Geoinformatics and Cyberinfrastructure for the Earth and Environmental Sciences

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Chris Crosby produced an early version as a web site
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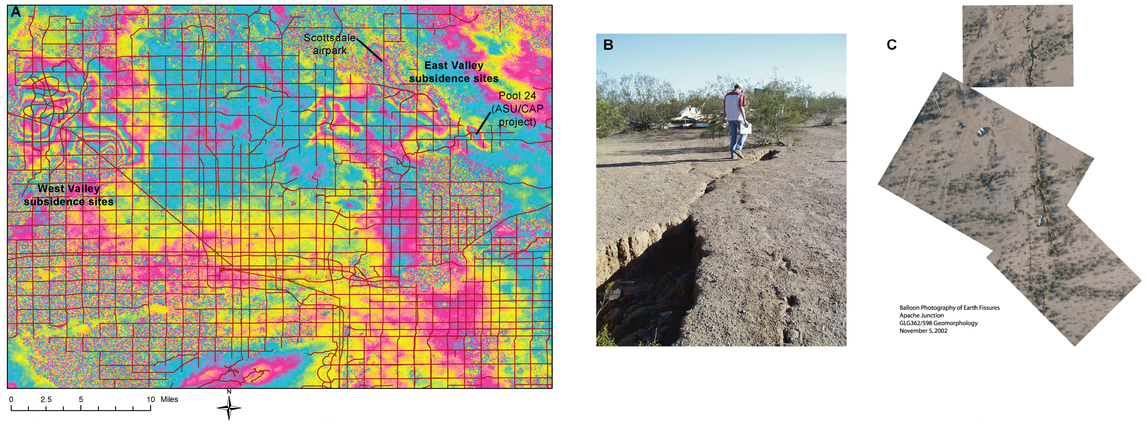
http://activetectonics.asu.edu/GIS/GIS.html

This poster is devoted to applications of Geographic Information Systems (GIS), and other geospatial technologies, to research projects with in the Active Tectonics, Quantitative Structural Geology and Geomorphology Research Group at Arizona State University. GIS technology applications in the group range from "classic" digital map and database preparation to web-based geoinformatics tool development as part of the GEON project. Like so many in the geoscience community, we rely upon the ESRI suite of GIS products (ArcGIS etc.) for many of our GIS tasks. Our group are also users of GRASS Open Source GIS. We utilize GRASS for many of our geoinformatics tool development projects because of it's open source environment and scriptable nature.

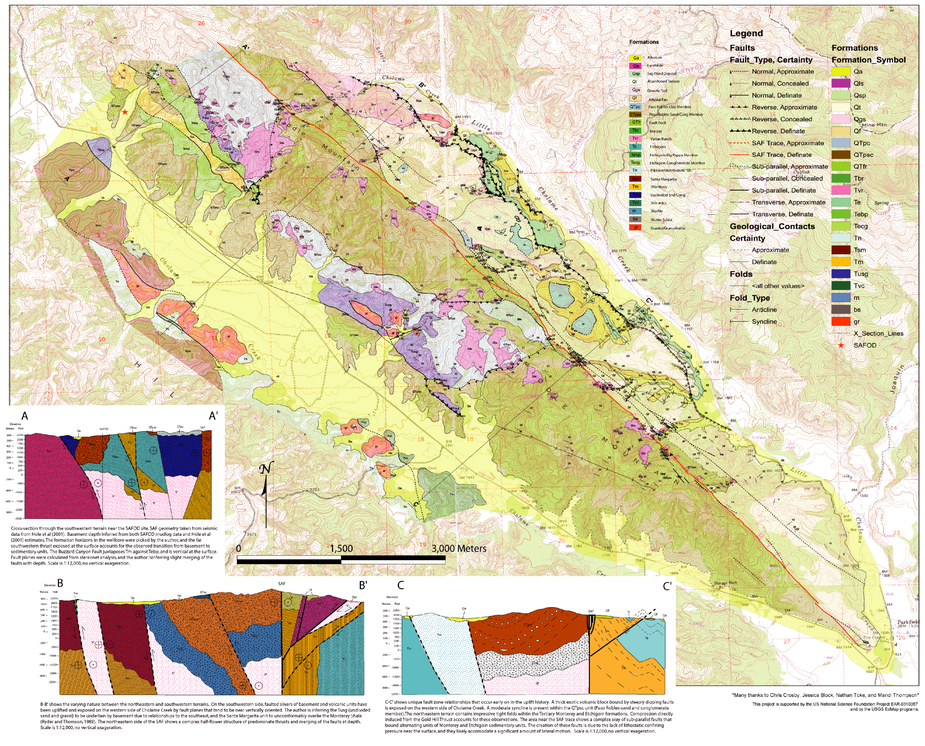
Groundwater withdrawal driven subsidence and earth fissure formation (with Amanda Perkins and Jim Tyburczy)



