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S1015: Use of the specific surface to measure the efficiency of grids of drillholes and classify the resources of a set of 2D mineral deposits

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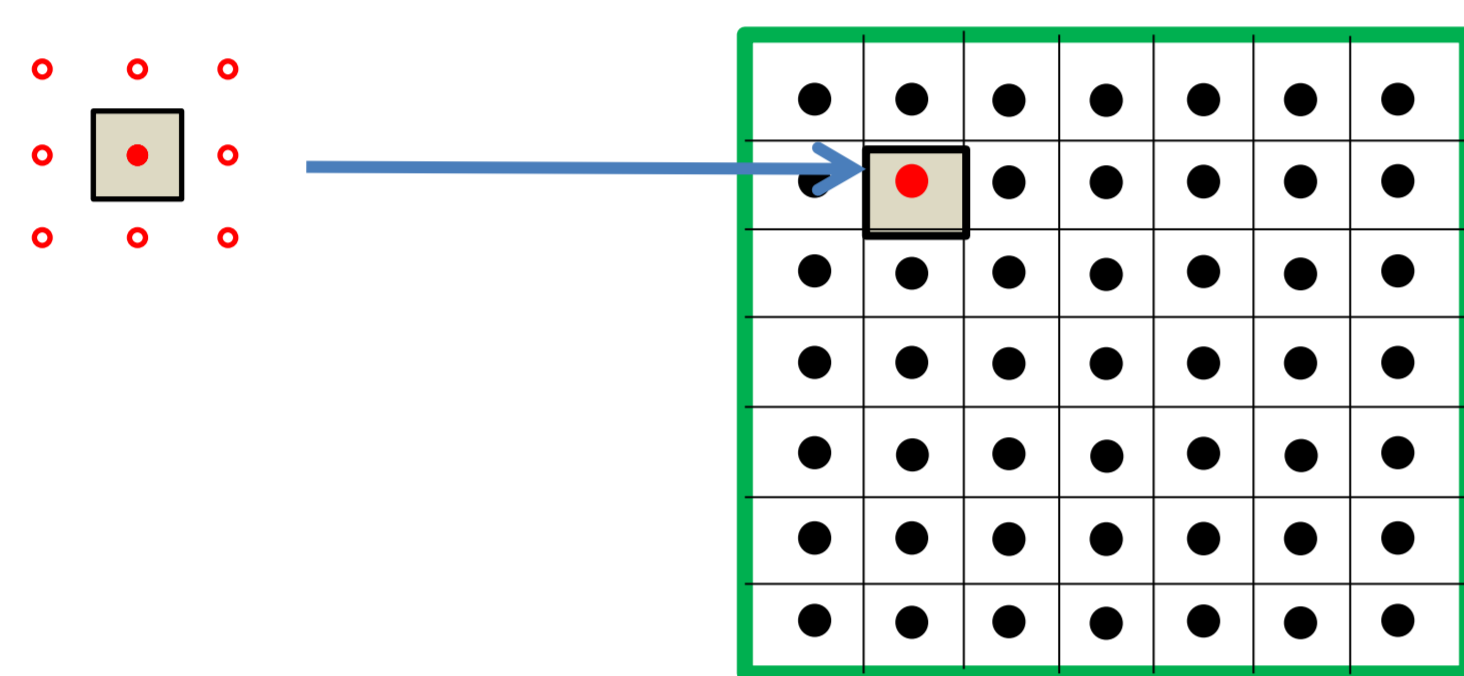
² Mines Paris, PSL University, Centre de Géosciences, France.

