



3D Slope Generation and Block Stability: Field Mapping to Analysis

Q1: If the topographic data is obtained from a drone which has no RTK module, is it possible to have coordinates along the fracture when digitizing?

A1: If you have normal accuracy GPS, then you will also obtain coordinates but in the accuracy of the normal GPS and not in RTK quality. If you don't have GPS at all in the drone, you can still obtain real-world coordinates if you use surveyed ground control points for registration. If you only scale and orient the 3D model, it only comes with local coordinates but with scale and north-corrected angles.

Q2: In Rocslope3, how to distinguish the type of discontinuity? The purpose is to identify the major and minor geological structure

A2: There are different ways of modeling discontinuities depending on the available data. For structures of large extents, these can be imported as geometry surfaces (i.e., smooth or undulating), and then added as "joint surfaces" with appropriate strength properties. The user may also create surface geometries within the program (i.e., large planes), and then add as a joint surface. Joints that have data for size, location, and orientation can be modeled as circular "measured joints". The assumption here is that the joint shape is unknown, hence assume circular. If location data is not available, users may create synthetic joints. Synthetic joints utilize information from traverses, including statistics of the joint orientation, size, and spacing (i.e., analyze in Dips). The user would draw a traverse in RocSlope3, and then joints would be automatically populated along the traverse according to the joint statistics.

Q3: Could you do that second design example for dowels in shear instead of tensioned bolts?

A3: RocSlope3 has options for the application of different support types and bolt efficiency models to help with modeling different support resistance mechanisms.

Q4: Can the irregular joints (e.g., DXF) exported from 3GSM be imported directly to RocSlope3 for block analysis?

A4: Yes, import the irregular joints into RocSlope3 as .dxf, then apply "Add Joint Surface". This helps convert the geometry surface into a joint surface to be used for block calculations.

Q5: How would you recommend the size of a 3D model (in terms of slope area and resolution) to be processed in both 3GSM and RocSlope3 to achieve a fully integrated workflow?

A5: The domain size mainly depends on the analysis scale of interest and is not affected by integration. Whatever model size is generated in 3GSM can be directly imported into RocSlope3. Resolution simplification is recommended to improve computation times. The mesh can be simplified via geometry tools in RocSlope3.

Q6: How do 3GSM and RocSlope3 account for uncertainties in joint orientation and persistence of joints?

A6: Uncertainties associated with joint persistence and orientation can be analyzed using a sensitivity study. If joint data is available for Measured Joints, the user may manipulate the dialog to enlarge joint sizes for block formation assessment.

Q7: Does SMX include/allow for the Terzaghi correction taking into account orientation of the bench slope modeled?

A7: If the user is defining synthetic joints, which populate joints along a traverse using set statistics, the user can import joint set orientations from Dips as unweighted or weighted values. The weighted values would have undergone Terzaghi correction in Dips.

Q8: Hi, what are the accepted files into ShapeMetriX again?

A8: Photos – jpg for 3D model generation using photogrammetry. Existing 3D models – obj (including mtl + jpg files); e57 LiDAR point cloud.

Q9: What is the ideal process to map and model structures in ShapeMetriX — is it pre-blast or post-blast?

A9: This depends heavily on the project and its requirements. One usual way is to map existing faces and update/verify as excavation progresses.

Q10: How practical is it to use bolts especially when the pit has already been excavated? What alternatives can we explore?

A10: Bolts may be applied as part of a hazard forecasting process before excavation. Alternatively, users may model support pressures and shotcrete in RocSlope3.

Q11: Can we do fault modeling in ShapeMetriX?

A11: Uneven discontinuities such as faults can be modeled with the Discontinuity Surface feature.

Q12: We spoke earlier about best ways to capture data with a drone. How would you fly a drone to capture an overhang low to the ground?

A12: The ideal angle to the surface is perpendicular. If you have an overhang, you need to look upwards. Not all drones support this, so you may need one that does. Alternatively, use a handheld camera looking upward if the overhang is low.

Q13: How long does it normally take to compute? What was the runtime for the first example in RocSlope3?

A13: The original runtime for the first example in RocSlope3 takes under a minute.

Q14: Do you think it is important to assess slope stability by integrating limit equilibrium methods with finite element methods? What are the pros and cons?

A14: The limit equilibrium method in RocSlope3 accounts for structurally controlled failures, not failures through intact material. If failure is not solely structure-governed, use FEM. If it is, RocSlope3 and RS3 (FEM) give the same FS or SRF. RocSlope3 is easier and faster to use because FEM depends on mesh quality.

Q15: Can ShapeMetriX automatically identify discontinuities? What are its advantages compared to LiDAR scanning?

A15: (1) Automated identification of joints: Not fully automated yet. Guided tools (Area Region Grow, Guided Trace) help expedite mapping with user oversight.

(2) Photogrammetry advantages over LiDAR: Photorealistic 3D models, high-res textures, easy data capture, low training needs, affordable hardware, adaptable environments, and no need for active sensors. ShapeMetriX also accepts LiDAR.

(3) Identifying lithology/veins: The Lithologic Region feature is returning in ShapeMetriX v5.0. It allows mapping of user-defined lithologies in 3D, exportable to other software. Integration with Rocscience tools is planned.

Q16: How long will a model of 500 photos take to generate (on a high-end computer)?

A16: Processing time depends on setup and detail, not only number of photos. On average, about 60 minutes with potential for improvement.

Q17: Do you have cloud processing options for the 3D photogrammetric models?

A17: Not yet.

Q18: We have drone photosets with more than 600 images — very time-consuming for local processing

A18: Thank you for the feedback. Processing time depends on photo count, computing power, and level of detail. You can optimize flight paths to reduce photos, use “Normal” settings for coarse reconstruction, and adjust dense reconstruction presets. Also, ensure your hardware is optimized. Please reach out for detailed advice.