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The role of bedrock geometry on hillslope hydrological response

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We investigate the role of bedrock geometry on hillslope response. Our method accounts for hydrological response of hillslope using a generalized hillslope-storage Boussinesq (hsB) equation. A general numerical method based on a dual grid has been developed and used to solve the equation. The generalized hsB equation performance for two types of complex bedrock profiles is evaluated. Comparison of both cases to the hsB model based on straight bedrock profile enables us to see the effect of bedrock profile curvature on hillslope response. The comparison is carried out on a gentle hillslope (5% bedrock average slope) with a uniform plan shape and varying profile curvature. The results show that the proposed generalized hsB model is easily capable of handling the effect of complex bedrock profile on the hillslope response. The model performance demonstrates the robustness of the proposed numerical solution approach to handle the model in different conditions. The mass balance control shows that the computer program works well for the model over curved and dead storage zone bedrock profiles.