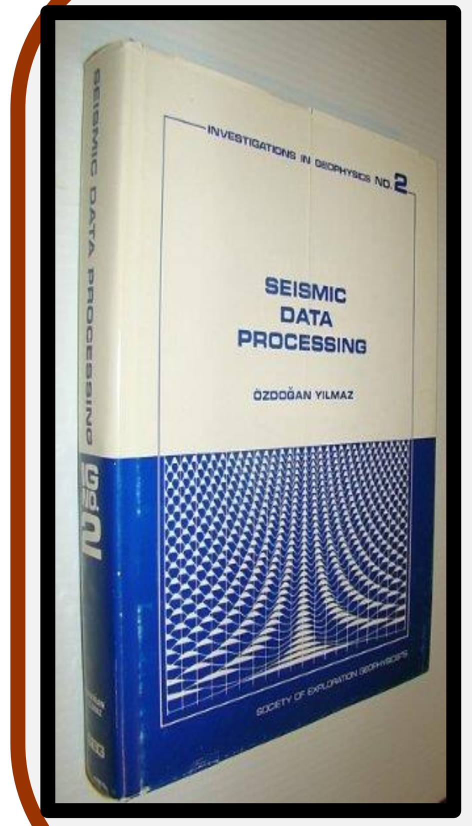


There are many excellent textbooks that describe theory and present case studies. However, students seem to learn best by making mistakes, identifying the mistakes, and then rectifying them.

Most Universities conduct lab exercises that process 2D data. Several lead excellent 3D imaging and anisotropy efforts. So far, I haven't encountered any University that conducts labs on 3D processing of land data.

Problem: Today's students are adept at modern quantitative processing workflows, but assume that the data presented to them by professional processors are accurate.

Objective: Provide students with an in depth understanding of the assumptions and approximations made in 3D processing of land data

Assumptions: Today's students are "hands-on" learners, less "excited" about theory but more adventurous with software.

Proposal: Develop a an online lab manual on 3D seismic processing using commercial software. Distribute this manual through the SEG, along with 3D prestack land data volume, as part of the IQ Earth initiative.

Challenges: University professors are strong on theory but weak on practice. Furthermore, academic culture rewards development of new technology and analysis, rather than capturing "best practices" and well-established workflows.

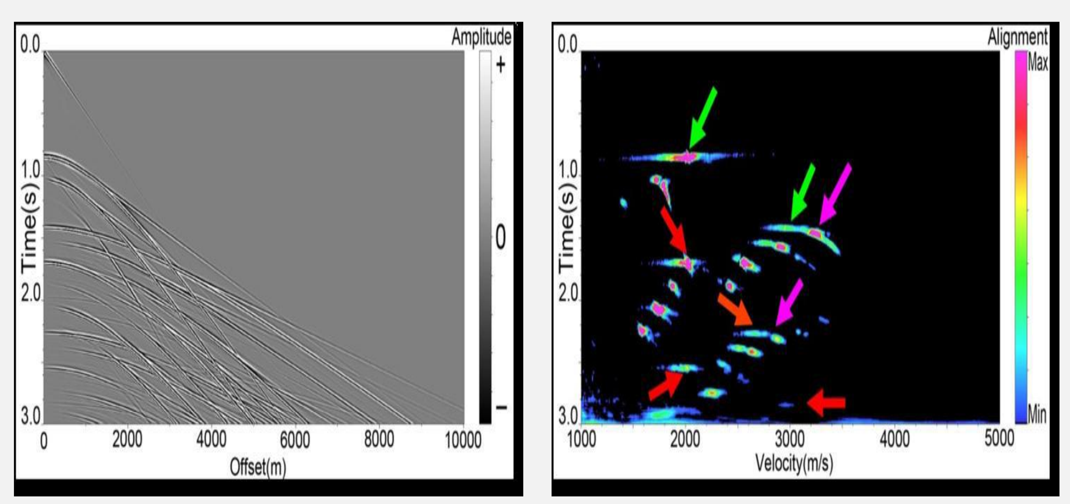
Solution: Find an old dog with tenure and teach the masters teach him new tricks. The dog will then capture these tricks as a Wiki that will hopefully have a life longer than 3.14 years. Start with ProMAX. Then Vista?

