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Finding the Optimal Dynamic Anisotropy Resolution for Grade Estimation Improvement at Driefontein Gold Mine, South Africa

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Grade estimation based on Kriging uses a search volume ellipsoid, centred on each block, to select samples used for estimation. Traditionally, a global orientated search ellipsoid is used during the estimation process. Where orientation of grade continuity in folded structures or meandering channels is dynamic, misalignment of the search ellipsoid by just a few degrees can impact the estimation results. An improvement in the estimation process can be achieved if the direction and continuity of mineralisation is acknowledged by aligning the search ellipsoid accordingly.

One solution to this problem is to apply the method of Dynamic Anisotropy in the estimation process. This method allows for the anisotropic rotation angles defining the search ellipsoid and variogram model, to locally honour the trend of the mineralisation for each cell within a block model. This paper describes the application of Dynamic Anisotropy to a slightly undulating area which lies on a gently folded limb of a syncline at Driefontein gold mine in South Africa.

Estimates calculated using Dynamic Anisotropy and the traditional method (Ordinary Kriging) were compared on a real-life dataset that puts theories and opinions about Dynamic Anisotropy to the test. The results of the study showed that generally, the application of the Dynamic Anisotropy interpolation technique during the estimation process slightly improved the quality of estimates. However, the results also revealed that the Ordinary Kriging interpolation technique becomes a better method of estimation with increasing block size in comparison to the application of the Dynamic Anisotropy estimation technique during the estimation process.