Spatial Sampling Density (regular sampling)

additive resource $Z(x)$ with variogram $\gamma(h)$ and mean M

From estimation variance

block v estimated by its center \Rightarrow domain V estimated by the mean of N regular samples



no correlation between errors of blocks estimated by inner sample

$$\sigma_e^2(Z_v) \Rightarrow \sigma_e^2(Z_V) = \frac{\sigma_e^2(Z_v)}{N} = \frac{\sigma_e^2(Z_v)|v|}{|V|}$$

to Spatial Sampling Density Variance:

$$\sigma_e^2(Z_v)|v| = \sigma_e^2(Z_v)|v| = SSDV$$

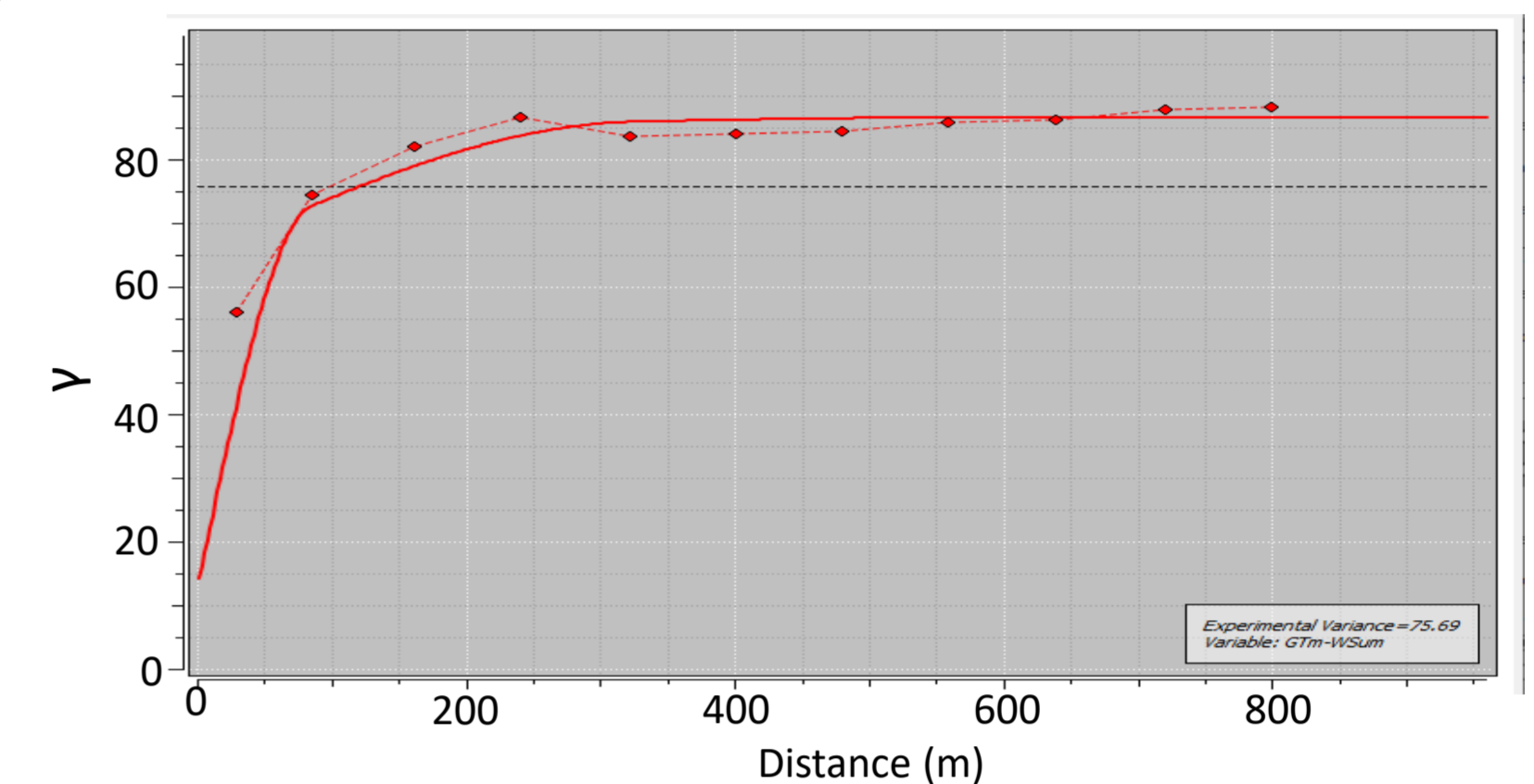
and Specific Volume (Area in 2D):

$$V_0 = \frac{SSDV}{M^2} = \frac{\sigma_e^2(Z_v)|v|}{M^2}$$

The same for v and V , they do not depend any longer on the number of blocks N
They measure the efficiency of the sampling pattern, irrespective of the size of the domain