noun: **wiki**; plural noun: **wikis**

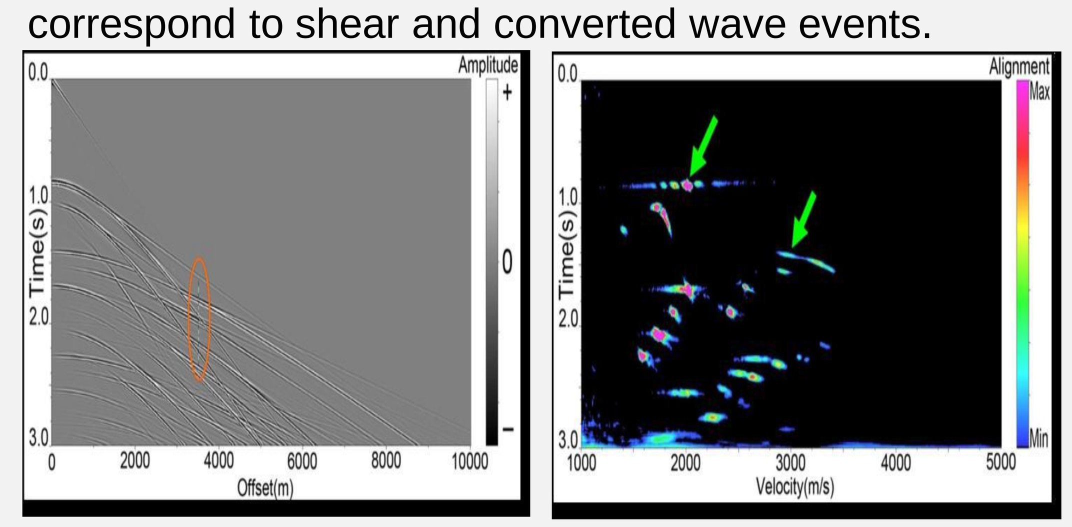
1. a website that allows collaborative editing of its content and structure by its users.
2. something Marfurt can prototype in Spring 2013 and trick others smarter than him to maintain.

One of several places to capture best practices.
Others include ProMax user group meetings, and visits to processing shops

Sample Content: What are all those wrap-ups on velocity panels?



An elastic CMP synthetic showing the velocity wrap-up patterns of primaries (green arrows), simple multiples (red arrows), and peg leg multiples. Note the pattern of walk back pattern of interbed multiples. Other wrap-ups correspond to shear and converted wave events.



The same synthetic showing the impact of noise burst velocity spectra. (Courtesy of Thang Ha, OU Senior in Spring 2013).

Week No.	Lab Description
1	Getting started. Importing a seismic data volume. Defining header geometry, geometry QC, and flex binning
2	Data QC – plotting shot and receiver locations and elevations. Generating cdp location, fold, and spider diagrams.
3	The data base tool, geometry application, applying field statics, and trace display. Data sorting and display – common shot, receiver, offset, azimuth, and midpoint gathers.
4	Trace editing, removing 60 Hz noise, and first break picking. Geometry QC through first break consistency
5	Refraction statics
6	Spectral analysis, autocorrelation and spiking deconvolution. Converting vibroseis signals to minimum phase.
7	Surface consistent deconvolution and trace amplitude balancing.
8	Supergathers and velocity spectra: The appearance of primary reflectors, headwaves, and multiples. Velocity picking. Discriminating between good, fully populated gathers and bad, sparsely populated gathers.
9	Normal moveout and muting
10	Generating a brute stack (with various mutes applied)
11	Residual statics estimation/denser velocity analysis/NMO iteration.
12	Air wave attenuation. Modeling ground roll using linear moveout and coherence analysis.
13	Improved velocity analysis after coherent noise suppression. The impact on velocity spectra of sparse gathers and strong noise.
14	Prestack time migration
15	Residual velocity analysis of prestack time migrated gathers. The Deregowski loop.
App	
A	Defining header geometry from observers notes
B	Advanced header manipulation, best practices, and geometry QC techniques
C	5D interpolation

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