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Indirect estimation of airflow inside uranium waste rock dumps using ground surface temperature measurements

Uranium waste rock dumps contain residual uranium mineralization, resulting in increased concentrations of radon within the dump body. Depending on the structure of the stored material as well as on the surface properties and environmental parameters, radon is released is from the waste rock dump body and the radon concentration in vicinity of the dump increases.

Areas of release vary during the year, depending on external temperature, cloud cover and atmospheric pressure. Radon release is coupled with airflow through the dump body, resulting in two typical vertical airflow regimes –up from base to top during winter, down with radon release near the base during hot weather.

Release areas in both regimes can be localized using ground or UAV thermography, providing hot and cold spots, and aiding in optimization of placement of the measurement instruments. However, surface radon exhalation measurements and radon concentration measurements above the surface are risky in terms of equipment damage and loss and do not provide inflow data.

Therefore, we propose method and instrumentation for evaluation of the airflow in the waste rock dump body using thermal dataloggers at above surface (control) and sub-surface positions. Such measurements provide indication of inflow and outflow at selected points and provide data to identify a critical "characteristic temperature" at which the natural airflow changes direction, resulting in sharp change in radon exhalation.

Results from an in-situ pilot campaign will be presented.

Primary author: KASCHNER, Martin (KDAIZ, FJFI, ČVUT v Praze)

Co-authors: THINOVÁ, Lenka (CTU FNSPE); ŠTĚPÁN, Václav (CTU FNSPE)

Presenter: KASCHNER, Martin (KDAIZ, FJFI, ČVUT v Praze)