Specific Surface as a function of hole spacing: Example of Somair 3 deposit

Deposit regularly sampled with vertical drillholes (100mx100m, 50mx50m, 25mx25m spacing)



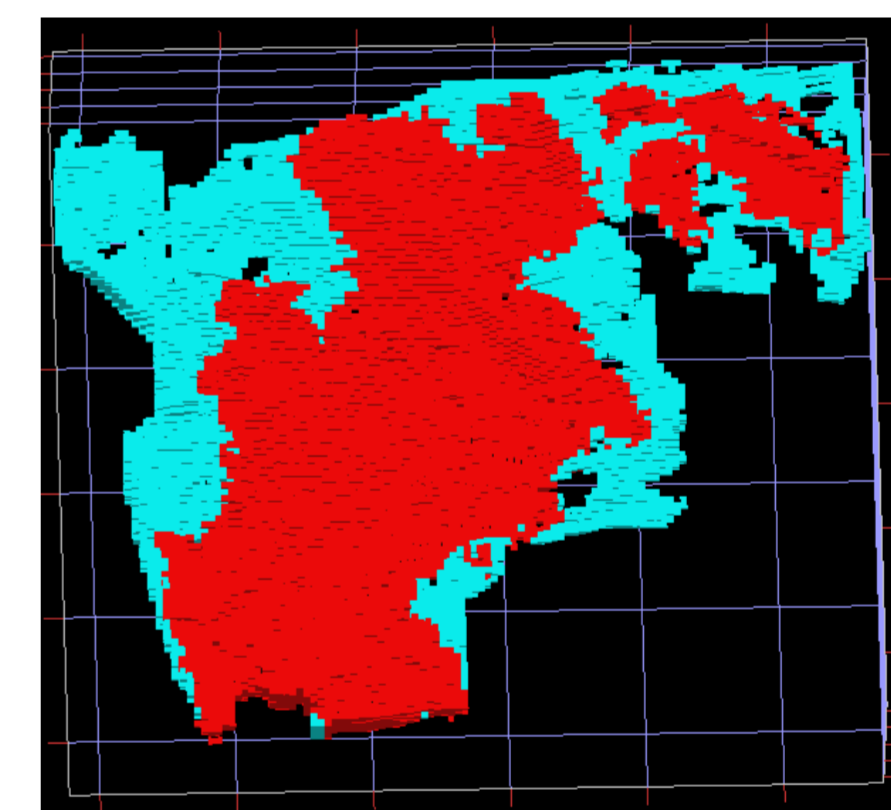
2D variogram of the uranium grade thickness in the mineralized envelope.

Calculation of the Specific Area per drillhole spacing

Pattern (m)	25 x 25	50 centered	50 x 50	100 centered	100 x 100
Specific Area (m ²)	157	357	846	2 105	5 465

The specific surface will allow classification of the resources depending on the hole spacing.

