

# NGS's Surface Gravity Prediction Tool

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## SUMMARY

In support of a new vertical datum, the National Oceanic and Atmospheric Administration's (NOAA) National Geodetic Survey (NGS) is developing a number of completely new products and services. This vertical datum, the North American-Pacific Geopotential Datum 2022 (NAPGD2022) will encompass a number of interrelated datasets including a geoid model, time-dependent geoid model, deflections of the vertical, surface gravity model, digital elevation model, etc. This paper will focus on the research and development of a surface gravity model. While this work will be focused on the earth's surface, additional effort will be presented with respect to a truly three-dimensional gravity field model.

NGS has upwards of 10 million terrestrial gravity observations and 100 million GRAV-D airborne gravity measurements all observed at different epochs, by different observers, and with different techniques. This paper will investigate how these various datasets can be combined most effectively with their very different spatial wavelength characteristics.

A number of separate gravity models relying on different methodology, input data, and assumptions will be evaluated including NGS's current surface gravity prediction tool, RTM based approaches, and forward modeled gravity from terrain. These various methods will also be validated using external high-quality absolute gravity data acquired by the NGS Geoid Slope Validation Surveys in Texas, Iowa, and Colorado and other high-quality absolute gravity throughout the U.S. and its territories. Additionally, the time-dependent nature of the gravity field will also be presented and considered in the gravity model relying on the GRACE and GRACE-FO satellite mission and NGS's Geoid Monitoring Service project.