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Optimal sampling for variogram estimation in order to determine sample line spacing for a Marine Diamond deposit

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The Southern Namibian onshore diamondiferous linear beach environment has been delineated between the 1930s and 1960s using 1m wide sampling trenches comprising 1m x 5m samples. These coast perpendicular 1m wide sampling trenches were spaced roughly 500m apart covering a coast parallel strip about 100km northwards from the Orange River mouth. The onshore diamond resource has virtually been mined out and the current exploration focus has shifted to the submerged beaches extending directly offshore from the mined-out area. An offshore coast parallel strip of 100km x 4km with very limited data is the target area for future resource development. This resource will be sampled with sample lines a certain distance apart and research is done to establish whether a well-defined variogram structure can help determine the required sample line spacing. The analog onshore trench data forms the basis and has been studied in an attempt to obtain variogram parameters for the offshore target area.

Expected spatial variography along the coast should be evident based on the strong geological controls. Up to now it has been challenging to determine experimental variograms. The variogram plays an important role in the resource development, determination of the sample line spacing and ranges over which samples can be extrapolated when resource estimation is done. Prins and Jacob [1] illustrated how simulated annealing was used to improve the detection of spatial variography from the onshore trench data.

The successful exploration of the offshore resource requires an optimal sample strategy of which the variogram forms an integral part. An alternative approach for variogram parameter determination is investigated. The work of Lyman [2] is extended in order to determine a strategy for optimal line spacing for a marine diamond deposit.

References:

[1] Prins C.F. and Jacob J. (2014) The journal of the South African institute of mining and metallurgy 114: 251-254

[2] Lyman, G (2007) In: Third World Conference on Sampling and Blending

