Multicomponent data in a complex setting: Catatumbo, Colombia

Saul Guevara
Gary Margrave
Robert Stewart

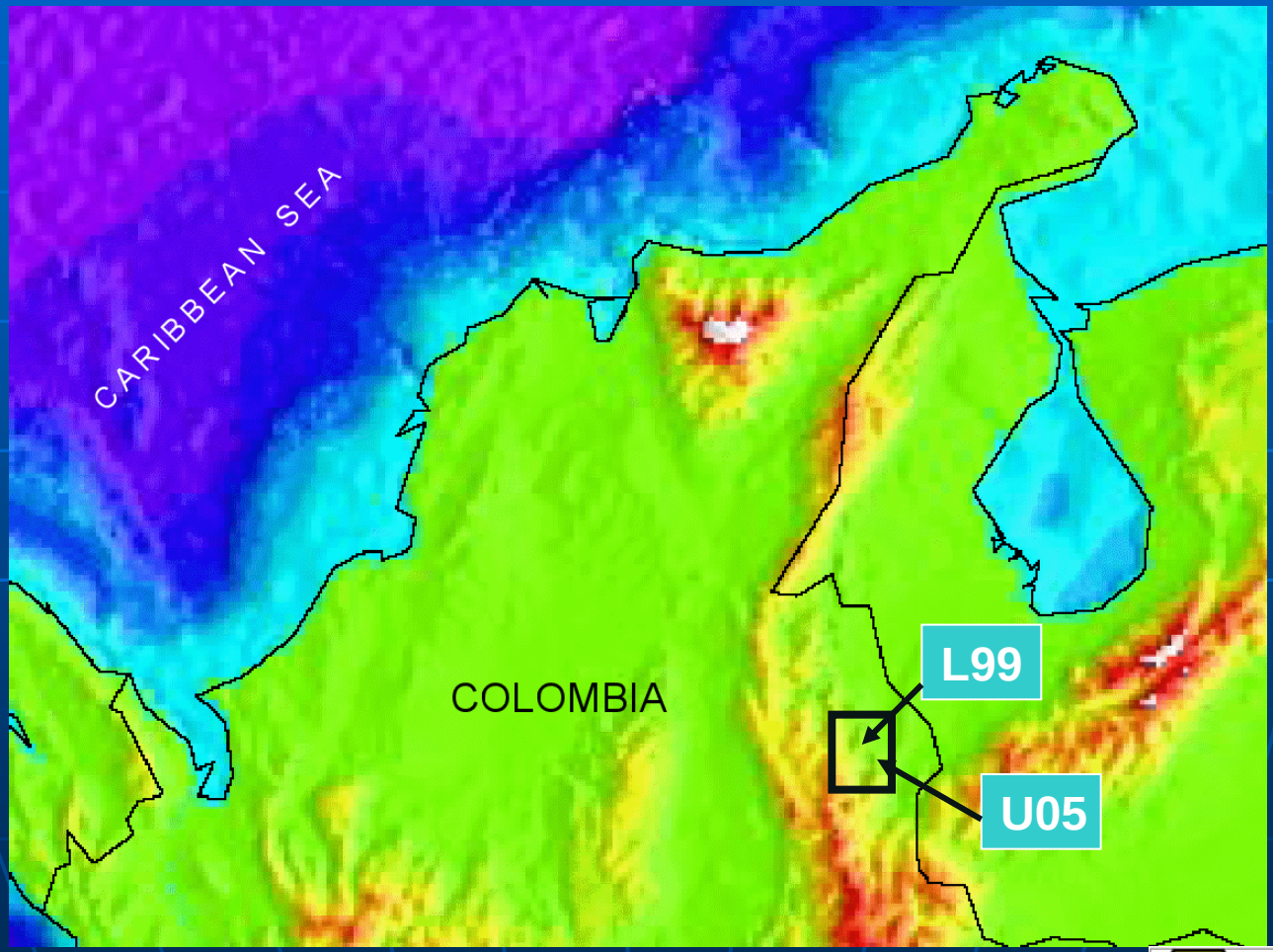
CREWES

UNIVERSITY OF CALGARY

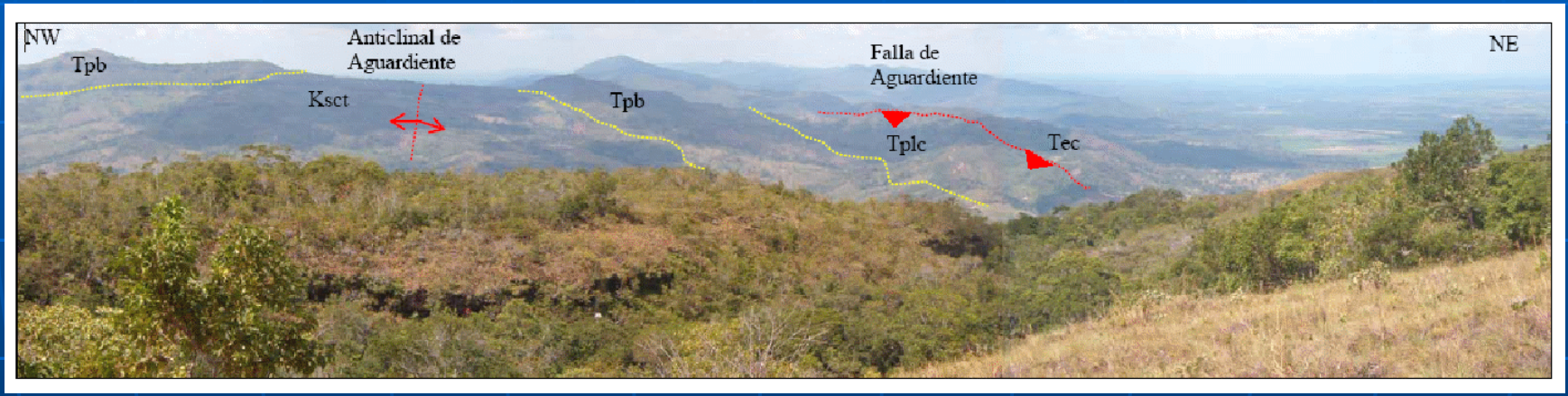
Outline

- The Catatumbo area and the 3C data.
- P-wave separation in 3C taking into account the topography.
- Converted wave processing issues.
- Conclusions and future work.

