

EGU21-15564

<https://doi.org/10.5194/egusphere-egu21-15564>

EGU General Assembly 2021

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



Automated recognition of the landforms origin for the Kola Peninsula based on morphometric variables

Sergey Kharchenko^{1,2}

¹Lomonosov Moscow State University, Moscow, Russia (xar4enkkoff@yandex.ru)

²Institute of Geography, RAS, Moscow, Russia (xar4enkkoff@yandex.ru)

The trying of automatic creation of the Kola Peninsula geomorphological map [after Grave M.K. et al., 1971] at the morphogenetic legend's principle was provided based on the "random forest" classification technique. As input data a several geomorphometric variables were used only (the basic variables – elevation, slope angle, curvatures etc., and the relatively rare variables including spectral terrain variables – result of the decomposition of digital elevation model into 2D Fourier series). On the training data covering only 1.3 % study area with known labels for one of thirteen probable landform types, it were carried out the reconstruction of geomorphological boundaries and the automatic creation of the geomorphological map. The accuracy of resulting map was 81 % (area's share with the correct classification result – the same landform type that expertly way defined). This result gives increasing of accuracy over "zero accuracy" (random guessing) more than x10. In general, a large visual similarity between the expertly created geomorphological map and the one created automatically based on the known typological affiliation of the landforms of a small part of the territory is also noticeable. Mistakenly recognized affiliation to one or another genetic type of landform in 19% of tries is rather not a problem, but a good opportunity to improve the predictive power of the model by targeted search of representative morphometric variables. We emphasize - the obtained accuracy of the model is achieved only when using variables extracted entirely from the DEM and calculated fully automatically. The use of data from tectonic and surficial geology maps, maps of quaternary deposits and other data sources can significantly improve the accuracy of the classification and bring it to the level of confident use of the model in practical work. As a by-product of landform classification by the random forest method - the characteristics that are most representative of the prediction of the genetic types of the landforms of the Kola Peninsula have been identified. Almost all of them turned out to be relatively rarely used focal geomorphometric variables. More standard and familiar parameters - slopes, aspect, curvatures are not characterized by significant representativeness. The predictive power of the model was considerably increased by using the spectral characteristics of the relief (parameters of periodicity of the elevation field, calculated by the sliding window method of two-dimensional discrete Fourier transform). The obtained results, we think, convince us that the possibilities of morphometric indicators alone in general geomorphological mapping are underestimated.

The study was supported by the Russian Science Foundation (project No. 19-77-10036).

