

Portable rock densimeter: development and calibration

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Context

Density (specific volume) is an important physical property of rocks, especially for gravity studies where a correction of rock masses near the surface is essential. Classical corrections use 2670 kg/m^3 as standard density value, but the actual density of rocks in geological outcrops can easily differ by $\pm 25\%$, and this has a major influence on corrections, especially in mountainous areas. To use more representative density values, rock samples are typically: collected in the field, carefully prepared, and then measured in the laboratory. Characteristic sample size is a few centimetres or less, and hours of work and measurements on a sample yields a high-precision density estimate.

However, for the purpose of gravity corrections, a lower precision estimate would be sufficient, which could be – ideally – measured directly in the field in a few minutes.

Objectives and Methods

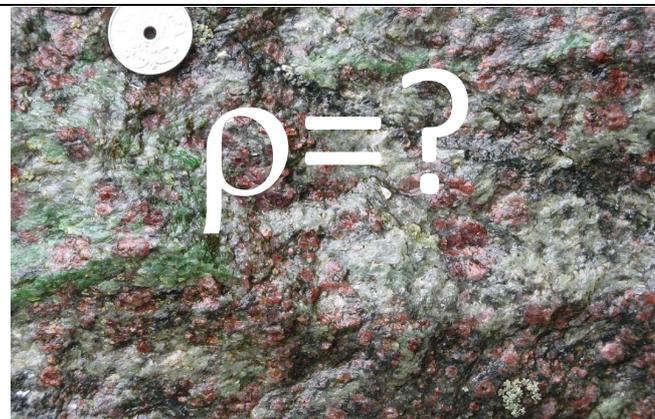
The goal is to develop, test and calibrate a new densimeter for field conditions, which is portable and robust. Several realization avenues exist and can be explored by a motivated, inventive and practical (two-right-handed) MSc candidate. The target precision of the new tool is ca. 10 kg/m^3 . The test measurements can be carried out on various types of rocks, on hand specimen sized samples. The obtained density values will be cross-checked at smaller spatial scales using a pycnometer (at EPFL) and/or X-ray tomography (at UNIL) for representativeness and final adjustments of the new tool.

Literature

Steinhauser et al. (1990) Gravity investigations in mountainous areas. *Exploration Geophysics* **21**:161-168.

Yamamoto (1999) Estimating the optimum reduction density for gravity anomaly: a theoretical overview. *Jour Fac Sci, Hokkaido Univ, VII*, **11(3)**:577-599.

Scarponi et al. (in revision) New gravity data and 3D density model constraints on the Ivrea Geophysical Body (Western Alps). In revision for publication in *Geophys J Int*.



WEB sites

Project OROG3NY: www.unil.ch/orog3ny

Pycnometer information, e.g.:

<https://www.micromeritics.com/product-showcase/AccuPyc-II-1340.aspx>

Choice of orientation :

1) Sedimentary, Environmental and Reservoir Geology / 2) Geochemistry, Alpine tectonics, Ore Deposits