



## **Modelling a geological cross-section: An experiment on uncertainty**

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Uncertainty is becoming an important area of study within the geological modelling community. The methods to quantify and spatially describe uncertainty are complex and this experiment was designed to look at a narrow focus of uncertainty and try to provide some quantification. A designed experiment was conducted using a group of 28 geologists who modelled a cross-section in London, UK. Each geologist used interpreted borehole records which included three Palaeogene sedimentary units, including the target unit: the London Clay Formation. The boreholes were divided into batches from which validation boreholes had been withheld; as a result we obtained 129 point comparisons between the interpreted elevation of the base of the London Clay Formation and its observed elevation in a borehole not used for that particular interpretation. Analysis of the results showed good general agreement between the observed and interpreted elevations, with no evidence of systematic bias. Between-site variation of the interpretation error was spatially correlated, and the variance appeared to be stationary. The between-geologist component of variance was smaller overall, and depended on distance to the nearest borehole. There was also evidence that the between-geologist variance depends on the degree of experience of the individual. We used the statistical model of interpretation error to compute confidence intervals for any one interpretation of the base of the London Clay Formation in the cross-section, and to provide uncertainty measures for decision support in a hypothetical route-planning process. The statistical model could also be used to quantify error-propagation in a full 3D geological framework model calculated from the cross sections.