Muography: a density imaging technique based on atmospheric muons

Applications: archaeology, volcanology, hydrology, speleology, geology, mining, civil engineering, oceanography, etc.
- 2D density images (muon radiography)
- 3D density images (muon tomography)
- Time-sequential 2D or 3D

Muography applied to studying bedrock fracturing and weathering:
- Imaging of soil layering and permeability structures
- Stability of tunnels (rock mechanics)
- Monitoring of rock and soil slopes
- Imaging weathered profiles and fracture patterns

Our plans:
- Field measurements in N Finland (tor formations)
- Imaging of thick kaolinitic saprolites of pre-Pleistocene age

Marko Holma\textsuperscript{1,2,3,4}, Pertti Sarala\textsuperscript{5}, Adrian M. Hall\textsuperscript{6}, Pasi Kuusiniemi\textsuperscript{2,3,4}, Hiroyuki K. M. Tanaka\textsuperscript{7,8,4}, and Dezso Varga\textsuperscript{9,4}

\textsuperscript{1}Kerttu Saalasti Institute, University of Oulu, Finland
\textsuperscript{2}Muon Solutions Oy, Finland
\textsuperscript{3}Arctic Planetary Science Institute, Finland
\textsuperscript{4}Virtual Muography Institute (global)
\textsuperscript{5}Geological Survey of Finland
\textsuperscript{6}Department of Physical Geography, Stockholm University
\textsuperscript{7}Earthquake Research Institute, University of Tokyo, Japan
\textsuperscript{8}International Muography Research Organization (MUOGRAPHIX), University of Tokyo, Japan
\textsuperscript{9}Wigner Research Centre for Physics, Hungary

For those interested in scientific cooperation with VMI, contact M. Holma for guidance:
marko.holma@muon-solutions.com