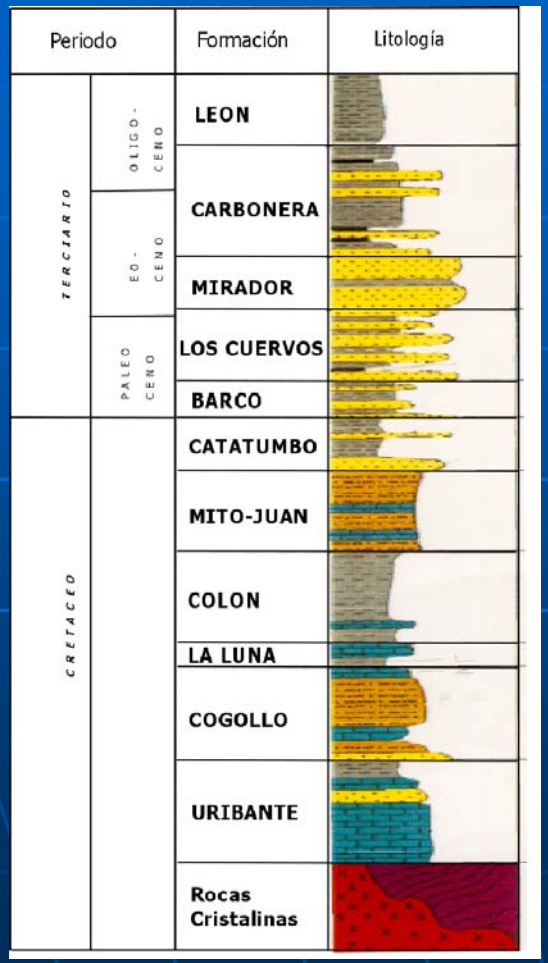
Catatumbo basin, Colombia

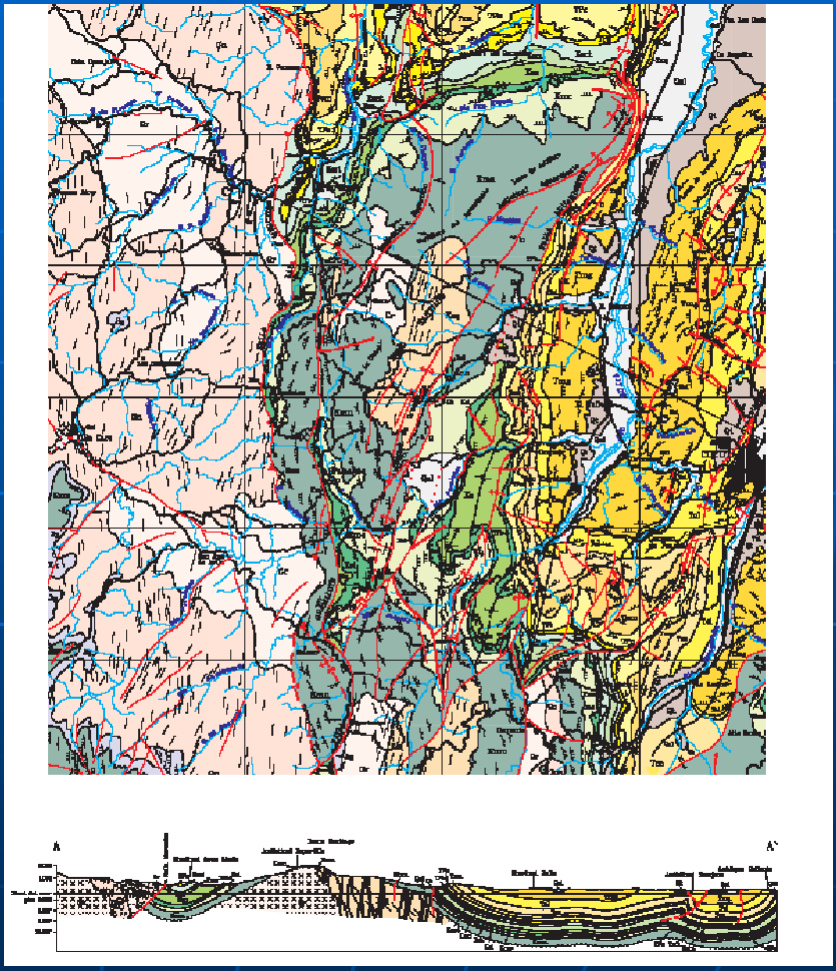


Landscape and Geology

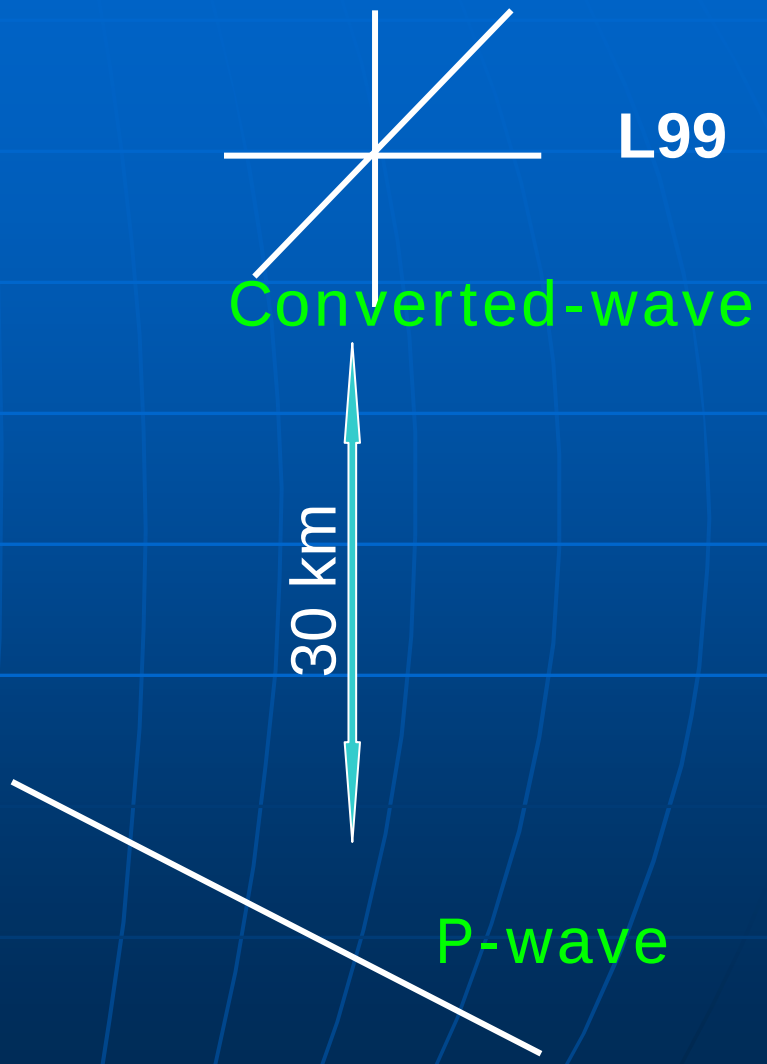


Landscape and Geology

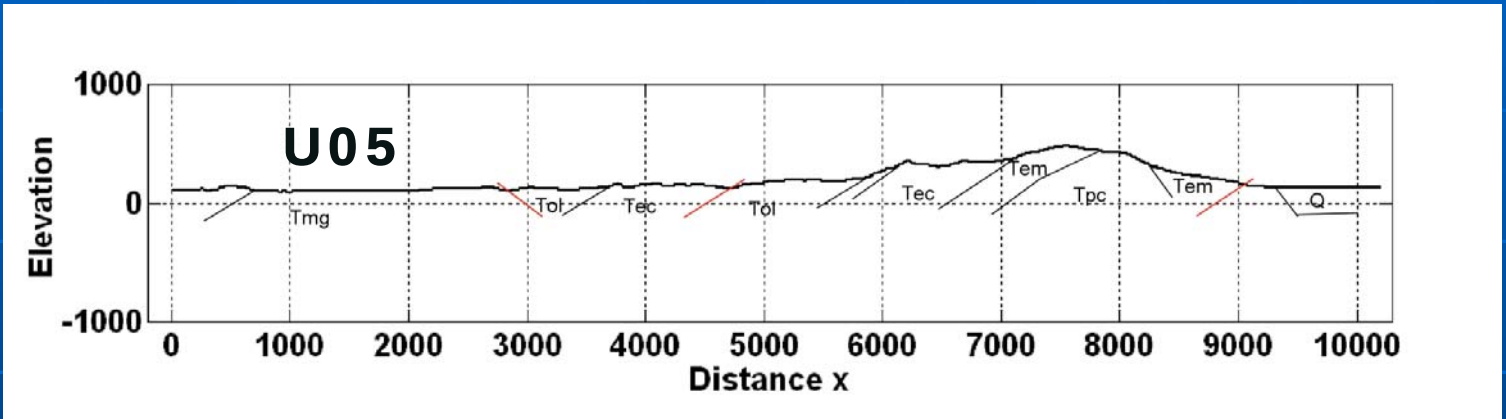




3C Seismic lines

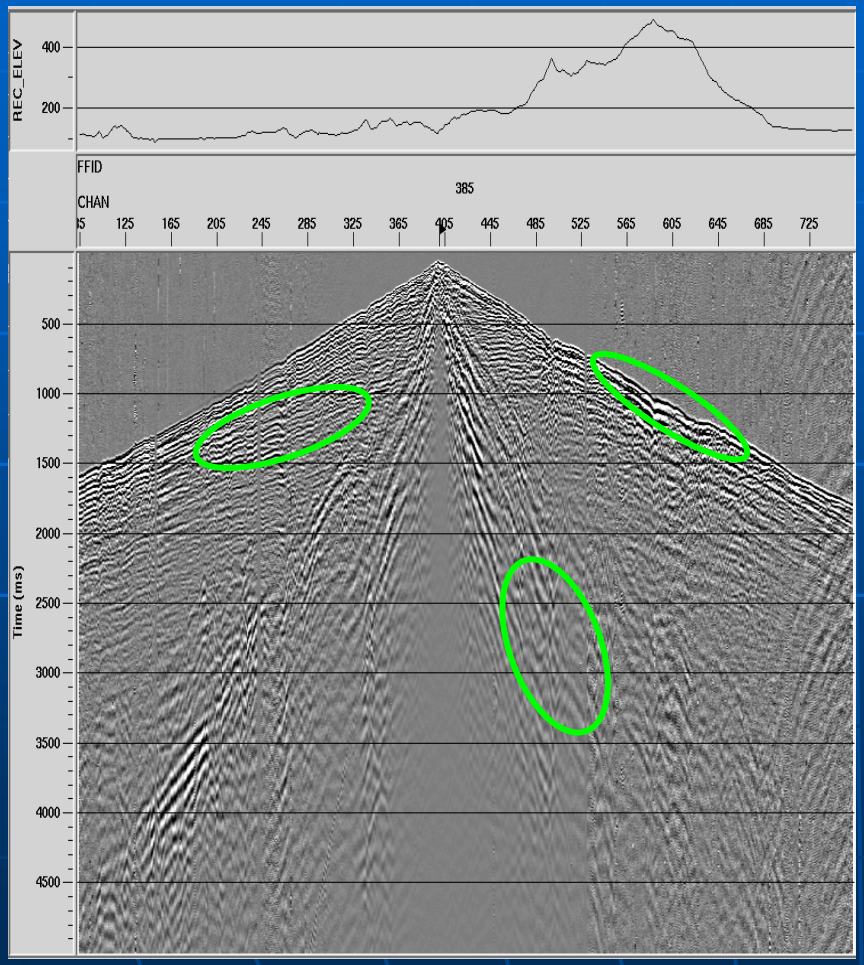


3C Seismic lines

