Crack Opening Analysis by Means of X-rays CT

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Crack projection method has been proposed for the crack opening measurement of rocks, using the 3 dimensional data of the linear absorption coefficient given by the X-rays Computed Tomography. This is a promising method to measure the crack opening from the X-rays projection normal to the crack surface. The fundamental formulae for the crack opening measurement have been firstly described as well as the necessary regional averaging technique and the data processing for measurement of accuracy to micron meters, and subsequently the crack model experiments using a couple of half-moon aluminum plates has been conducted to examine the accuracy and reliability of the method.

As a case example of the Crack Projection Method, the Short Rod testing has been presented and described, that is a suggested testing method of the International Society for Rock Mechanics for determining the fracture toughness of rock. Crack growth characteristics with pull-loading have been described by showing the 2 dimensional images of the X-rays Computed Tomography. The permanent opening displacement of the extended crack has been successfully examined by the subtraction of the crack opening profiles measured before and after the Short Rod testing, and the elastic opening of the extended crack has been also examined by analyzing the change of the crack opening profile by reloading. Moreover, the dimension of the fracture process zone has been estimated as well as the permanent strain in this zone.

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