midland valley

the structural geology experts

June 2011 newsletter

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University of Canterbury

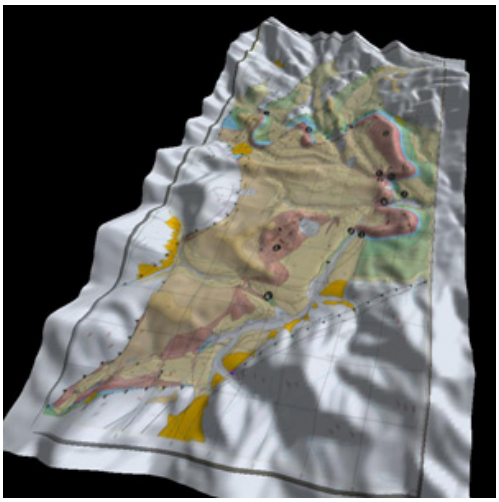
Recently Move was used within an MSc class to help the students visualise and understand problems, and learn the major progression steps for a regional project.

The Castle Hill Basin is a small intramontane basin located in the foothills of the Southern Alps, nearly 230 km WNW of Christchurch. The infilling sedimentary sequence is preserved in a structural depression bounded by basement blocks, uplifted by transpressive strike-slip faults and thrust faults. The oldest sediments (Late Cretaceous) overlying the Torlesse basement are terrestrial and deposited during episodes of active extensional tectonics. The overlying Eocene to Late Miocene marine sequence was deposited during a transgressive-regressive cycle, common to many regions of the South Island. Compressional deformation (resulting in folding of the cover sequence and thrusting of the basement above the sedimentary units) started since the Miocene and continues today, as demonstrated by the regional tectonics and the recent seismicity recently culminating in the two severe earthquakes that have destroyed large parts of central Christchurch (*Sept. 4 2010, M7.1 and Feb 22 2011 M6.3*).

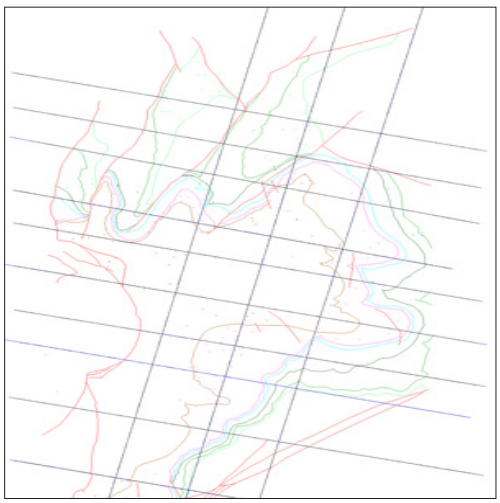
The presence of two sets of subperpendicular fold systems (NNE-SSW and WNW-ESE) in the Castle Hill Basin is intriguing because it can be ascribed to two distinct events of folding (not common to other nearby regions) or to a non-cylindrical geometry of the folds (as argued in previous studies, e.g. *Bradshaw, 1975, J. Royal Soc. New Zealand, vol5 pp. 209-217*). Alternatively, it can be argued that this geometry is controlled by blind faults. Note that a blind, E-W strike-slip fault is the source of the Sept. 4 earthquake.

Francesca Ghisetti who teaches the class said "students in the Department of Geological Sciences visit the Castle Hill Basin for their field work and structural training, so it did seem appropriate to use this area for an exercise with Move to discuss problems and implications of the poorly constrained subsurface geology". The workflow consisted of ten progressive steps which can be found in detail on their Case Study page on the Midland Valley website.

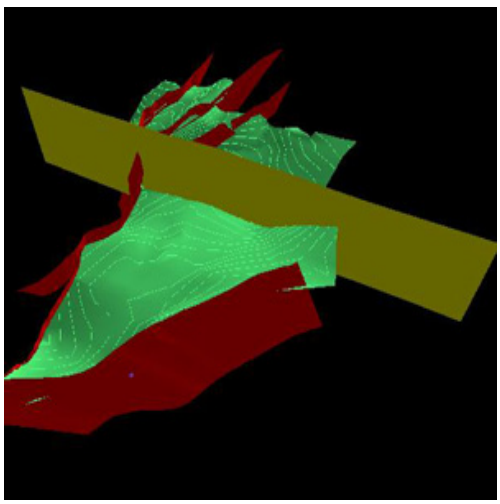
1. Setting the project in a geo-referenced frame (loading dem and maps etc).



2. Digitizing the geological map and dips. Building a database.



3. Putting together all cross sections (17 in total) to build a 3D Model with interpretation of faults and stratigraphic horizons.



4. The image shows some of the problems of the 3D reconstruction.