An integrated and interoperable platform enabling 3D stochastic geological modelling

LoopStructural and LoopResources applied to gold estimation

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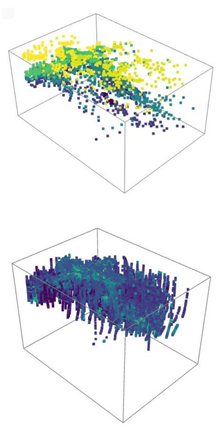
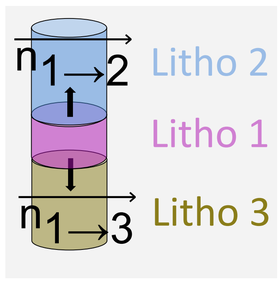
Drill hole data

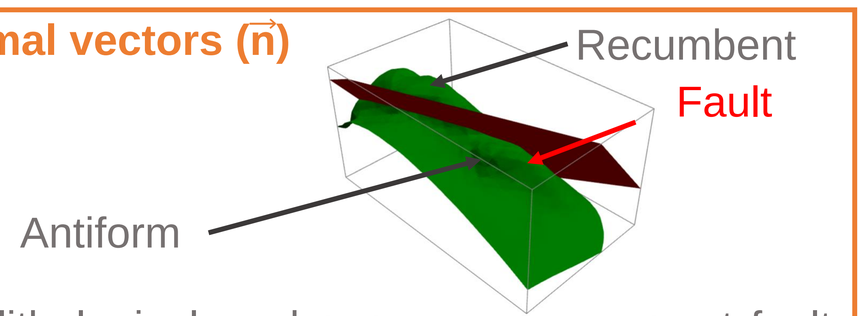


The data set is composed of drill hole data with information about interpreted lithology and gold assays.

Lithological contacts implicit modelling with normal vectors ($\vec{n}$)

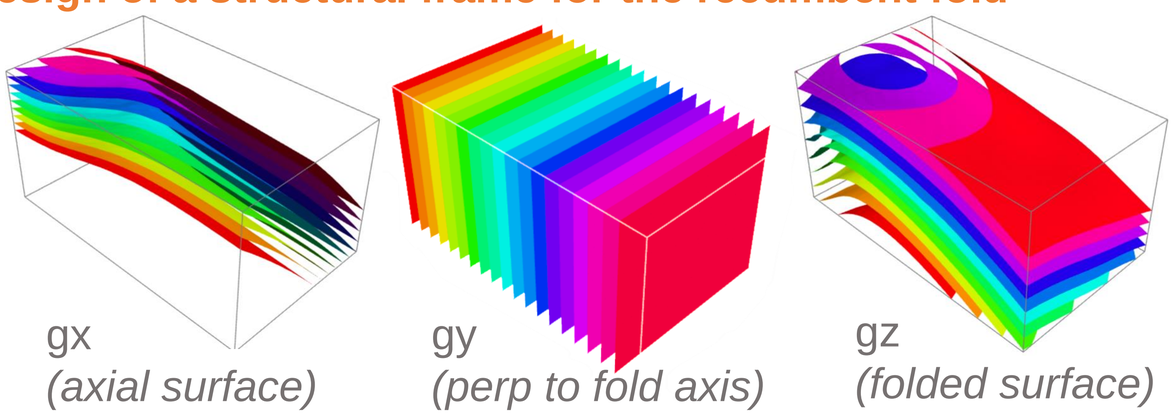


In the absence of structural measurements, lithological contact orientations were estimated considering the plane fitting the 15 nearest neighbours contacts along the drill holes. That information was used to interpolate a lithological model in *LoopStructural*.



The lithological model snows a recumpent fault propagated fold overprinted by an upright fold. These structures were modelled in *LoopStructural* using structural frames.

Design of a structural frame for the recumbent fold



gx *(axial surface)*

gy *(perp to fold axis)*

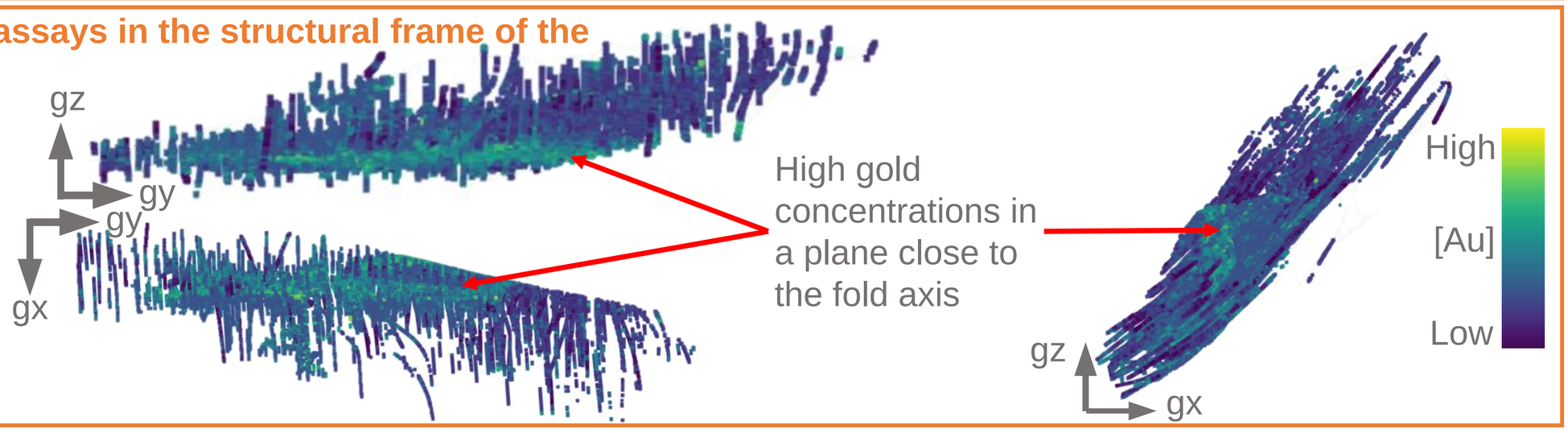
gz *(folded surface)*

The structural frame is defined by three scalar fields which are:
- gx, the axial surface of the recumbent fold
- gy, perpendicular to the fold axis
- gz, the scalar field of the folded surface