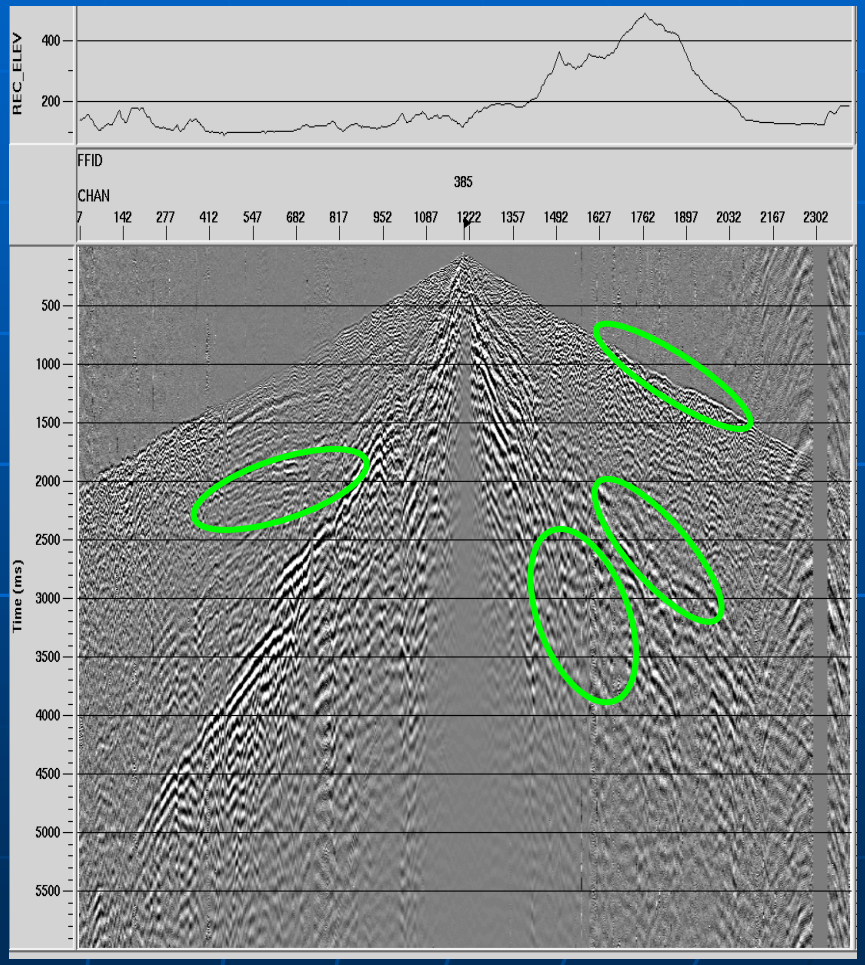


P-wave with 3C

Shot gathers from U05

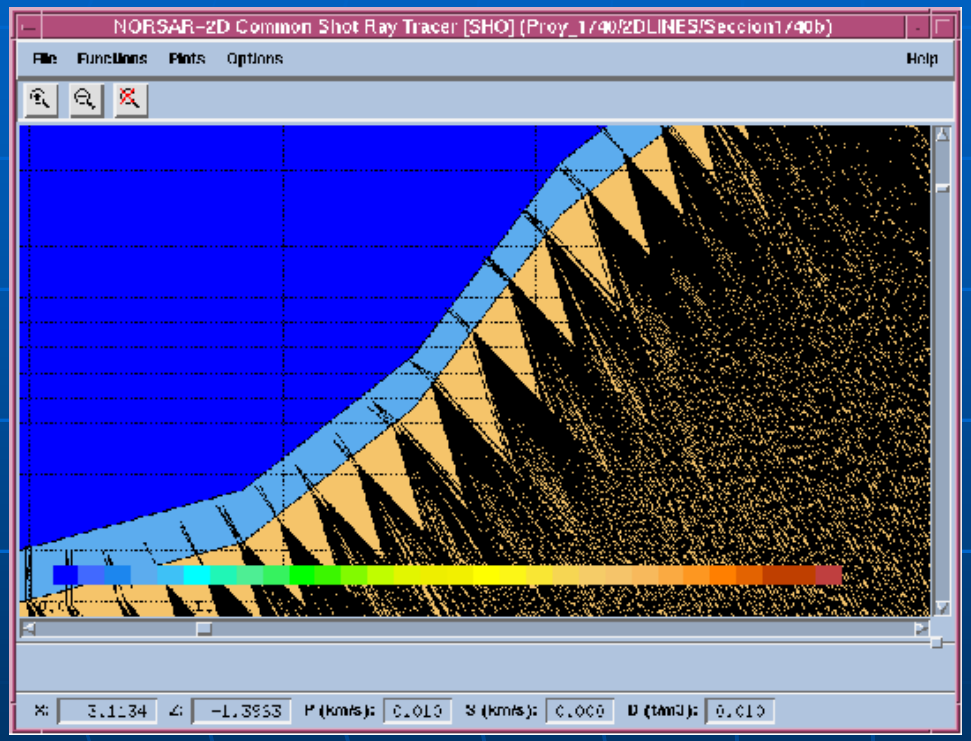


Vertical

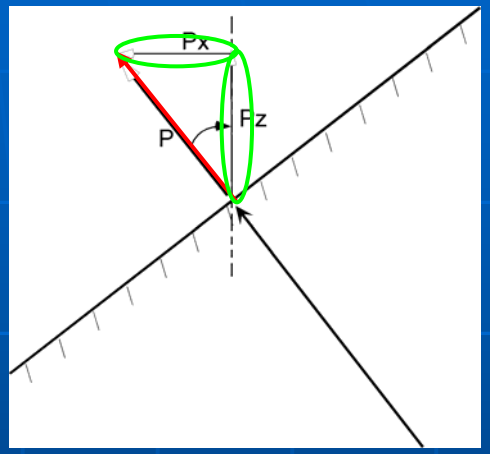


Horizontal

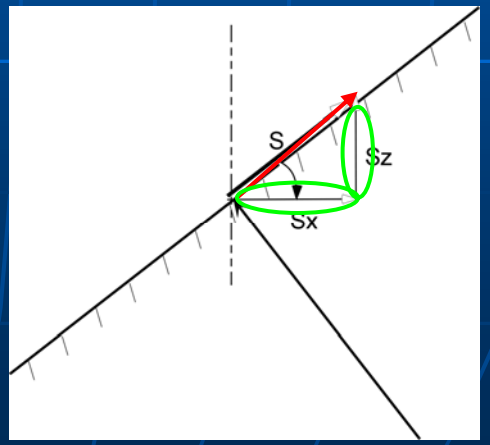
Topography, wave modes, and components



Ray trace modeling of Colombia Foothills:
Wave incidence is (almost) normal to the surface.

