

## **Description for the general public**

Everybody knows how layer-cake looks like. Its inherent geometric feature is that contacts that separate layers are parallel. The parallelism of contacts is however the case not only for confectioners but also geologists. The study objective is to develop methods capable of estimating deviations from the layer-cake parallelism among geological contacts.

Deviations from parallelism at a larger scale are referred to as unconformities. The recognition and quantification of unconformities is essential in many geological considerations:

- In stratigraphy for subdividing stratigraphic units,
- In structural geology for determining the timing of tectonic activity,
- In exploration for predicting turbidite reservoir facies and in forecasting porosity development.

It should also be noted that in geological mapping distinguishing conformable contacts from low-angle unconformities is critical for a correct interpretation of a geological map. The preliminary experiments can serve to propose and investigate an additional working hypothesis about the lithological determinants underlying spatial distribution of the angular distance. This hypothesis states that small-scale dissimilarities of the angular distance measured may be controlled by lithological differences of units separated by the contacts. For example, contacts that separate clays from other sediments may have a more “wavy” geometry.

We will use boreholes documenting specific geological contacts for the construction of geological models. The core of the methodology is triangulation that serves to build models for two contacts of interest. The measured angular distance between corresponding triangles that locally represent the contacts can be attributed to the geometric centre of a 2D triangle. Geostatistical analysis can be then used to estimate the range of spatial correlation of the angular distance and kriging can also be applied.

From the methodological viewpoint, the realised methodology gives the subsurface researchers a new method for investigating angular relationships between contacts of interest. From the regional viewpoint (Kraków Silesian Homocline), it is possible to investigate small- and medium-scale geometrical differences between contacts that influence other elements of the geological system, for example the groundwater flow.