gx, gy and gz provide a curvilinear conformable coordinate system within which distances can be estimated in any direction allowing for geostatistical methods in an “undeformed space”.

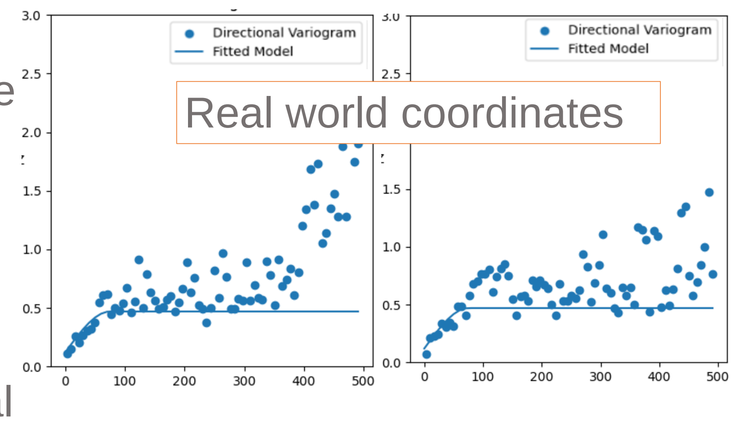
Reprojection of the gold assays in the structural frame of the recumbent fold

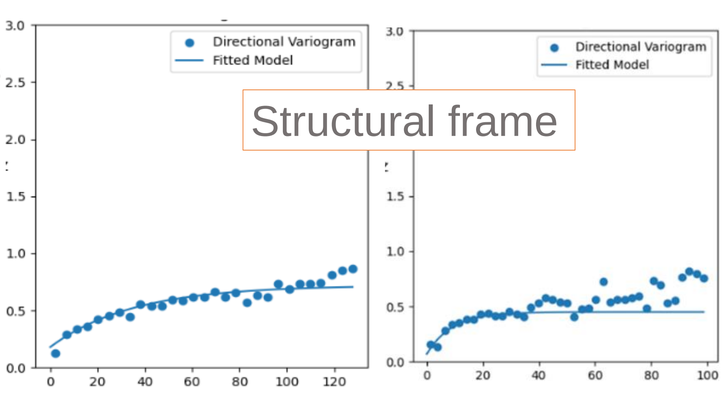
The high gold assays, projected in the structural frame, exhibit a linear geometry mainly parallel to gy (the recumbent fold axis).



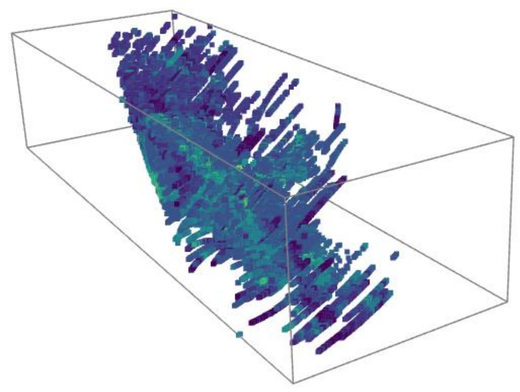
Geostatistics in the structural frame vs in the real world coordinates

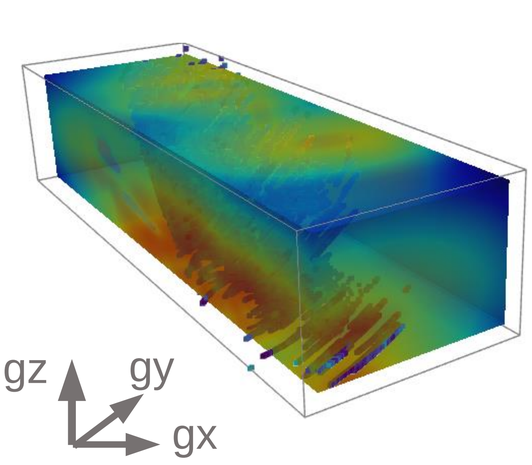
A comparison of the directional semivariograms calculated in the real world coordinate system and in the structural frame shows that the structural frame allows a better modelling of the semivariograms leading to a better understanding of the data.





A structurally controlled gold estimation





Gold concentration has been estimated using simple kriging based on the covariance model in the gx, gy, and gz coordinate system. In this space, high gold concentrations exhibit a well-defined linear structure. When transformed into the X, Y, Z reference frame, this feature adopts a curvilinear geometry.

High

[Au]

Low

Due to confidentiality constraints, this transformation cannot be displayed in this poster.

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CSIRO
RING — Université de Lorraine
MinEx CRC
BHP
NSW Government — Regional NSW
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Government of South Australia — Department of State Development
South Australia
Queensland Government — Business Queensland
Victoria State Government
British Geological Survey — Natural Environment Research Council
USGS — science for a changing world
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NE Geology — Providing geoscience data globally