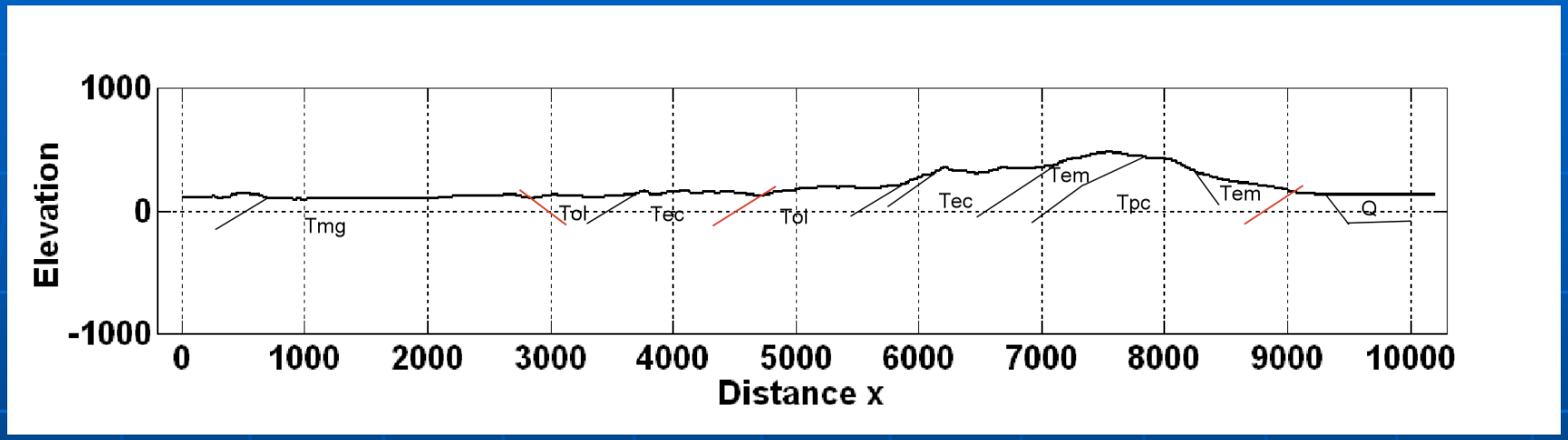


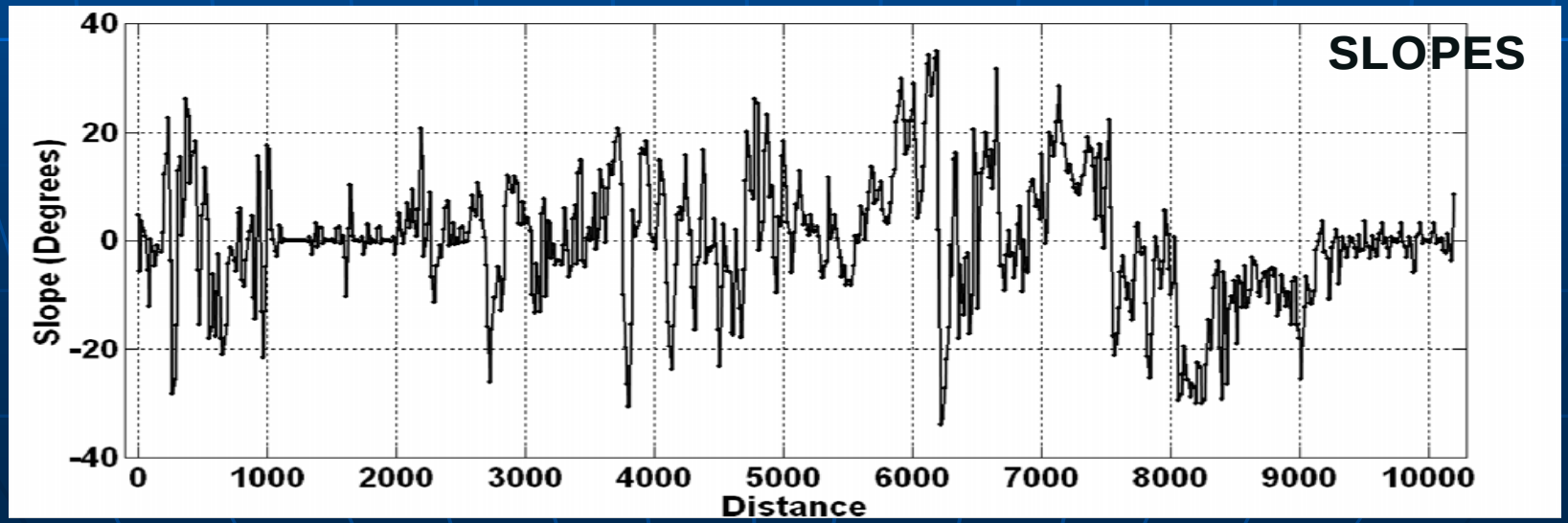
P-wave



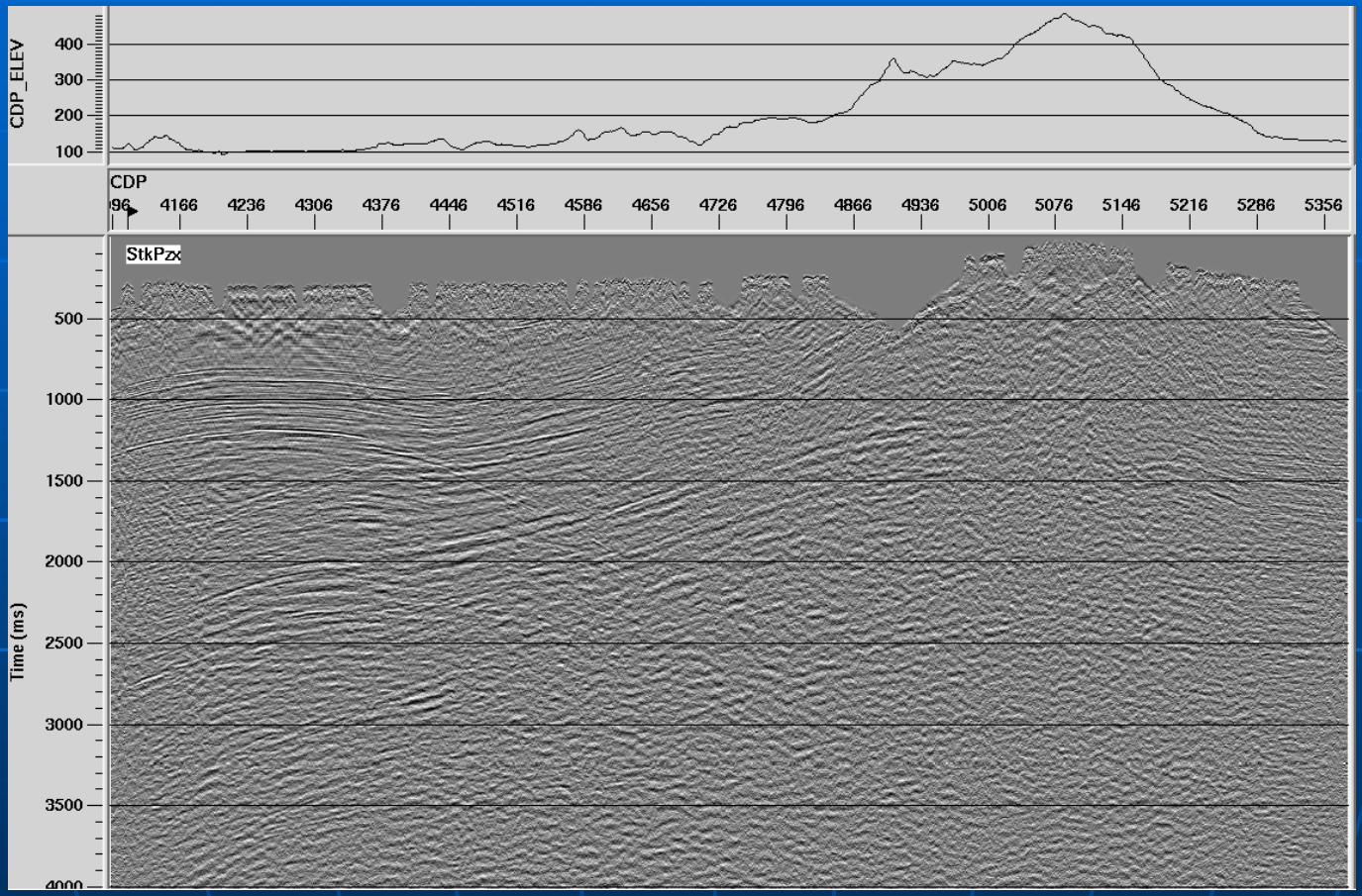
S-wave

U05 :Topography and slopes





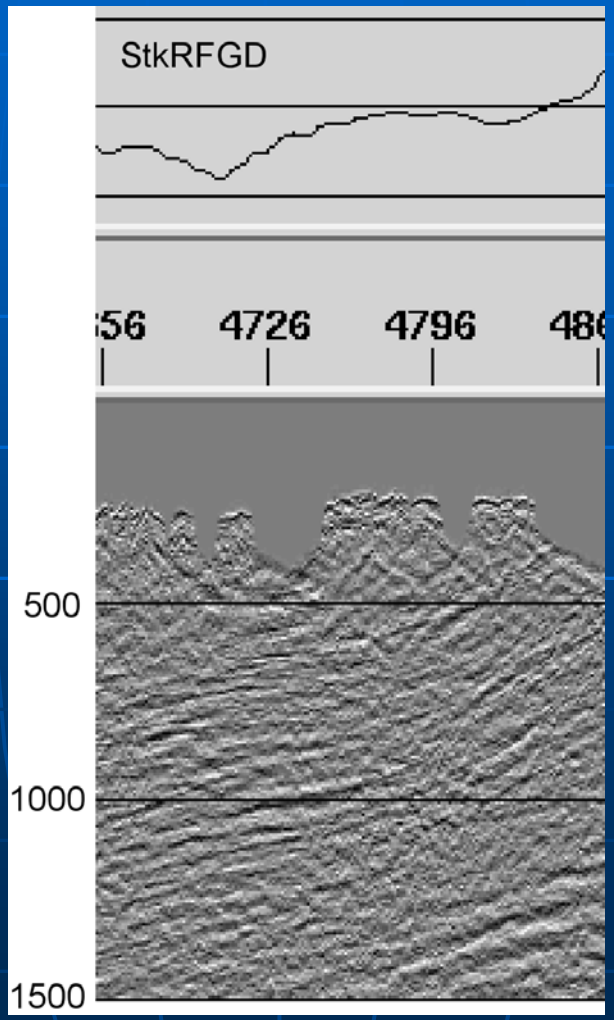
Stacked Section – P wave



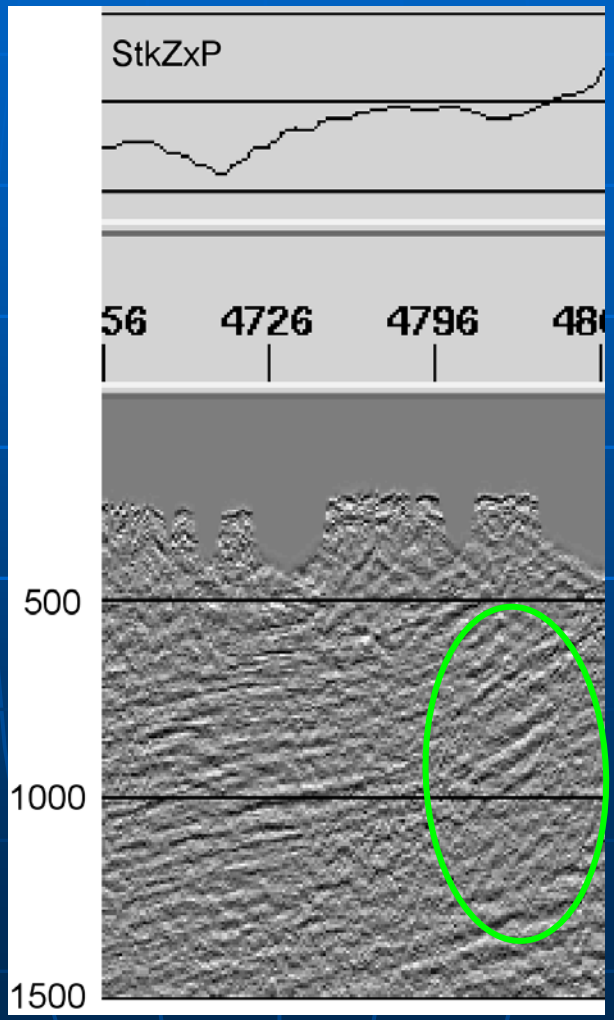
-Radial trace filtering

