Numerical developments about variability of multi-dimensional correlation factor between geophysical parameters

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The variation of the correlation factor between two or more sets of parameters brings information for geophysical, geological and tectonic assumptions. This correlation factor can be calculated, similarly as in mobile averages with windows of different sizes, passing through the entire network of points, bringing information from depths. The correlation factors may be good indicators for parameters that are related on common causes.

In this paper we have developed computational programs for the generalized correlation factor Pearson between two variables disposed in the surface (2D) or Euclidean 3D space. In the first case we used squares of different sizes and in the second case we used cubic windows. We scrolled these windows with a point until the entire parameter space passed. The values calculated successively for the correlation factor we reported in the center of the used mobile window, thus obtaining sets of 1D, 2D or 3D values for it.

For 1D case we calculated the correlation factor variation between the geomagnetic record series between two very geographically observable Observatories. In this case, we have achieved a significant increase during geomagnetic storms and a near zero decrease during periods of magnetic calm. Since geomagnetic storms occur throughout the planet at the same time, the variation of the mobile correlation factor clearly highlights the start of geomagnetic perturbations. The functional links between the two sets of data are realized directly between the cause phenomenon, represented by the solar activity and a phenomenon-effect, represented by the geomagnetic storm recorded in all observatories.

For 2D case we calculated in surface (latitude, longitude) the correlation factor variation between geophysical parameters (Bouguer anomaly, Free Air anomaly, Magnetic Anomaly, Geoid high, Ellipsoidal high, etc.)

Also, for 3D case we calculated in space (latitude, longitude, depth) the correlation factor variation between geophysical parameters.

The functional links between the more sets of geophysical data are realized between the more cause phenomenon, represented by geological structures and a phenomenon-effect for each response function of the Earth.

This informations can be integrated in 3D GeoModeler software together with all geological and geophysical parameters, obtaining a 3D model with scientific and economic importance.