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Potential of spaceborne imaging spectroscopy for surface mineral detection in northern latitudes

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The upcoming launch of the EnMAP hyperspectral satellite will open up new opportunities to map and explore geological regions where bedrock is not obscured by standing vegetation. Investigations of arctic and subarctic regions are positioned to particularly benefit from the availability of such data.

This presentation will cover a range of potential geological applications in northern settings spanning various degrees of mapping or detection complexity. An example of feasible regional lithological mapping will be illustrated using an EnMAP satellite image simulated from a large airborne hyperspectral survey acquired over a Ni-Cu ultramafic belt of Northern Canada, located at a latitude above the tree line. The merits of EnMAP for baseline bedrock identification in the context of spectrally similar rocks (mafic-ultramafic) are shown as well as the benefit to target prospective units for mineral exploration.   We will also illustrate that the presence of extensive lichen cover does not fully preclude the detection of certain minerals associated with targeted lithologies. The potential to map several types of gossans and their relation to substrate geology will be discussed in the context of exploration.

Next a more challenging scenario is reviewed where satellite spectral sensing can offer value for mineral exploration and the regional scale detection of deposit alteration footprints. Results will be presented for alteration vectoring using the detection of white mica and its composition from airborne spectral sensing in northern Canada. The investigation of mineral composition is more challenging due to the potential spectral interference by vegetation. In the study presented geologically informative results were nevertheless achieved after rejecting most of the available pixels due to contamination with vegetation and extensive lichen cover.

Lastly we will examine the prospects of exploring for rare earth minerals (REE) and gemstones (e.g. sapphire) using geological examples from northern Canada as a baseline. A brief overview of REE mineral spectroscopy and an example of gemstone exploration will be covered to discuss the potential detection of these classes of minerals from upcoming hyperspectral satellites.