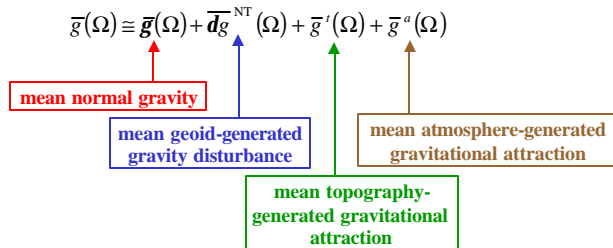


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The mean value of gravity along the plumbline between the earth surface and the geoid $\bar{g}(\Omega)$ depends on the mass density distribution within the earth and the shape of the earth. Since the actual gravity along the plumbline cannot be measured, the mean value of gravity has to be computed from the gravity observed at the physical surface of the earth. This can be realized by reducing the observed gravity according to some accepted physical model.

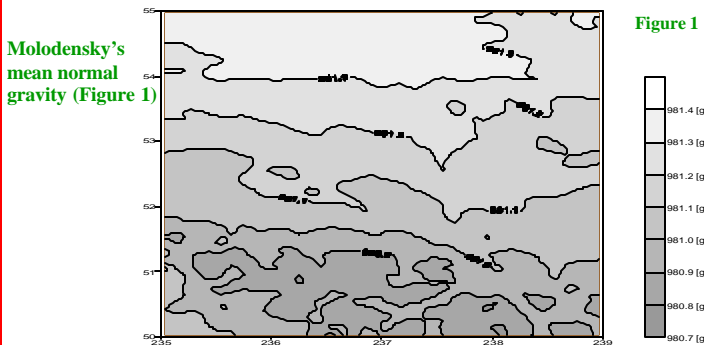
To evaluate the mean gravity, the actual gravity is decomposed into the normal gravity, geoid-generated gravity disturbance and the gravitational attraction of topographical and atmospheric masses. The mean normal gravity is defined according to Somigliana-Pizzetti's theory of the normal gravity field. The mean geoid-generated gravity disturbance is obtained by applying the Dirichlet's boundary value problem into the theorem of integral mean. The mean values of gravity generated by topographical and atmospheric masses are computed as the mean linear potential gradient.



Reference: Tenzer, R., P. Vaníček, M. C. Santos, W. E. Featherstone and M. Kuhn (2004). "Rigorous Orthometric Height", submitted to *Journal of Geodesy*.

Results for a test area in the Canadian Rocky Mountains $\Delta\phi < 50^\circ, 55^\circ >$, $\Delta\lambda < 235^\circ, 239^\circ >$

Mean Normal Gravity is composed of two terms: *Molodensky's mean normal gravity and correction to normal gravity due to the geoid undulation.*



Mean geoid generated gravity disturbance (Figure 2)

Mean topography-generated gravitational attraction is composed of: mean gravity generated by the Spherical Bouguer shell, mean value of spherical terrain correction within the topography and effect of anomalous topographical density.

Mean atmosphere-generated gravitational attraction is the mean linear potential gradient of the atmospheric masses

Mean gravity along the plumbline (Figure 3)



Figure 2

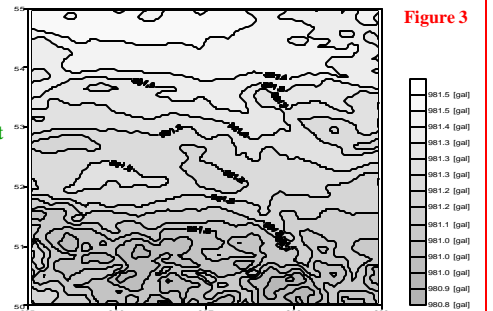


Figure 3

Conclusions

	Min.	Max.	Aver.
Orthometric Heights [m]	4	2736	1166
Geoidal Heights [m]	-17.17	-11.90	-14.63
Anomalous Topo Density [$g \cdot cm^{-3}$]	-0.18	0.31	0.04

	Min [mGal]	Max [mGal]	Aver [mGal]
Mean Molodensky's Normal Gravity	980751.5	981392.1	981111.0
Correction to Normal Gravity for Geoid Undulation	3.7	5.3	4.6
Mean Geoid-Generated Gravity Disturbance	-169.2	128.2	-14.6
Mean Gravity of Spherical Bouguer Shell	0.0	286.1	130.4
Mean Spherical Terrain Correction	-64.3	35.0	-2.1
Mean Gravity of Anomalous Topo-Density	-10.1	29.0	2.3
Mean Atmosphere-generated Gravity	-0.10	-0.01	-0.05
Mean Gravity	980858.5	981517.1	981232.2

Acknowledgments: Funds provided by GEOIDE Network.