GeoSciML Testbed

GeoSciML Compliant Borehole Data into 3D GeoModeller Software

33rd International Geological Congress

Oslo - August 2008

Presenter: Philip McInerney

GeoSciML Workshop, 33rd IGC, Oslo 2008

3D GeoModeller Software

Software designed to build 3D geology models … rapidly …

… directly from …

- geology contact data
- geological strike and dip data
- making use of the stratigraphic column

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Demonstration Presented to Workshop

- A live demonstration of the GeoModeller software was presented to the Workshop
- This PDF shows a series of screen-captures from the presentation. The scenario presented was:
  - a 3D geology model exists for the ‘HotRox’ Project
  - new drillhole data are added to the project
    (from XML instance documents in GeoSciML format for a borehole)
  - the new drillhole data are incompatible with the existing model … and are used to build a revised 3D geology model

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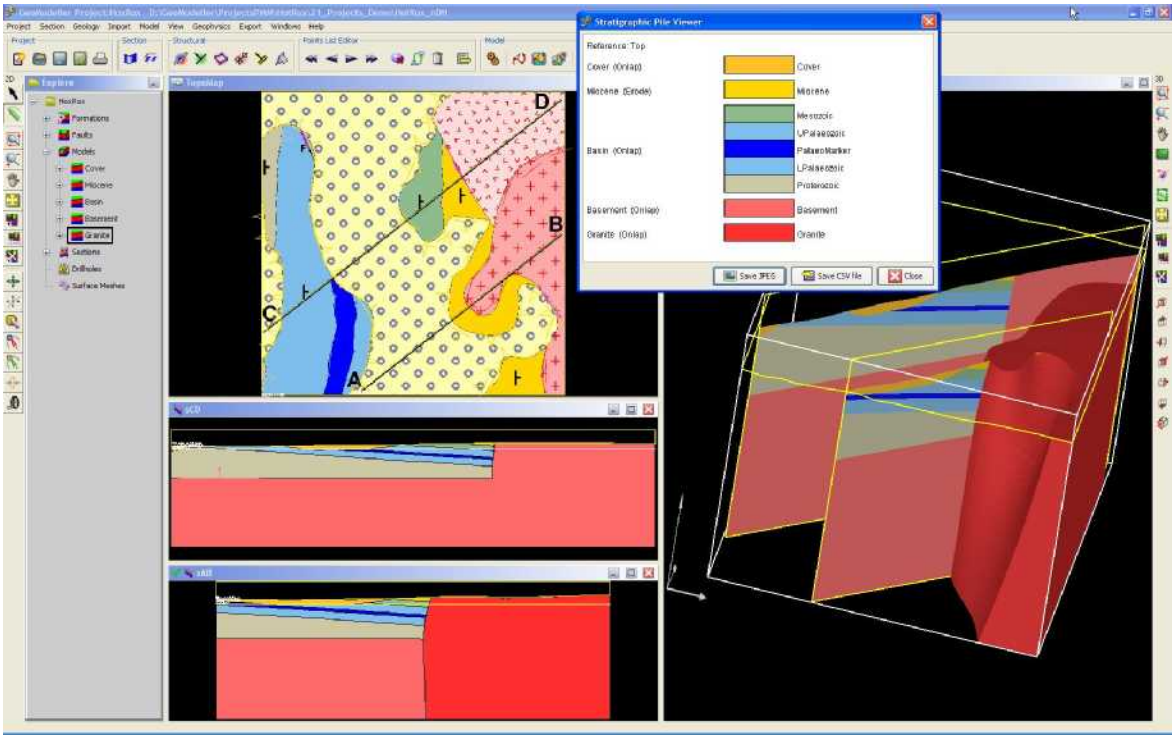
Step 1: The HotRox Project



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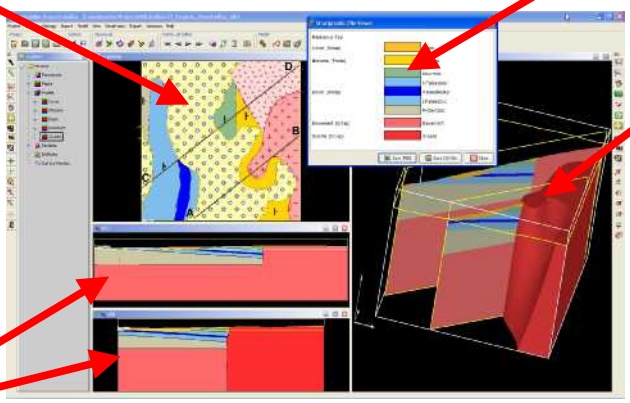
Step 1: Commentary

The ‘map view’ showing the geology map

The stratigraphic column for the project



A 3D view … with 3x vertical exaggeration … showing parts of the initial 3D geology model

Two ‘section views’ showing the modelled geology … a sedimentary sequence dipping to the east, overlying basement.

