Variance Structure Function(aka the variogram)

by Stephen Crowley

This equation defines the semivariogram $\gamma(h)$ for a stochastic process $Z(x)$. It has the two forms:

1. The discrete form:

$$\gamma(h) = \lim_{\Delta h \to 0} \frac{1}{2\,N\,(\Delta\,h)} \sum_{i=1}^{N(\Delta h)} (Z(x_i) - Z\,(x_i + \Delta\,h))^2$$

   This expression calculates the average squared differences between values of the process at points separated by a distance $\Delta\,h$, as $\Delta\,h$ approaches zero. The factor of $\frac{1}{2}$ normalizes the semivariogram.

2. The continuous form:

$$\gamma(h) = \frac{1}{2\,L} \int_0^L (Z(x) - Z\,(x+h))^2\,d\,x$$

   Here, the semivariogram is expressed as a continuous integral over a domain of length L, considering the squared differences of the process at every point x and its value at $x + h$.