Active-source results for southern California; Comparison with noise-source Vs modeling

Gary Fuis
Priorities for CRM:

rock properties
rock type

also

block boundaries, or faults
In this session we will focus on seismic properties also density and magnetic susceptibility
Fuis: rock type and faults interpreted from Vp from active-source data

also

a bit about rock type interpreted from Vs from noise-source data

also

a bit about tectonics
Hauksson: interpretations of Southern CA velocity structure from earthquake-source data --using both Vp and Vs

also

interpretations of the bottom and top of the seismogenic zone
Catchings: Vp, Vs, Vp/Vs from shallow active-source data

also

element of use of Vp, Vs, and Vp/Vs from Koyna Dam area, India
Active-source results for southern California; Comparison with noise-source Vs modeling

Gary Fuis

Fuis: during discussion will illustrate a new tool using Vp/Vs vs Vp to map out rock type in the crust
Comparison of Seismic-Imaging Methods

**Active-Source Methods**

**Advantages**
- Detailed imaging of near-surface (velocities)
- Reflection imaging
- Uniform coverage (by design)

**Disadvantages**
- Resolution diminishes rapidly with depth
- Commonly only 2-D
- Commonly only Vp
- Expensive (to scientists)

**Earthquake-source Methods**

**Advantages**
- Coverage of whole crust and mantle
- 3-D
- Includes Vp and Vs
- Cheap (to scientists)

**Disadvantages**
- No resolution of near surface (no accurate velocities)
- No reflections
- Non-uniform source coverage
Comparison of Seismic-Imaging Methods (cont.)

**Noise-source Methods**

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<thead>
<tr>
<th><strong>Advantages</strong></th>
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Comparison of Seismic-Imaging Methods (cont.)

Resolution for all methods depends on station and source spacing.

The 3 methods are complementary and all are necessary for a complete picture.
Vp
Fuis et al., BSSA, Feb. 2012

Southern CA EQ Hazard Assessment
Vs
Line 6

Barack

CVMH-11.9

edge mantle high Vs body
lower crust of Peninsular Ranges

Barack

San Bernardino

crystalline basement

edge mantle high Vs body
Imperial Valley

Barack

high Vs body

Partial melt?
Vp/Vs vs Vp
DATA POINTS

- [Weathered rocks: Tertiary seds, Franciscan rocks (<30m)]
- Miocene seds, Varian well
- [Franciscan graywacke (Geysers, CA well)]
- SAFOD damage–zone rocks, average (minor volume)
- SAFOD Great Valley sequence seds.
- SAFOD arkoses (chiefly Paleocene)
- [Serpentinite]
- SAFOD granitic rocks

Brackets enclose non–local rock types
END2