The project geology is …

- basement & granite exposed to the east
- a central area of ‘cover’
- limited exposure of east dipping sediments

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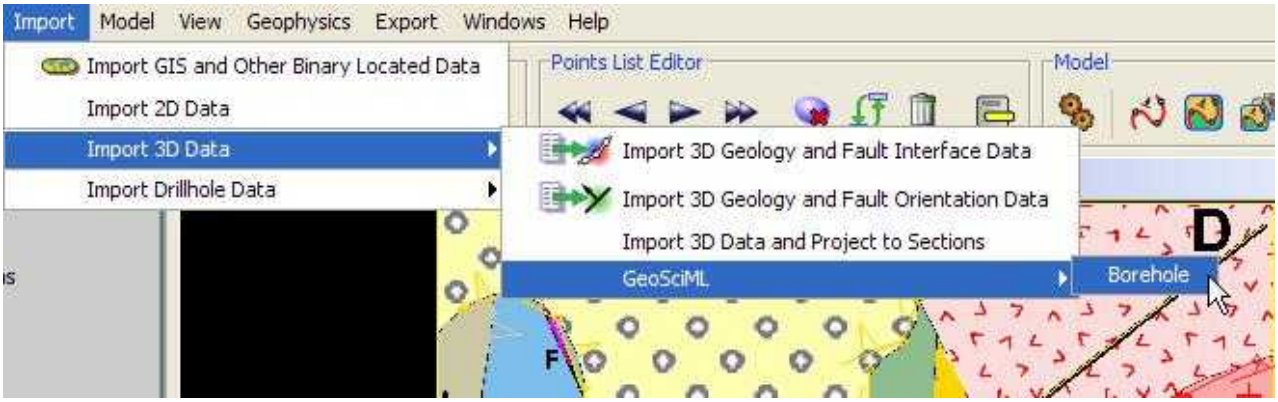
Step 2: Import a GeoSciML Borehole



The demonstration then showed the import of three boreholes … and displayed these boreholes in both the 2D section-views, and in the 3D view

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Step 2: Commentary

The boreholes were read from XML files in GeoSciML format describing the geometry and geology of a borehole

