Earth **Surface**
Dynamics

Discussions

EGU

Interactive comment on "Modelling Bedrock Topography" *by* Nils-Otto Kitterød and Étienne Leblois

Johannes de Beer (Referee)

hans.debeer@ngu.no

General comments

This paper is an interesting and relevant approach to improve estimates of depth to bedrock in areas without data, based on freely available public data. The statistical concepts are well established and documented. The application and customization of traditional Gaussian statistics to improve estimation of uncertainty in the depth to bedrock estimation is novel and shows weakness and strengths of different statistical methods. The application value of bedrock topography models based on public available data is potentially huge in many practical applications such as e.g. cost and risk estimations in drilling, construction and hydrological analyses. The paper is well writ-

ten and structured, with clear method descriptions, assumptions and concise and clear conclusions.

Specific comments

Section 1, lines 66-68. The application of Poisson's equation is motivated by the expected physical shape typical for areas excavated by glaciers. This implies that Poisson's equation may likely yield results that are in line with morphological characteristics in a glaciated landscape, but may not be applicable in other landscapes. This could be mentioned as a possible limitation. Section 2.3, lines 156. The global dataset for this study seems to include 19.682 boreholes. The GRANADA well database includes much more data on D(u) than 19.682 (85.373). Please explain the limition applied on the global dataset. Section 5.5, lines 405-408. Due to the fact that DQMs are constructed independently of the GRANADA well database (although results may have been used for quality check), there will always be inconsistencies. An increase of datapoints, e.g. by using geotechnical databases, will lead to an increase in these inconsistencies. The scale in which the DQM has been created also plays a vital role in the accuracy of the DQM and therefore its application limitations. However, a valid point is that analyses of these inconsistencies should ultimately lead to into improving the DQMs and thus better primary data sources. Secton 6.1, lines 447-449. This statement is historically correct, but may need some modification with regards to changed digital reporting rutines. Today, digital registration requires the depth to bedrock D or total depth D (for sedimentary wells) as a mandatory reporting fields for drillers. This will lead to improved data for such analyses as carried out in this paper. Section 6.4, lines 589-591. Agreed, see comment above. Digital reporting does significantly improve the quality of the input data.

The value of using other sources of input data, such as geotechnical drillings available through the National database for ground investigations (NADAG) could be mentioned in the conclusions. Also inclusion of other public sources such as geophysical data could be mentioned as future addtional constraints in modelling bedrock topography,

although it is outside the scope of this paper.

Technical corrections

Technical corrections are given in the attached pdf.

Please also note the supplement to this comment:
https://www.earth-surf-dynam-discuss.net/esurf-2019-57/esurf-2019-57-RC1-supplement.pdf