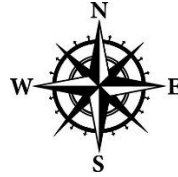


Question

In the table below, total organic content (TOC) from 16 equally spaced wells is summarized. First column and row provide spatial data of the TOC.

	0	10	20	30
0	10	12	9	8
10	20	17	10	7
20	24	20	16	12
30	32	28	12	18



Answer the following questions:

- Calculate the variogram in the north-south direction at lag distance of 20 ft.
- Calculate the variogram in the northeast-southwest direction at lag distance of $20\sqrt{2}$ ft.

Solution

From the equation of variogram provided in the notes:

$$\gamma(h) = \frac{1}{2N} \sum_{i=1}^N [\Phi(x_i) - \Phi(x_i + h)]^2$$

a) We can calculate γ in the north-south direction with 20 ft lag distance. The summation composes of 8 combinations. Plugging table values to the equation:

$$\begin{aligned} \gamma(20, \text{N} - \text{S}) &= \frac{1}{2 \cdot 8} \cdot [(10 - 24)^2 + (20 - 32)^2 + (12 - 20)^2 + (17 - 28)^2 \\ &\quad + (9 - 16)^2 + (10 - 12)^2 + (8 - 12)^2 + (7 - 18)^2] = 44.69 \end{aligned}$$

b) The variogram in northeast-southwest direction with $20\sqrt{2}$ ft lag distance composes of 4 combinations. Again from the same equation:

$$\gamma(20\sqrt{2}, \text{NE} - \text{SW}) = \frac{1}{2 \cdot 4} \cdot [(9 - 24)^2 + (8 - 20)^2 + (10 - 32)^2 + (7 - 28)^2] = 161.75$$

For the calculation of variogram in this question, we do not need lag tolerance. That is because the data is uniformly spaced.