Proposed Physical Models for Investigating Wave Attenuation by Frequency-Dependent Reflectivity

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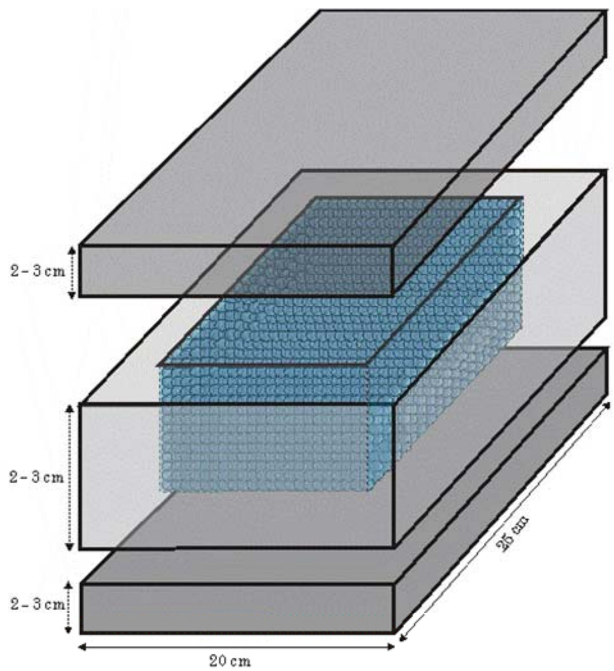
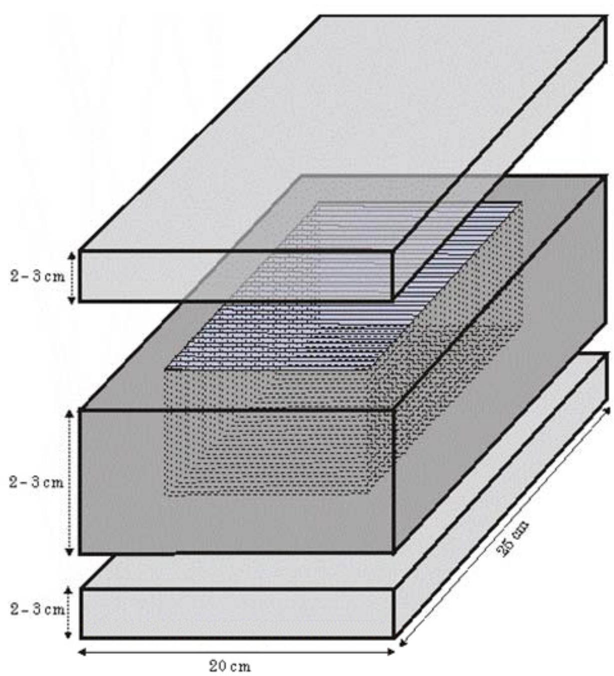


POROUS RESERVOIR MODEL

To test the concept of frequency attenuation due to porous zones, we are constructing a new porous physical model. The model is comprised of three sections. The top piece is a solid, rigid block. The middle piece is a rigid block with a hole in the middle. During data acquisition, this hole is filled with sintered-glass beads that have been faced-fused. This simulates a cemented sandstone. In addition, the face-fused sintered beads can be compressed to facilitate homogeneous small fractures or not fused to simulate unconsolidated sands. The pore space between the beads is filled with air, water, or glycerin. The bottom block is rigid with a raised section in the middle that corresponds to the dimensions of the middle section hole.

Once the blocks are constructed, the assembly is inverted and the center is filled with glass beads. Then the base is positioned to compress the beads in the middle section. This assembly is clamped or bolted together, turned right side up, and placed in the data acquisition tank.

By filling the center hole with a fluid, i.e. water, before the beads are added, we can control the fluid content. By using different fluids and air we should be able to determine the magnitude of the attenuation due to the different materials. This procedure will allow us to calibrate attenuation measurements.



DOUBLE POROSITY MODEL

To test the dual porosity model (Silin *et al.,* 2005), we will construct a physical model of porous fracture system. The porous zone in this model will be constructed by face-fusing sintered glass beads into thin sheets. Glass beads fuse at 700 C^o so we plan to place layers of the glass beads in a kiln set to 700 C^o for 15 minutes make several thin sheets of the face-fused beads. The key step is to sinter the beads long enough to fuse the beads together but leave pore space between the beads. The fused glass beads, that are sheets, are stacked side-by-side and sandwiched between two blocks of resin. Finally, the entire assembly is coated with resin to prevent the water from invading the fractures. During assembly we can choose what material we want in the pore space. However, experience has taught us that, once assembled, it is difficult to change the pore fluid.

This experiment will provide insight into the seismic signature of a fractured porous reservoir and help in quantifying the effect of the dual porosity theory.