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  - <CV_GeometryValuePair>
    - <geometry>
      - <CV_DomainObject>
        - <spatialElement>
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              <pos>4500.0</pos>
            </LineString>
          </spatialElement>
        </CV_DomainObject>
      </geometry>
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    </CV_GeometryValuePair>
  </element>
 </CV_DiscreteCoverage>
 </result>
 </Observation>
 </relatedObservation>
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 <length uom="urn:ogc:def:uom:UCUM:m" xmlns="http://www.opengis.net/sampling/1.0">4500</length>
- <collarLocation>
 - <BoreholeCollar>
   - <location>
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       </Point>
     </location>
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 </collarLocation>
</Borehole>
```

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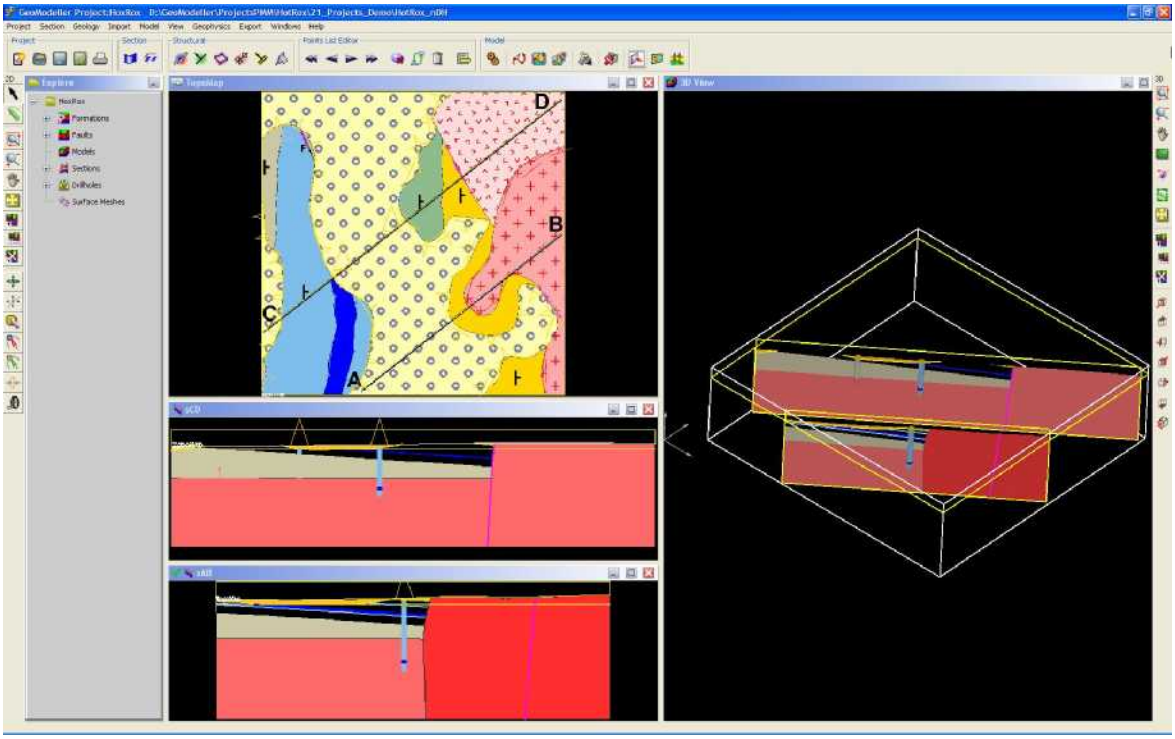
Step 3: Display the Imported Data



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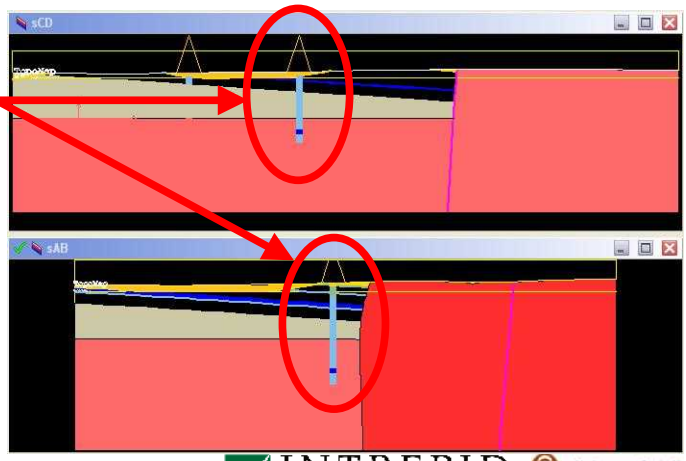
Step 3: Commentary

- The imported borehole data show that the sedimentary section is much thicker than has been modelled (based on the surface mapping data)

The borehole data are inconsistent with the existing interpretation!

A revised interpretation is required … and a fault is proposed to explain the thicker sedimentary section.



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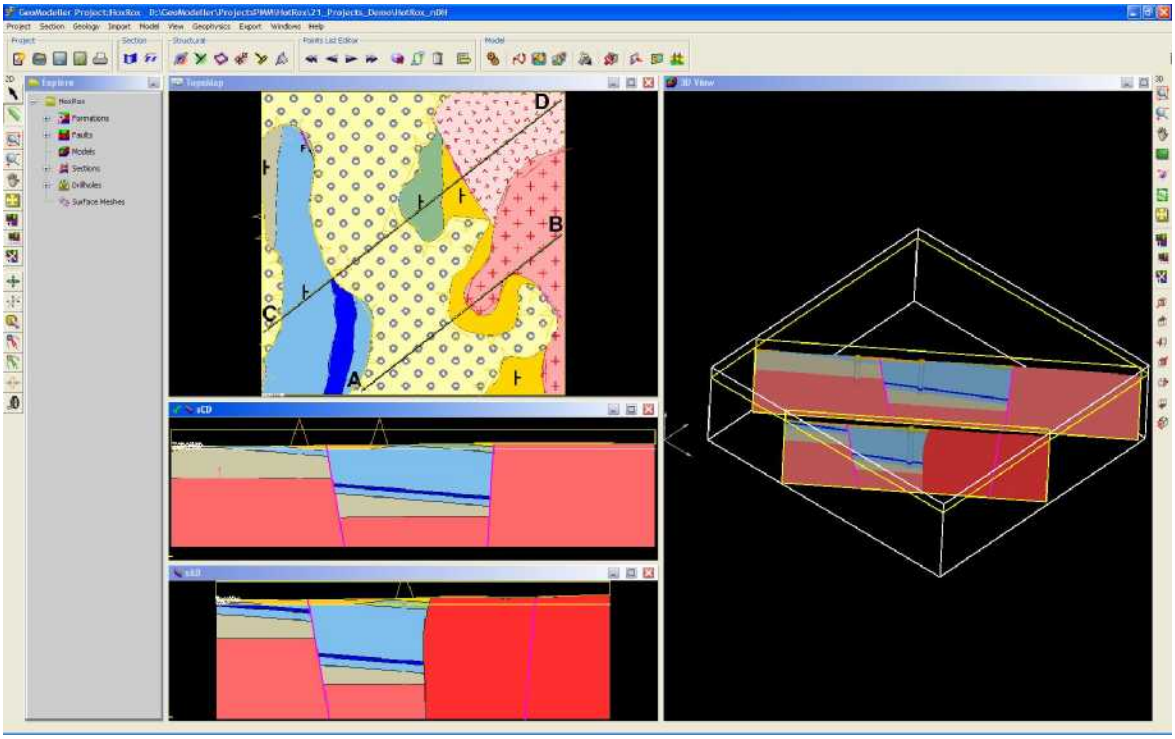
Step 4: Build a revised 3D model



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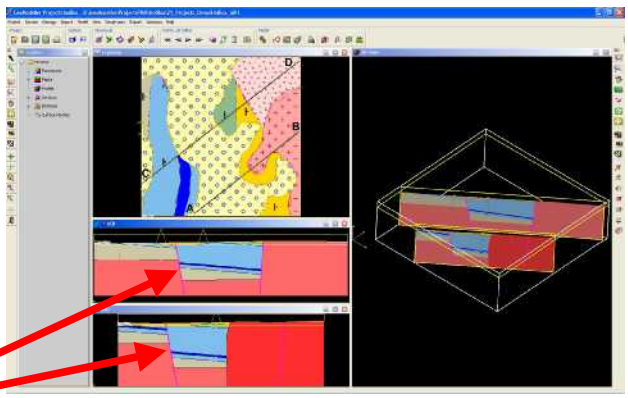
Step 4: Commentary