-Gabor decon

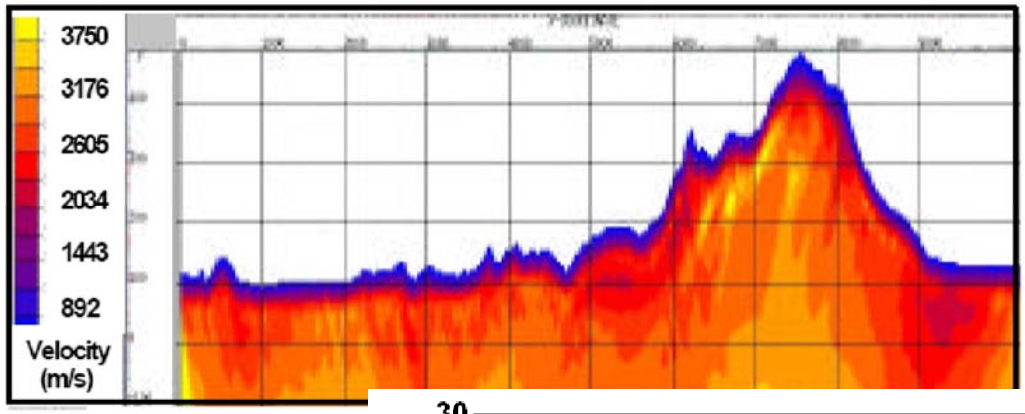
Close-up before mode separation

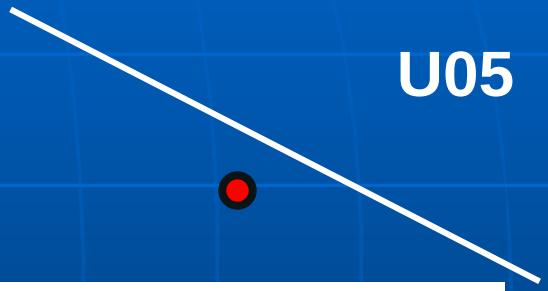


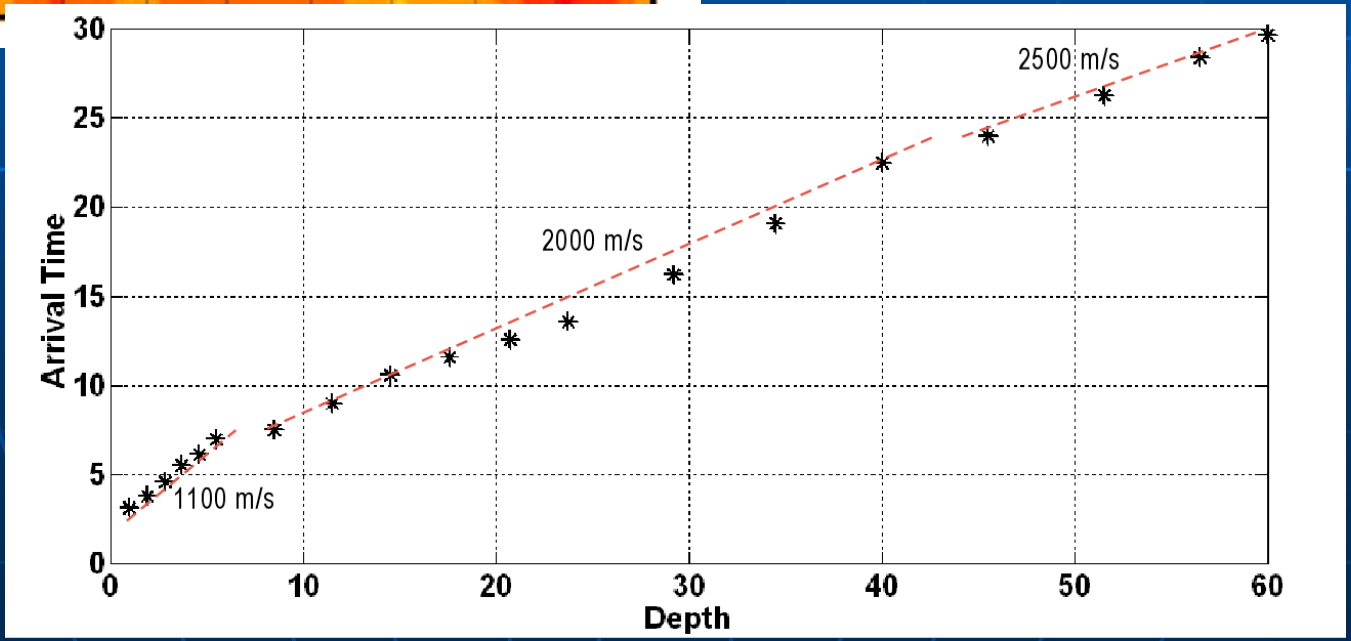
Close-up after mode separation



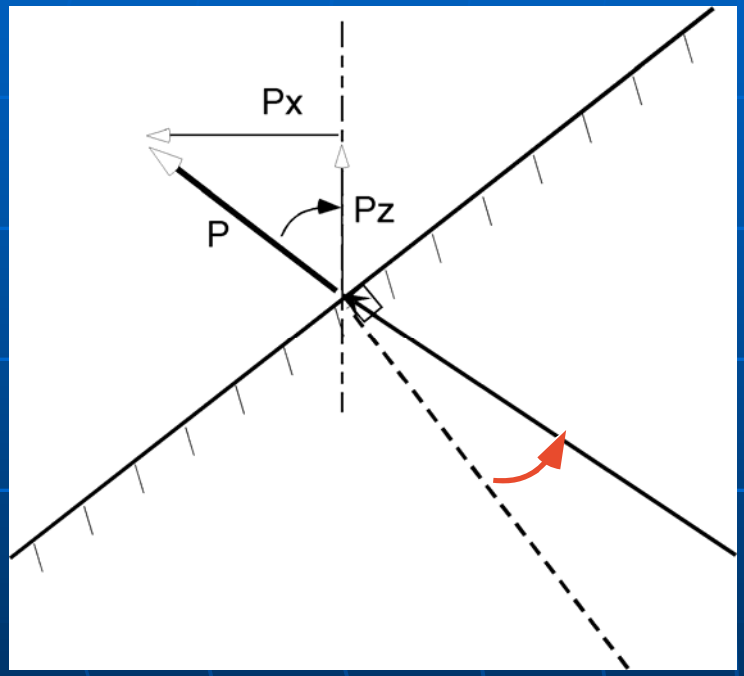
Discussion on P- wave: What about the near surface model?