A) Ground motion map for greater Phoenix area showing subsidence bowls in northeast and southeast Valley Each set of yellow to blue fringes colors represents 2.8 cm. 1330 day Interferometric Synthetic Aperture Radar data from M. Tatlow (ADWR) and S. Buckley (UT Austin). InSAR images (like the one at left) are being used to characterize ground subsidence within the western portion of the Phoenix Valley. The images are made up of an array of XYZ data, thus when two images are subtracted, the difference in values corresponds to the amount of displacement that has occurred since the previous acquisition. B) Earth fissures formed on edge of subsidence zone in Apache Junction. C) Balloon aerial photography of earth fissure zone.

Digital Geologic Map Compilation (with Maurits Thayer, Chirs Crosby, and Jessica Block)

Geologic Structure of Middle Mountain within the San Andreas Fault Zone near Parkfield, California
Maurits Thayer, Ramon Arrowsmith, Jeri Young, Annia Fayon, Michael Rymer



We have compiled a number of geologic field maps related to research on the San Andreas Fault zone near Parkfield, in central California into digital format through the use of ArcMap GIS software. Field maps were first rectified into the UTM Nad 1983 coordinate system. Next, all contacts were digitized to polyline feature classes, and finally, polygons were created that were bound by the contact polylines. We are using these data to study the structure of the San Andreas Fault zone and understand earthquake rupture processes.

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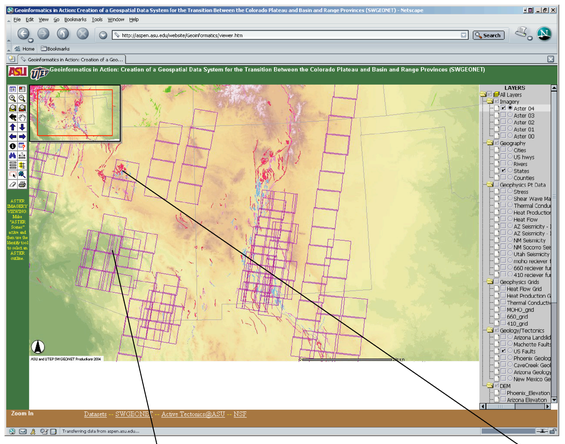
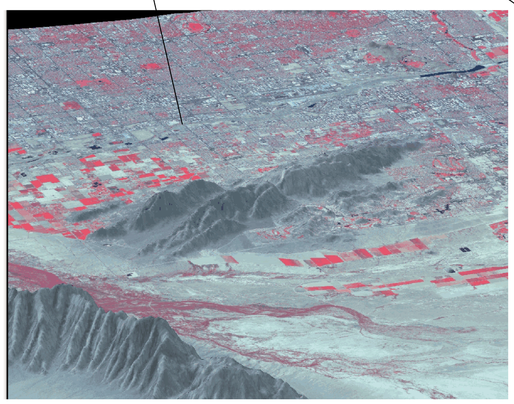
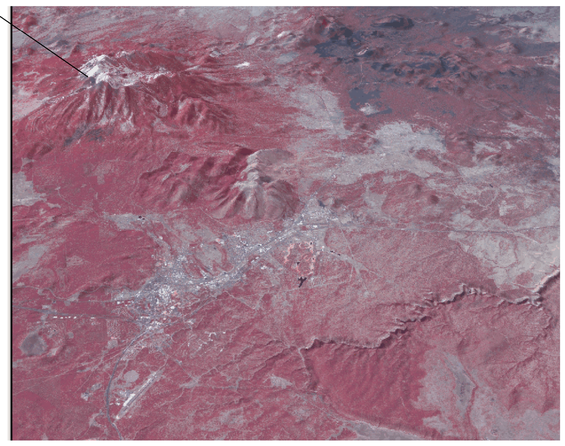
Interactive Data Portal and online ASTER Satellite Image Processing (with Jeff Conner, Lela Prashad, Chris Eisinger, Will Stefanov and numerous others)



