

Si, T.-Q., Su, Y.-H., Xiao, W., 2017, Robust reliability analysis of support surrounding rock based on Info-gap theory, *Yantu Lixue/Rock and Soil Mechanics*, Volume 38, Issue 3, 10 March 2017, Pages 827–832 and 910.

Abstract The stability of surrounding rock support structure is the key to the design of underground structure. To overcome the insufficiency of statistical information on surrounding rock parameters of deep tunnels, the information-gap theory is introduced to develop a non-probabilistic reliability analysis method for surrounding rock. The info-gap model of dimensionless parameters is given based on the uncertainty level, and the robust function of reliability analysis is obtained according to the system model and performance requirements. The maximum fluctuation amplitude of uncertainty parameter which can be tolerated before structural failure is taken as a robust reliability index. An optimal support resistance of homogeneous elastoplastic surrounding rock is obtained based on the slip-line field theory. Then a response function of stability analysis of surrounding rock support structure is established. The engineering example illustrates the specific operation procedures of robust reliability analysis. The parameter analysis shows that the greater the support resistance is, the more stable the structure is. In the meanwhile, it is shown that increasing the internal friction angle and cohesion of the surrounding rock is the key to improve the stability of the support structure. The proposed procedure is a reasonable and effective method to deal with the uncertain problem when the parameter information and sample data are limited.

Keywords Info-gap model, Response function, Robust evaluation, Slip-line field, Support surrounding rock