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A method and work flow for quantifying Rock Burst in 4D

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A better understanding of the rock burst process is highly important in deep tunneling and mining, as this type of rock failure occurs abruptly and releases devastating amounts of energy. To quantify the rock burst process in 4D (i.e. space and time), a novel work flow comprising rock mechanics testing, destructive and non-destructive data acquisition and analysis methods has been established. The core of the work flow is a cycle of uniaxial compression of sample cylinders and data acquisition. Each cycle increases loading, controlled by acoustic emission testing to record timing and approximate 3D location of newly created cracks. Data acquisition is performed by a combination of non-destructive and destructive methods: high-resolution micro-computed tomography is used to register cracks with sizes down to several microns in 3D, photomicrographs are acquired from petrographic thin sections to investigate vulnerability of mineral types to cracking. Acquired 2D and 3D data are processed by Object Based Image Analysis to provide spatial statistics on shapes and configurations of cracks and the interactions with different mineral types.