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Using Earth Observation to track lithium movements in the Salar de Uyuni region, Bolivia

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The increasing global effort to overcome the reliance on fossil fuels is driving the demand for 'green' metals such as lithium. This study aims to develop a repeatable and seamless workflow to track the mass of lithium from its source in the watershed surrounding South American salt lakes ("salars") to the nucleus of the salar itself. The area of interest is in and around the Salar de Uyuni, Bolivia, the largest salt flat in the world. We aim to create an understanding of how Li brine deposits develop, where the water and solute comes from, how the brines are created and how does abstraction affect the mass balance within the salar. For this research, open source Earth observation (EO) data is analysed to support geological and hydrological research. We explore the potentials of EO data for several research aspects, such as (1) Jointing: it may influence fracture-flow of groundwater and also be significant in terms of surface-area for water-rock interaction, i.e. potentially increasing the 'leaching' rates of Li from the bedrock into the water; (2) Weathering: the degree and style of weathering may influence the liberation of Li from rocks into the water; (3) Distribution of clays: the distribution of clays that may restrict the liberation of Li from weathered rock, or may scavenge Li from passing water; (4) Water and moisture: the distribution of water-bodies and sources, including active streams, springs etc. We are building a groundwater recharge model having as input soil moisture content; (5) Geological structure: the presence of neotectonic faults that may disrupt the salar, as well as structures that may provide pathways for the flow of fluids; (6) Lithological mapping and classification: possible refinement of existing geological maps. This workflow will support the sustainable management of lithium in the region. Moreover, the provision of "fit for purpose" systems of tracking Li helps in filling gaps in existing methods to enable Li brines resources to be correctly reported.