GeoModeller computes interpolator equations to model 3D geology using the supplied geology contacts and strike & dip data.



The postulated fault shown in the two section views.

The recomputed model – using the new drillhole data, and the postulated 'western fault' - show a revised 3D geology, with a thicker sedimentary section in a down-faulted graben. This revised model is compatible with the surface mapping and the imported drillhole data.

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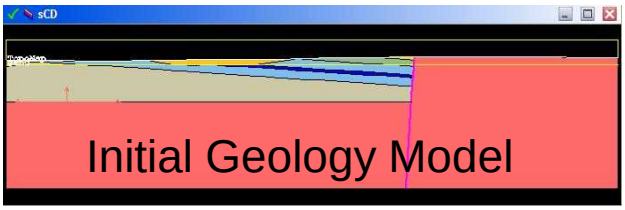
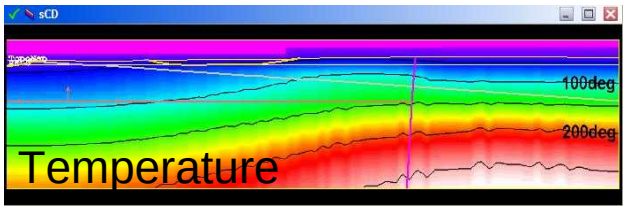
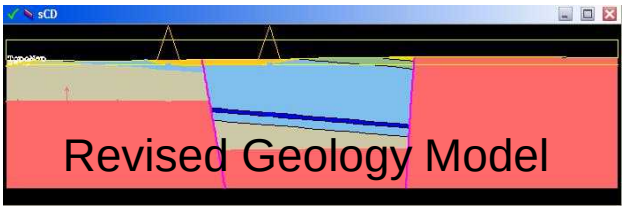
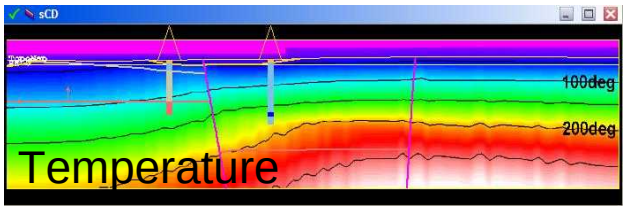
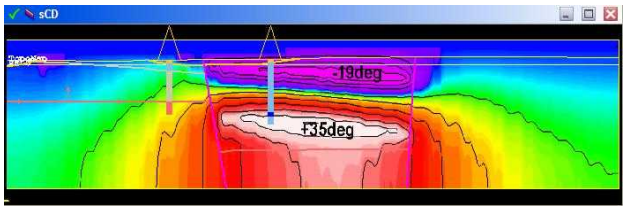
Step 5: Using a 3D Geology Model











The difference in temperature between the two scenarios

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Step 5: Commentary

- To make the point that a 3D geology model is more than just a picture! … and can be ***used*** for various purposes … modelled temperature for Section CD was shown for the initial and revised 3D geology models
- The temperature images were generated using GeoModeller's geothermal modelling
- The temperature difference plot shows the hotter temperatures to be expected below a thicker 'insulating blanket' of sediments

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Conclusions

- Intrepid has implemented the ability to import a GeoSciML compliant borehole file into the 3D GeoModeller Software
- The imported data can be used to compute a revised 3D geology model
- 3D geology models are not simply pictures to visualise … but can be ***used*** for a range of practical purposes