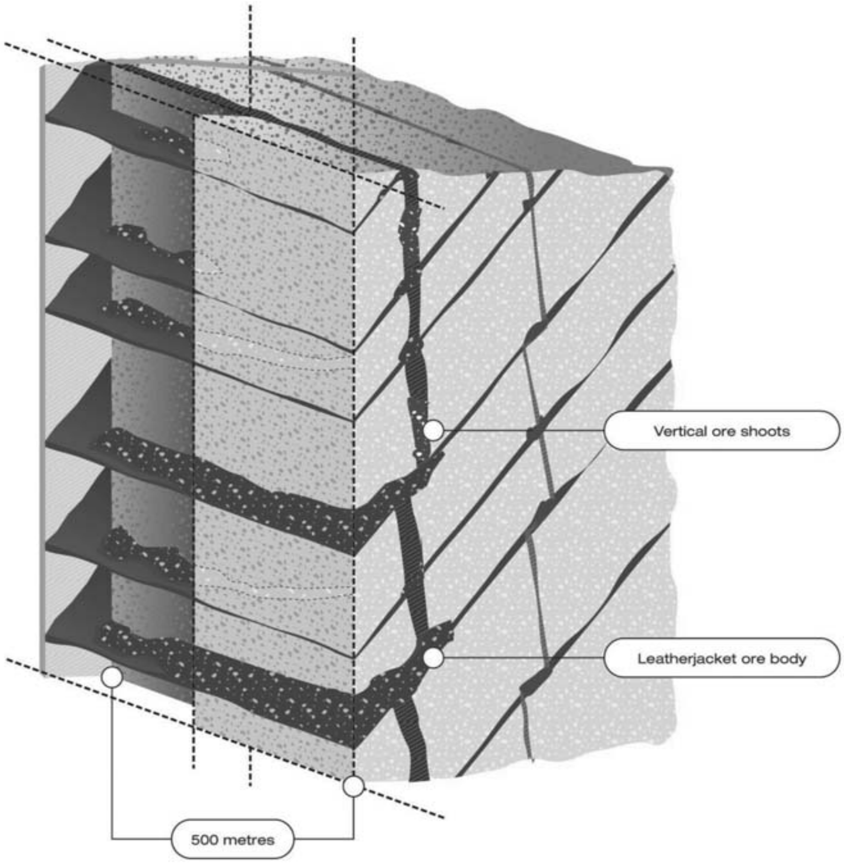
The Estimation and Reporting of Resources and JORC:

The Role of Structural Geology



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THE CONVERGENCE OF STRUCTURAL GEOLOGY AND GEOSTATISTICS

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ABSTRACT

Metalliferous deposits are almost certainly either structurally emplaced or structurally modified, therefore the involvement of the structural geologist to assist in the resource estimation process makes sense. The logic behind the construction of domains by the structural geologist however, requires examination.

Over domaining is where a geologist generates too many domains and it is in part a symptom of the wandering and branching curvilinear geometrical variation of mineral deposits that exists in nature. Domains in such cases will not contain enough data for experimental variograms to be constructed and several domains must be combined before variography. This practice in itself, whilst a practical one (from an estimation viewpoint) is problematic, as it may compromise the geometrical model that has been carefully constructed with the structural controls in mind. Almost invariably mineralisation continuities are not rectilinear, but curvilinear in space, therefore range anisotropies interpreted from experimental variograms are an average of the true grade anisotropy that varies through space. Combining domains will result in spatial averaging of mineralisation continuities and could conceivably be one of the major sources of errors introduced in the resource estimation process. Industry accepted practices, such as "unfolding", do not provide a resolution to this problem, as there are infinite variations of unfolding transformations that result in equally varying experimental variograms. In general, it is simply not possible to accurately describe spatial grade variations using variogram models because geometries of mineralisation cannot be forced into rectilinear geometries.

One novel solution to the problem of curvilinearity of mineral deposits was provided by the multiple-point statistical approach (Strebelle, 2002; Krishnan and Journel, 2003) whereby the geologist provides a training image for conditional simulation. This technique is effective if the spatial pattern is repeated in the volume (eg. stockwork veins), but the modelling of unrepeated first-order continuities of mineralised zones (eg. single mineralised fold), the interpretation by the geologist is still the most straightforward method. An alternative to using training images is to simply allow geologists to generate the most realistic models directly in 3D and interpolate the grade continuously through space. The mineralisation continuities in this method are then provided not by the ill-defined experimental variograms, but by the geological interpretation of the structural geologist. The outcome of this type of collaboration is the likely convergence of the structural geology and geostatistical professions.

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