Indicated Resources
Inferred Resources



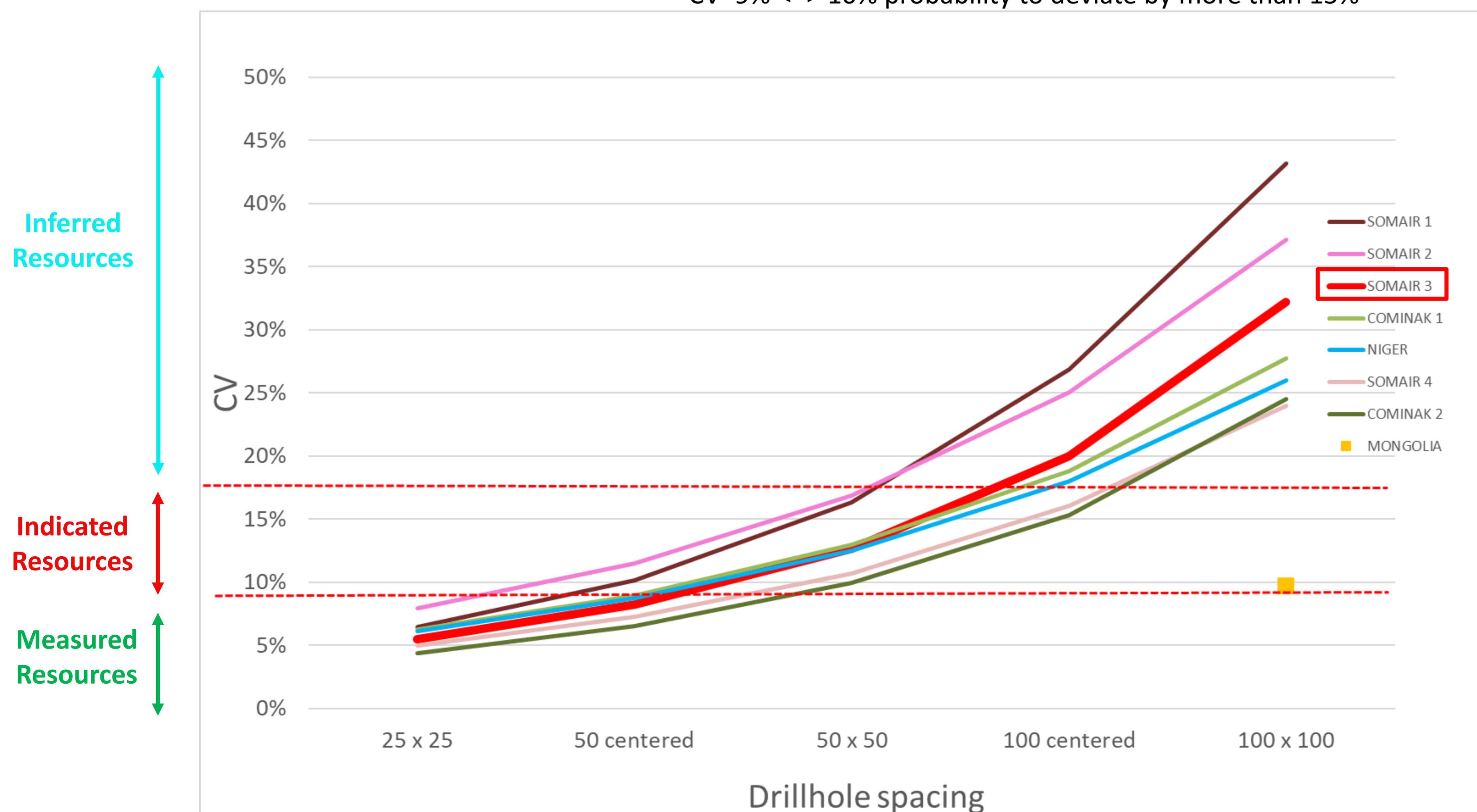
Use of Specific Surface for resource classification: Comparison between deposits

SSDV and V_0 allow computing estimation variance and Coefficient of Variation for a given production volume (surface in 2D) V

$$\sigma_e^2(Z_V) = \frac{SSDV}{|V|} \quad CV = \frac{\sigma_e(Z_V)}{M} = \sqrt{\frac{V_0}{|V|}}$$

The smaller the CV, the higher the confidence.

CV=9% \Leftrightarrow 10% probability to deviate by more than 15%



Classification of resources in term of hole spacing for a nominal production of 1 000 T U

The method allows an objective classification of resources for comparison.
Applying the method to either 3D or irregular drillhole spacing is possible but more complex.

Febvey M-C, Rivoirard J, Martin B, 2021. On measuring the spatial sampling density of a deposit for Mineral Resource classification, APCOM 2021 Proceedings Book, Editors: C. Musingwini and M. Woodhall, SAIMM, pp 437-448