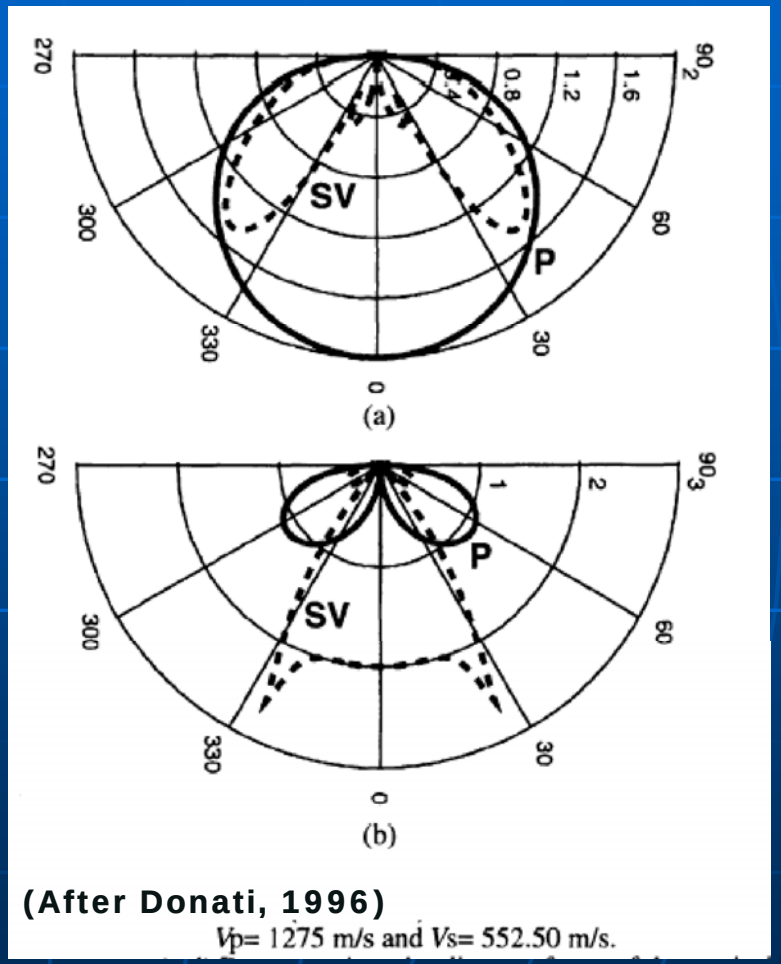






To be considered: the free surface effect

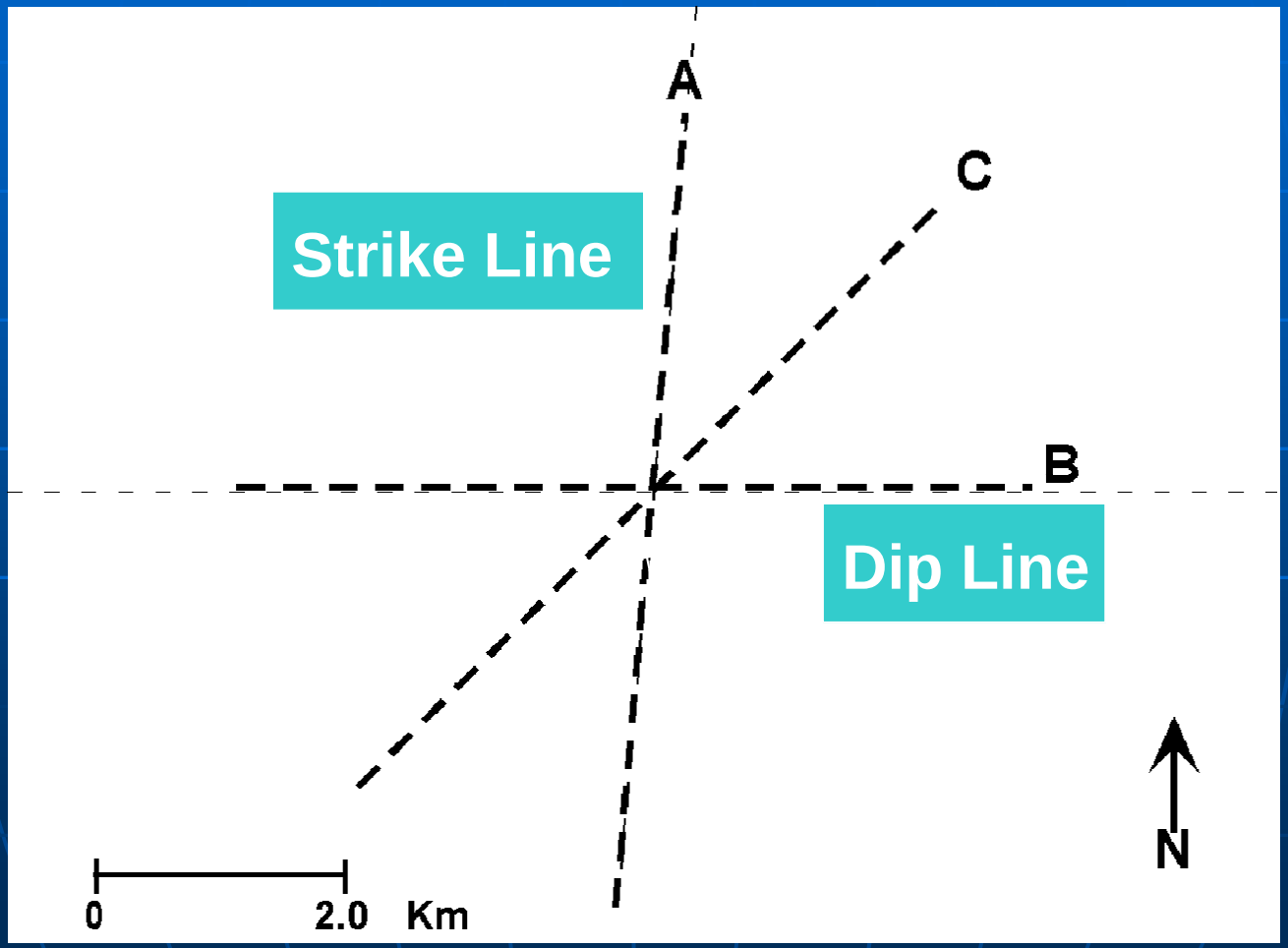




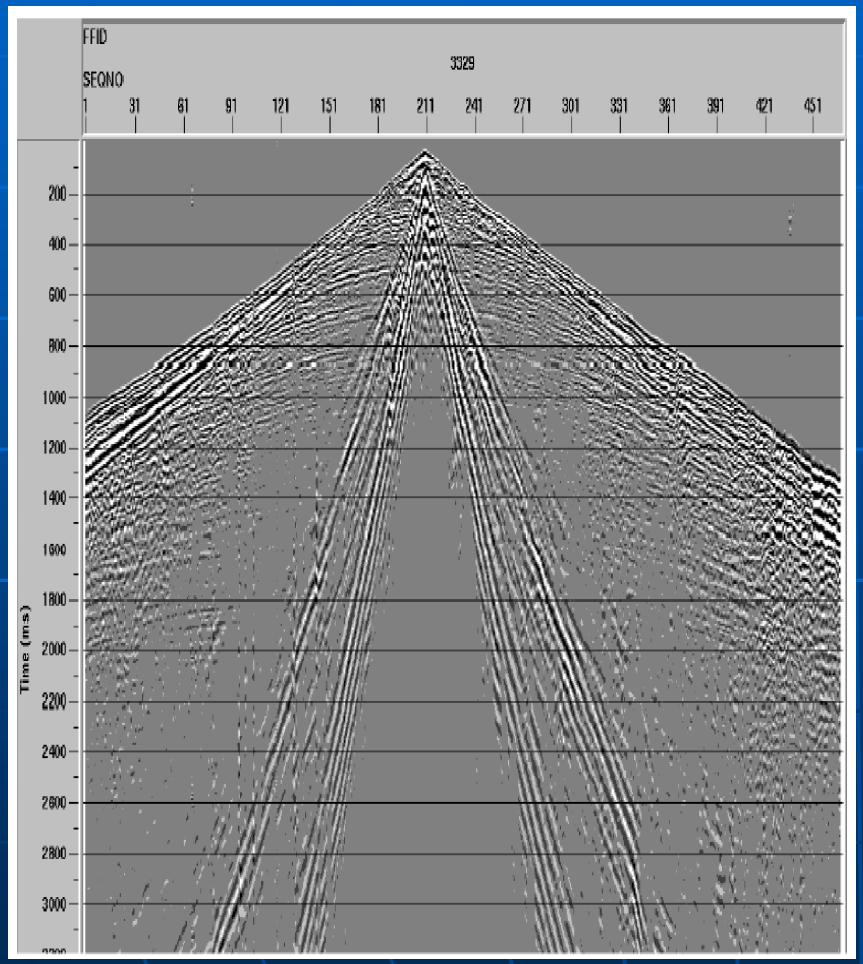
