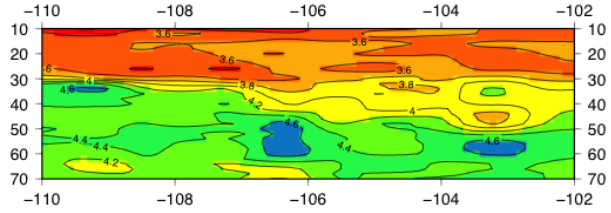
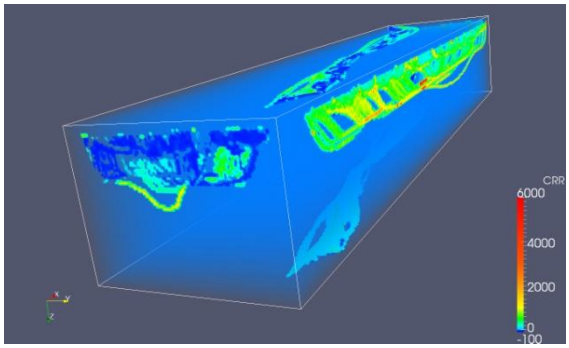
NSF Highlight

Integrated Analysis for Development of 3-D Models of Earth Structure

An interdisciplinary team of researchers and students from geosciences, computer science, and computational science at the NSF CREST Cyber-ShARE Center of Excellence at the University of Texas at El Paso (http://cybershare.utep.edu) are developing two novel approaches to create more accurate models of the Earth by fusing information from multiple data sources that may differ in accuracy, sensitivity, and resolution. In general, analysis of individual geophysical and geological data sets and contextual information usually leads to different models, sometimes with little overlap, mostly due to mischaracterization of errors. The model fusion approach merges datasets output from different techniques to develop Earth structure models, and the joint inversion approach inverts all datasets at once – a computationally challenging endeavor – to develop an Earth model. An optimization method for joint inversion provides a more robust approximated model in terms of satisfying geophysical constraints, accuracy, and efficiency with respect to one of the most common approaches currently used. The team is now applying the approaches and visualization to multiple data sets in British Columbia, the southern Rio Grande Rift in southern New Mexico, and western Texas, and they are expanding the datasets for industry applications including a geothermal prospect in Kenya.





(Top left) Joint inversion results for the southern Rio Grande Rift at 32°N latitude. (Right) Geological Sciences graduate student Sarah Quinonez ready to deploy seismic sensor for the British Columbia Batholith experiment. (Bottom left) 3-D visualization of initial model of the Earth's crust using the British Columbia Batholith data set.

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