

# **The Application of High-Degree Gravitational Models to Processing Airborne Gravity Collected under the NGS GRAV-D Project**

**Simon Holmes and Dan Roman, USA**

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## **SUMMARY**

In the United States, the National Geodetic Survey [NGS] holds the official charter to maintain the vertical datum for the USA and its territories. This includes the responsibility to maintain a current geoid model for transforming between orthometric (H) and geodetic (h) heights. The latest NGS gravimetric geoid model, USGG09, incorporates the latest GRACE-based satellite-only geopotential solutions; very-high-resolution digital elevation models [DEMs] derived from the Shuttle Radar Topography Mission [SRTM], and other additional data and processing improvements. The NGS also made extensive use of the National Geospatial-Intelligence Agency's [NGA] Earth Gravitational Model 2008 [EGM2008] to identify and remove corrupted data from the NGS gravity database. NGS intends to increase its efforts to refine and improve the coverage and integrity of its gravity database. Their ambitious "Gravity for the Re-definition of the American Datum" [GRAV-D] project aims to update the NGS gravity holdings by flying new airborne gravity surveys over a large fraction of the USA and its territories. To be useful for geoid determination, gravity observed at flight altitude must first have a correction applied to it to obtain the corresponding gravity on the topographic surface. The collective process by which these correction terms are computed and applied is known as 'downward-continuation'. A new and highly versatile means of computing these corrections proceeds by augmenting existing gravitational models, such as EGM2008, with the airborne gravity data, such that the augmented model is able to reproduce the original gravity observations at flight altitude to sub-milliGal accuracy. Once this is achieved, downward-continuation becomes a simple matter of using the augmented gravitational model to synthesise the desired gravimetric quantities on the appropriate computation surface. Spectral combination of the airborne gravity with other terrestrial and/or satellite datasets is also greatly facilitated.

## **CONTACTS**

Dr. Principal Scientist  
SGT Inc.  
Geophysics, Geodynamics and Space Geodesy  
Simon Holmes  
7701 Greenbelt Road, Suite 400  
Greenbelt  
20770  
MD

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1/2

Simon Holmes and Dan Roman, USA

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United States  
+1 301 489 1122  
[sholmes@sgt-inc.com](mailto:sholmes@sgt-inc.com)