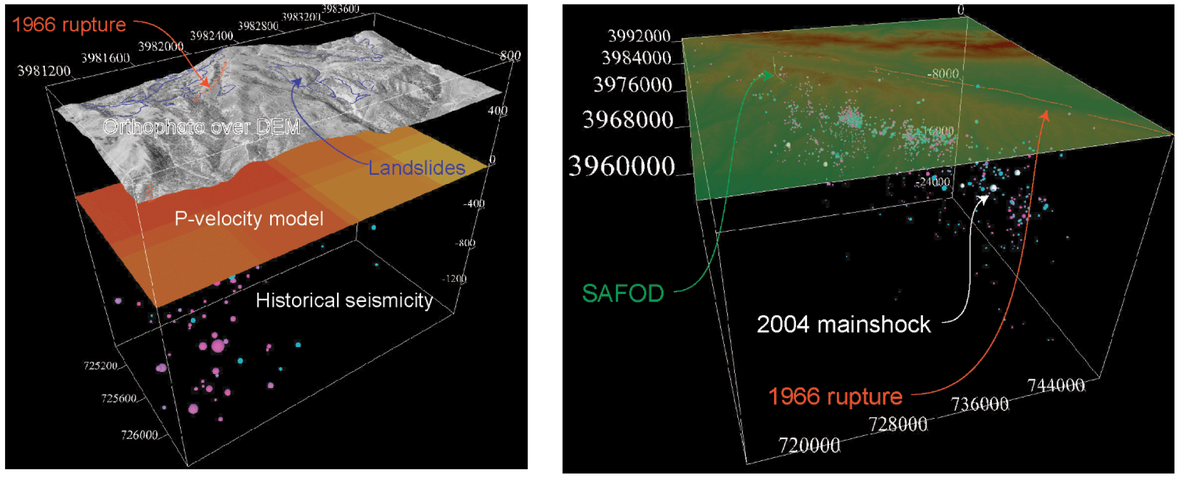
As part of the Geoinformatics Initiative, Arizona State University and the University of Texas at El Paso have teamed up to construct an integrated data system focusing on the Transition Zone between the Colorado Plateau and the Basin and Range Province, located primarily in Arizona and New Mexico. The region is of fundamental significance if we are to understand the geologic evolution of Southwestern North America and to address practical problems such as the effects of urbanization and dwindling water resources. Thus, this region is an excellent place to construct a prototype data system for Earth Science investigations. This project is funded by the National Science Foundation Information Technology Research (ITR) program and builds on our existing projects supported by NASA in particular.





Views of Phoenix (left) and Flagstaff (right) both from the south with satellite imagery draped over digital topography. Reds in these images indicate vegetation.

Interactive data integration and Visualization (with Gilead Wurman and Jeff Conner, and Chris Crosby)



In our earthquake and fault system studies, we must integrate diverse 3D data that characterize fault zone properties. The Parkfield Unified Visualization Project (PUVP) is a geospatial data repository, with the added benefits of easy, WWW-driven access and an in-house Virtual Reality Markup Language (VRML) generator to allow visualization of multiple data sets over the web. The data are stored georeferenced, and queried using GRASS Open Source GIS. The user queries this data via a Java web form which runs a series of Perl scripts to extract these data from the GRASS database in either GRASS or ARC/ESRI format. The scripts also convert this data into VRML directives that can be displayed using any web browser with a VRML plugin, or on a GeoWall. This project is completely open source, and we hope will be built up by contributions of both data and code by the user community.