

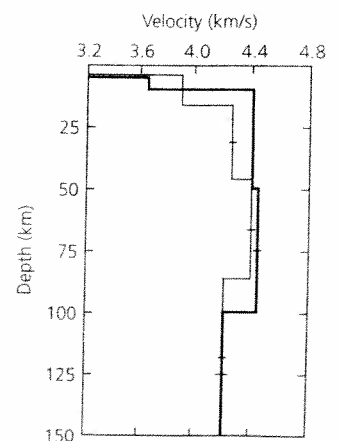
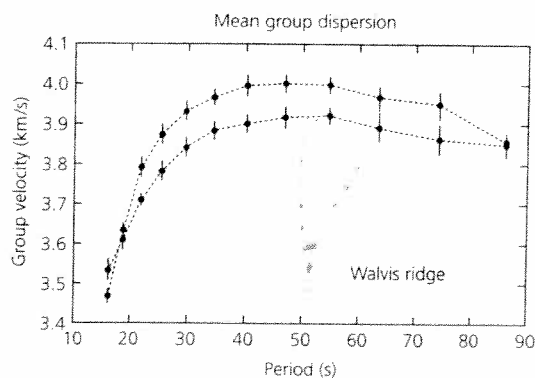
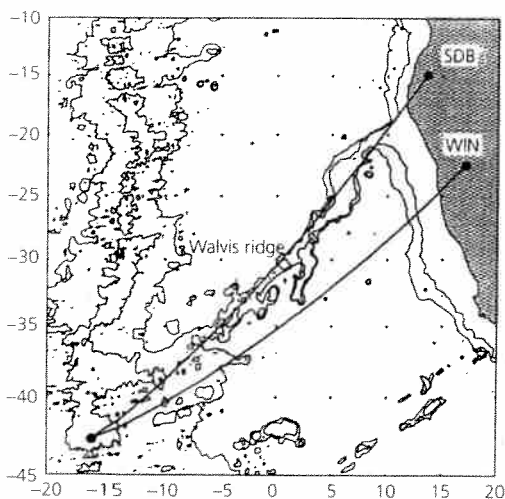
Exam Introduction to seismology and seismics, Part 2

January 27, 2009, 9:00-12.00

1. Explain how subsurface reflectors (i.e. interfaces of the seismic velocity structure) can be imaged using multichannel reflection seismics.
Use (and explain) the terms common midpoint (CMP) gather, normal move out (NMO), common midpoint stacking, root mean square (RMS) velocity, Dix equation, and migration.
2. (a) Make a sketch of the ray paths of the PcP, PKP, and PKKP phases that originate at the same earthquake and that have the same ray parameter.
(b) Explain the terms magnitude, intensity, and seismic moment that are used in earthquake seismology.
3. (a) Explain the terms dispersion, phase velocity, and group velocity.
Give mathematical expressions for the phase velocity and group velocity.
(b) Consider the figures below.

Left: An event on the southern Mid-Atlantic ridge is recorded at station SDB with a path following the Walvis ridge and at station WIN with an off-ridge path. Center: Rayleigh wave group velocity curves measured from the two seismograms. Right: Shear-velocity structures derived from the group velocity curves.

Identify and explain which group velocity curve and which shear-velocity structure belongs to the path along the Walvis ridge.



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4. An earthquake is recorded by a large number (N) of seismic stations. Explain how the origin time and the location of the earthquake can be determined from the P-arrival times at the stations for a given seismic velocity structure.
5. The figure below shows 3 mid-oceanic ridge segments offset by 2 transform faults. Give the 3 focal mechanisms (beach balls) that you would expect for earthquakes occurring at the locations indicated by the dashed arrows with question marks. Explain.

