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Rock mass damaging investigation through the analysis of microseismic monitoring data collected on rock masses

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Rock mass damaging investigation is a main research topic in the ambit of rock fall hazard assessment. Roads and railways interruptions, as well as damages of buildings, are among the main inconveniences due to the detachment of unstable sectors of highly jointed rock masses. The contribution of rock mass creep together with natural and anthropic forcings leads to the accumulation of inelastic strain within the rock mass and to the formation of new joints or to the extension and movement of the pre-existing ones. The associated stress release produces tiny vibratory signals (known as microseismic emissions) that can be detected by on-site installed microseismic monitoring networks. Monthly and annual microseismic monitoring data can provide information on seismicity increase over certain periods and on the deterioration of rock properties as the elastic moduli. However, other seismic attributes may support the comprehension of rock mass damaging processes. In particular, the analysis over time of the damping ratio associated with the microseismic emissions could indicate transient and permanent changes within the micro-joint network. This analysis approach has been already conducted on a three-month long microseismic dataset collected at the Acuto field-lab, which is hosted in an abandoned quarry and is mainly exposed to environmental forcings (rainfalls and thermal cycles); moreover, to account also for anthropic vibrations, preliminary studies were carried out on a rock mass located in proximity of a railway. As a further perspective, the investigation of multi-year seismic dataset acquired on unstable rock masses will allow to better inspect the reliability of this analysis approach for rock mass damaging assessment.