(After Donati, 1996)

Vp= 1275 m/s and *Vs*= 552.50 m/s.

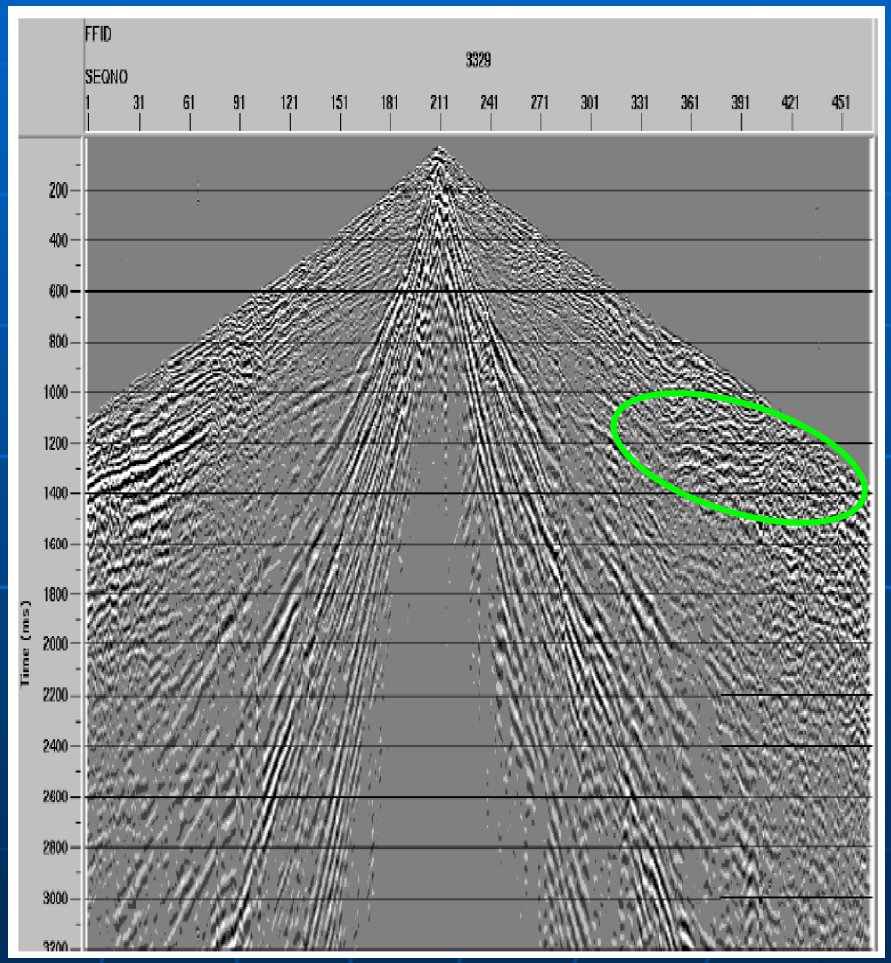
Converted wave:
Experimental 3C Survey L99



