Wichmann, V. (2017): The Gravitational Process Path (GPP) model (v1.0) – a GIS-based simulation framework for gravitational processes. GMD

The paper presents a very valuable toolbox comprising established approaches which have partly been extended. The open source release of the GPP model supports simulating gravitational processes in university teaching as well as in engineering practice. The paper gives a scientifically sound presentation of the implemented components and can also serve as an extended manual for the GPP model. I strongly support the acceptance of the manuscript after some minor revisions.

Detailed comments

Page 1, line 5: I am not sure, if the expression "large-coverage studies" is common. I would suggest "studies covering large areas" or "regional scale studies".

Page 1, line 16/17: word repetition (working, work)

Page 2, line 20: "our" / Page 13, line 26: "for us"/ Page 21, line 3 and 5: "we": As the manuscript is presented by one author, it can be assumed from the citations of the precursor developments, who is meant with the plural expression "we". However, it may sound like a Pluralis Majestatis. I would recommend reformulating the sentences.

Page 2, line 24: Please give a short overview on the structure of the paper.

Page 2, line 26: "starting zones" might be better than "initiation sites".

Page 2, line 27: "represented" might be better than "organized".

Page 4, Figure 2: If the particle reaches the DTM border, there is no sink filling any more, I assume. Thus to my understanding, the arrow from DTM border should go directly to next particle and not lead to "Fill Sink".

Page 4, line 6: "combine them" instead of "combine these selections" as the components are combined, not the selections.

Page 5, introduction to chapter 3.1: The introduction to chapter 3.1 presents different approaches for process path modelling. It would help to avoid wrong expectations for the following subchapters if a last sentence could be added explaining which of the mentioned approaches are implemented within GPP and thus presented in detail. The introduction to chapter 3.1 is much longer than the introduction to chapter 3.2 (page 8). Maybe they can be homogenized regarding their length and structure.

Page 6, line 18: For me, the sentence would be more comprehensible if it would be: "This introduces a probabilistic component, especially if the terrain is modified by sink filling or material deposition between two model iterations."

Page 6, line 21-23: Please explain what the pseudo-random number generator is used for in the maximum slope approach.

Page 6, line 4: It is not absolutely necessary but would help if N were also defined N in words as the set of possible flow path cells.

Page 6, line 8: "different terrain" or "different topography" instead of "different relief"

Page 7, formula 4: To my opinion, the usage of j may lead to misunderstandings and is not necessary. It may be replaced by i.

Page 7, line 15-16: I don't understand the explanation within the brackets: which is also contained in the computation of the sum if i' belongs to N).

Page 7, line 14-18: N is the set of possible flow path cells, i' is the previous flow direction. Thus, strictly speaking, i' cannot be part of N, as a direction is not a cell. Of course, it can be understood that each element n_i as part of N is attained from the previous cell by using a clearly defined direction. Nevertheless I would prefer a mathematically sound formulation.

Page 7, line 24-29: Bullet points for the description of the three parameters would enhance the readability of this passage.

Page 7, line 33/34: Please insert a reference to chapter 3.2.2 (where the Geometric gradient is explained).

Page 9: Geometric gradient, Fahrboeschung and Shadow angle are subchapters to 3.2.1 energy line approaches and should thus be numbered: 3.2.1.1, 3.2.1.2, 3.2.1.3

Page 9, line 26: Better "For the Fahrboeschung the vertical offset is determined like for the geometric gradient". (Passive, because the Fahrboeschung is a concept and cannot define anything, determine in order to avoid the repetition of the work define).

Page 10, line 28: Please use ≤ instead of <=.

Page 10, line 7: "Approach (i) requires the user to specify the amount of energy reduction in percent." After reading this sentence I asked myself how the user should do this and had to wait until page 11, line 19 for the explanation (that the value has to be calibrated). Maybe the first statement and the explanation can be brought together.

Page 11: From the example given later in the manuscript I understood that the decision if the sliding or rolling mode is calculated is not made by the model, but has to be taken by the model user. It would help if this could be noted here.

Page 12, line 24: Does "also" mean that formula 14 is implemented, too?

Page 13, line 22, line 24, line 32 /Page 18, line 18: "left" instead of "left over"

Page 13, line 3-4: word repetition (simulating)

Page 13, line 5: "achieve" instead of "archive"

Page 14, line 14: I am not sure if the expression "how many percent of the material" is correct.

Page 14, line 17: "artefacts" instead of "artifacts"

Page 15, Table 1 /Page 17, Table 3 und 4: please use "μ" instead of "mu".

Page 15, Table 1: The dominating processes within rockfalls are falling, bouncing and rolling. Sliding occurs only subordinatedly. However, it is not unusual to simulate rockfalls by using the sliding motion for the sake of simplicity, but should be discussed.

Page 18, chapter 4.4: Of course, GPP can be a valuable tool for investigating different scenarios and thus also estimating e.g. the impact of protection measures. However, due to the mostly conceptual run-out modelling approaches, it is very well suited at the regional scale and can only be used with extreme caution at the local scale. For example, different block sizes of rockfall can only be simulated indirectly by using different friction parameters. In order to avoid false expectations I would appreciate if the use restrictions at the local scale could be thematised at an appropriate place.

Page 19, line 2/3: 2.5 m - lease use a no-break space.

Page 20, Figure 8 e): Why are no deposition heights shown at the end of the paths?

Page 20, line 18: "extent" instead of "extend"

Page 20, line 18: "Reasonably" instead of "reasonable"

Page 21, line 2: "The GPP model should" might be better than "The GPP model is an attempt"

Table A.3: I would prefer to skip 1 and 2 and list all parameters completely. Of course this means a lot of repetitions, but makes it clearer.