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Hylite: a hyperspectral toolbox for open pit mapping

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Hyperspectral imaging is a powerful tool for mapping mineralogy and lithology in core and outcrops, as many minerals show distinct spectral features in the commonly analysed visible, near, short-wave and long-wave infrared regions of the electromagnetic spectrum. High resolution ground and UAS (unmanned aerial system)-based sensors thus have significant potential as a tool for rapid and non-invasive geological mapping in mining operations, exploration campaigns and scientific research. However, the geometrical complexity of many outcrops (e.g. cliffs, open-pit mines) can result in significant technical challenges when acquiring and processing hyperspectral data. In this contribution we present updates to the previously published MEPHySTo python toolbox for correcting, georeferencing, projecting and analysing geometrically complex hyperspectral scenes. We showcase these methods using datasets covering volcanogenic massive sulphide (VMS) mineralisation exposed within open pit mines in Rio Tinto (Spain), and interpret possible structural and lithological controls on mineralization. Potential applications of hyperspectral mapping for grade control, outcrop mapping and the characterisation of different mineral deposit styles are also discussed.