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Calibrating relative gravimeters in the changing gravity field

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We discuss results on the local calibration line Masala–Vihti, Finland, which is based on absolute gravity measurements and intended for calibrating relative gravimeters used in high precision surveys and in applied geophysics. To establish and maintain a stable and precise calibration line several aspects must be taken into account. In Fennoscandia the postglacial rebound (PGR) changes the gravity differences between the stations. This can be dealt with either 1a) by making repeated absolute gravity measurements to determine the gravity trend for each site, or 1b) by approximating the gravity change using a PGR model. 2) Care must be taken to determine the gravity as a function of sensor height above the station marker, as users are unwilling to mount their relative meters at the effective height of the absolute meters. 3) In most cases, the parameters for tidal corrections (Earth tides and ocean load tides) can be obtained with sufficient accuracy from models, both for absolute and relative measurements. 4) Regional hydrological loading and attraction, and local hydrological attraction (snow, soil moisture and groundwater) are potentially the most difficult aspects to deal with. Models are available for regional loading and it may in a small geographical area largely cancel out from the gravity differences. But the local attraction must be handled individually for each station. Hydrological effects will also show up in the absolute measurements which usually cannot be performed with sufficient frequency to determine even the seasonal component. For the best results, continuous recordings on site by well calibrated recording gravimeters (superconducting or quantum gravimeters) for at least one year would give a reliable basis to model most environmental effects and in addition the earth-tide related parameters.