Geologically Constrained 3D Earth Modelling of the Nechako Basin British Columbia, Canada.

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Mira Geoscience ...modelling the earth

Geoscience BC

1. Objective and Approach

To construct a 3D Common Earth Model of the Nechako basin for Geoscience BC to aid in the geologic understanding of the area and for prioritization of mineral, oil and gas, and geothermal exploration targets.

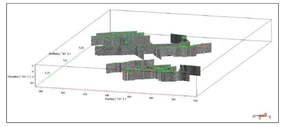
The VPmg potential fields modelling software from Fullagar Geophysics is ideally suited to co-operatively invert gravity and magnetic data with constraints. During the inversion, a starting lithological and physical property model, based on a simplified stratigraphic section, is gradually optimized and updated to find a new model that fits all data sets appropriately. The inversion is performed subject to honouring prior constraining information including: geologic mapping, well data, physical property statistics, and seismic and magnetotelluric interpretations.

The resulting 3D Common Earth Model contains geological (lithological and structural), and physical property attributes based on all available geologic, physical property, and geophysical data. The model can be used to answer geologic and exploration questions both qualitatively and quantitatively using 3D GIS tools.

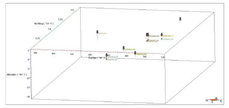
2. Prior Constraints

Geological mapping

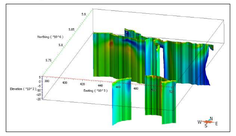
Time-to-depth converted seismic interpretations



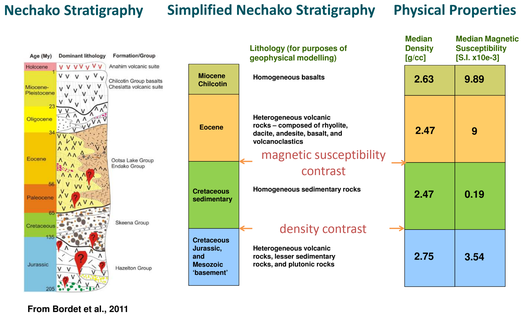
Wells with geologic logs



2D and 3D magnetotelluric models



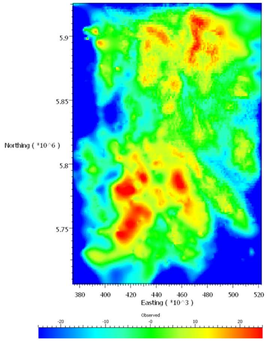
3. Stratigraphy with Physical Properties



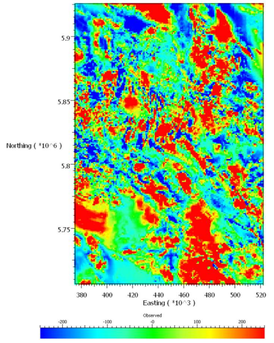
From Bordet et al., 2011

4. Data

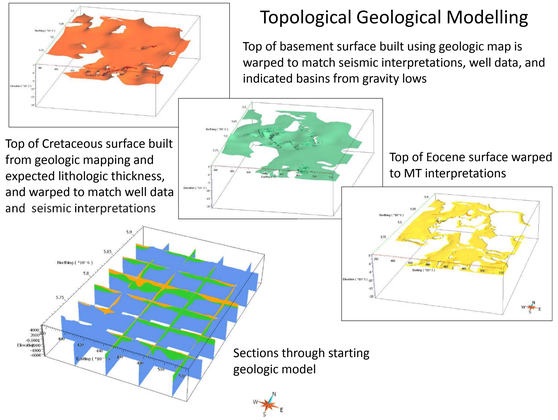
Terrain Corrected Gravity Data



Total Magnetic Intensity Data



5. Geological Modelling



Topological Geological Modelling

Top of basement surface built using geologic map is warped to match seismic interpretations, well data, and indicated basins from gravity lows

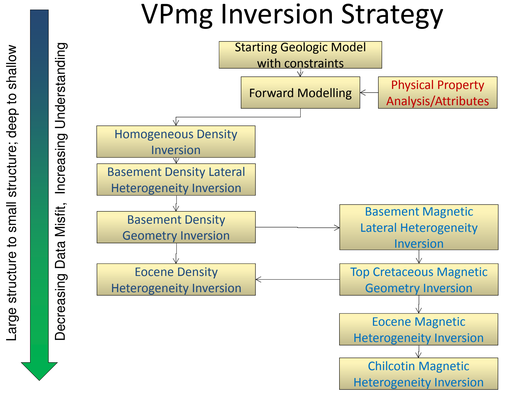
Top of Cretaceous surface built from geologic mapping and expected lithologic thickness, and warped to match well data and seismic interpretations

Top of Eocene surface warped to MT interpretations

Sections through starting geologic model

6. Geophysical Modelling

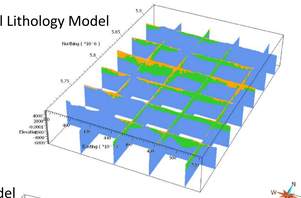
VPmg Inversion Strategy



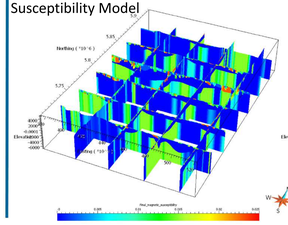
7. The Common Earth Model

Final Lithology Model

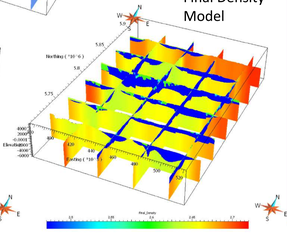
V.E. x3



Final Magnetic Susceptibility Model



Final Density Model



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