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Contribution of the GRACE and GOCE models to a geopotential-based geodetic vertical datum in Canada

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Natural Resources Canada (NRCan) is presently getting ready to release a new vertical datum for the country by November 2013. The Canadian Geodetic Vertical Datum of 2013 (CGVD2013) will be defined by the geopotential surface 62,636,856.0 m^2s^{-2}, which was agreed between the USA and Canada. This geopotential value is representative of the mean coastal sea level around North America and is consistent with IERS Conventions 2010. CGVD2013 is to replace the current levelling-based Canadian Geodetic Vertical Datum of 1928 (CGVD28). A GRACE and GOCE geopotential model will be spectrally combined with the North American terrestrial gravity data and a global Digital Elevation Model to determine the high-resolution Canadian Gravimetric Geoid model 2013 (CGG2013). CGG2013 will be the first geoid model realizing officially CGVD2013. NRCan will apply the remove-compute-restore Helmert-Stokes scheme for its development. As part of this significant undertaking, this study focuses on assessing the contribution of the latest GRACE and GOCE models in terms of spectral content to enhance our understanding of the gravity field over Canada, ultimately improving the realization of CGVD2013. These GRACE and GOCE-based models include EGM08, EIGEN-6C, EIGEN-6C2, DIR_R3, TIM_R3, GOCO03S and other possible newer releases. The geoid models are determined by combining the satellite-only models with the terrestrial gravity data by the spectrally modified Stokes formula. The resulting geoid models will be compared with independent GPS-Levelling, gravity and other data for Canada and sub-regions. The results of this study will allow NRCan to select the 'best' GRACE and GOCE model for the development of CGG2013 and to determine its optimal spectral combination with terrestrial gravity data in Canada.