L99 data

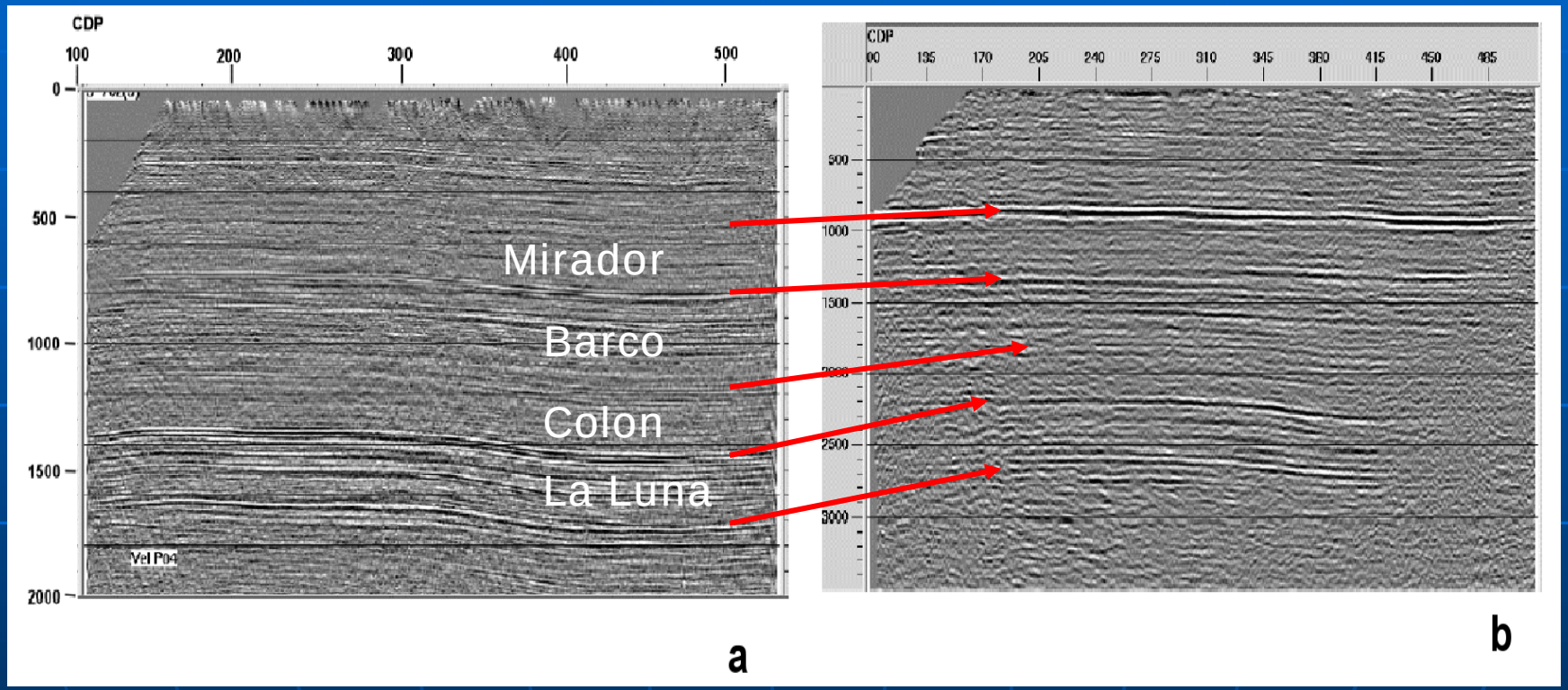


Vertical



Horizontal

Strike line

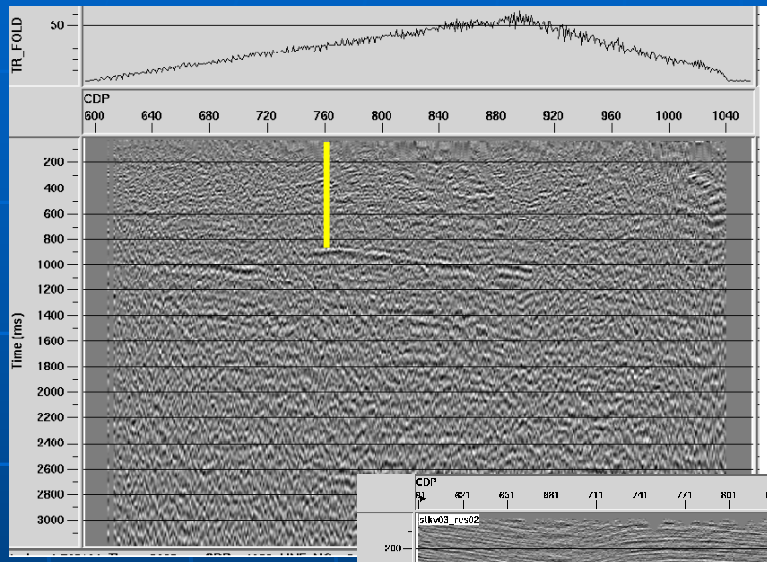


P-wave

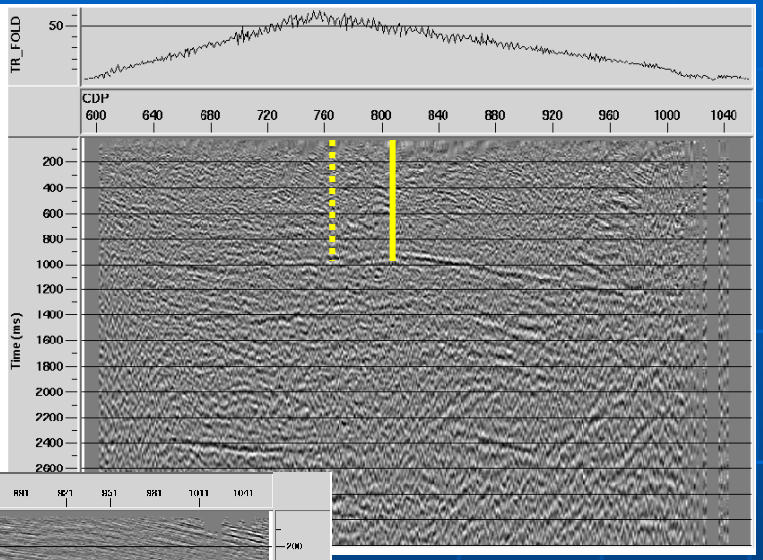
PS-wave

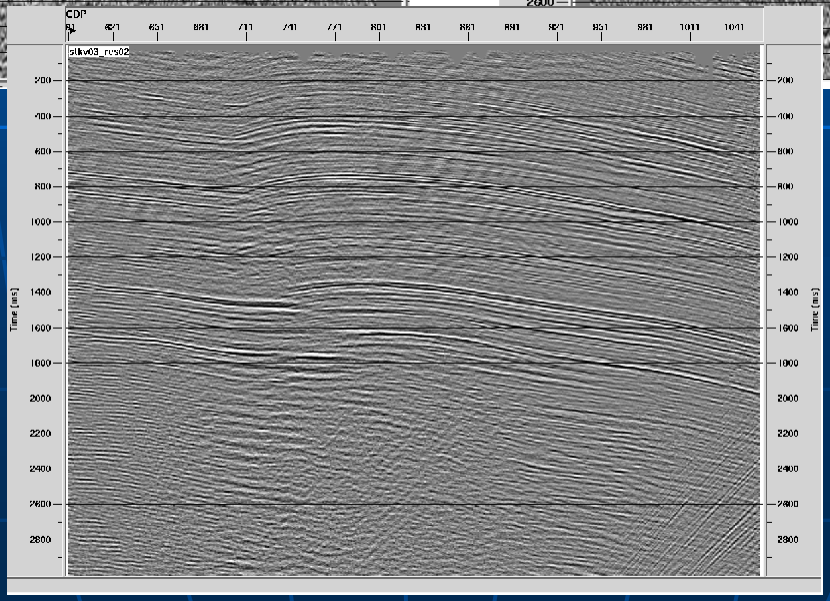
Dip Line

Positive offset



Negative offset





PS-wave

P-wave

Discussion on PS wave

- Converted wave datuming methods in complex areas need to be improved.
- Stacking depends on physical properties such as structures, velocities and anisotropy.

Conclusions

- Topography affects P-wave, 3-C data gives the possibility to correct for this effect in rough terrain.
- Converted wave imaging in complex areas requires advanced methods such as PSDM.
- The near surface model needs more work, since it is a key factor for onshore 3C data.

Acknowledgements

- ECOPETROL, who provided the data and authorized to publish this work.
- *CREWES* sponsors for their support.
- Kevin Hall, Dave Henley and Rolf Maier (*CREWES*)
- Andrés Calle, Alfredo Tada and William Agudelo (ECOPETROL-ICP).

CREWES

ECOPETROL