Applying global mathematical models in the cartography of sandbanks, a case study

Vande Wiele T.

Universiteit Gent, Vakgroep Geografie
Krijgslaan 281 - S8, B-9000 Gent
E-mail: tom.vandewiele@rug.ac.be

For the mapping of sandbanks we will make use of global mathematical models. The general models available are the trendsurfaces (algebraic) and the double Fourier series (trigonometric). In this case study we will focus on the double Fourier series model.

The justification why to use these models falls within the framework of a general research on the influence of point patterns on different models for the representation of the relief of submarine sandbanks. Our hypothesis states that these global methods are less subject to the influence of certain point patterns with as result that these models can serve as a base for a further mapping. A second justification is that there is always a general trend in the data, which can be described by global models.

The research module now tries to determine to which extent the models can be used for mapping. We look how this global model reacts on different point patterns (orientation, density, track distance) and this in relation to the model settings. In order to compare the different models we developed a testing method, based on general descriptive coefficients, correlation coefficients and graphical techniques. For making these estimates possible we make use of a validation data set.

With an increase of the number of terms, used in the equation, we expect a performance increase. Aside this expected result we also notice an instability effect. This effect can be correlated with the distance between tracks (the data pattern) and the number of terms in the equation. This last variable is related to the wavelengths of the cosine en sine function in the equation.

Furthermore we examine how the model can be applied for mapping the submarine structures and we distinguish between direct mapping and indirect mapping. As an indirect mapping we state that the deviations with respect to the model are significant and thus represent a local component. This interpretation gives us the opportunity to map the differences between the data and the model with local methods, like the classical interpolation models.