ARMA Future Leader Webinar Series

Evaluating the Accuracy of Bonded Block Models for Prediction of Rockmass Analog Mechanical Behavior

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https://stonybrook.zoom.us/j/9539339965?omn=96069259795

Abstract

Large-scale rock formations, referred to as “rockmasses”, consist of intact rock separated by pre-existing discontinuities (i.e., joints). The mechanical behavior of rockmasses is difficult to directly test in the laboratory due to the required specimen scale. Instead, Synthetic Rockmass Modeling (SRM) is often used to simulate field-scale rockmass behavior. SRM requires a calibrated discrete element model (DEM) of intact rock combined with a Discrete Fracture Network (DFN). While the SRM concept has been informally determined to provide reasonable results based on practitioner experience, detailed and peer-reviewed validation is lacking. The goal of this study was to evaluate the predictive capabilities of the SRM method. Previously available data on intact and rockmass analog laboratory specimens of Blanco Mera granite containing DFNs with two joint sets were used as a basis for the SRM created in this study. Specifically, the intact DEM was a Bonded Block Model (BBM), generated to match the grain structure and composition of Blanco Mera granite and the model’s input parameters were calibrated so that the behavior of the BBM matched that of the intact laboratory specimens. The predictive capabilities of the model were evaluated by recreating the DFN from the jointed laboratory specimens within the intact BBM and comparing the behavior of the jointed models back to the jointed laboratory specimens, which has not been previously studied in the literature. The BBM was found capable of approximately predicting the behavior of rockmass analog specimens containing a pre-existing DFN without further calibration, which shows potential for the use of SRM in both industry and academia. Specifically, the BBM predicted the strength, dilatancy, and microfracturing behavior of the jointed laboratory specimens.

Biography

Isabella (Ella) West works as a geotechnical engineer at WSP USA in their mine stability (rock mechanics) group. Her focus is on numerical modeling of rock and soil structures for mining applications. Prior to working in industry, she completed her PhD in Geological Engineering from Colorado School of Mines with a focus on discrete element method numerical modeling and laboratory testing.