

Red gravimétrica de orden cero y primer orden en España. *Zero and First Order Gravity Network in Spain.*

Enrique Rodríguez Pujol⁽¹⁾, María Fernández de Villalta⁽¹⁾, Eduardo Núñez Maderal⁽¹⁾

⁽¹⁾ Instituto Geográfico Nacional. General Ibáñez Ibero 3, 28003 MADRID.

SUMMARY

Since the first absolute measurements of gravity in Spain (1882 by Joaquín Barraquer y Rovira) no absolute measurements were performed till 1989, by R. Vieira and J. Makkinnen with a Jilag-5 absolute gravimeter. The IGN of Spain has recently purchased the well known FG5 (number 211) and A-10 (006) absolute gravimeters. First step was the attendance to the International Comparison of Absolute Gravimeters (ICAG2001) at the Bureau International des Poids et Mesures (BIPM) in Sèvres, in order to have a reference of measurements to other absolute gravimeters. In Spain some stations have already been observed. Not only absolute but also vertical gradient and relative measurements are necessary in every station for datum reduction on the floor, because the absolute gravimeters FG5 and JILAG have the nominal observation point around 1.30 meters (70-80 cm for the A10) above ground. In the next years a Zero and a First order gravity network will be completed in order to better the actual accuracies provided by the IGSN71 and RGF73.

1. The very first network

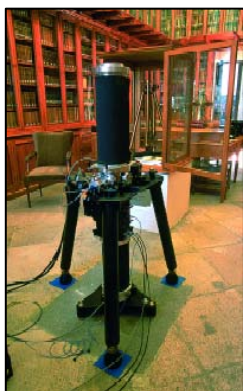
First gravimetric measurements of certain precision in the world were made by Plantamour in 1864 in Switzerland and by other astronomers in Russia, Germany and Austria with Bessel Pendulum gravimeters build by Mrs. Repsold in Hamburg.

The first ever fundamental gravity reference station in Spain was observed by Mr. Barraquer y Rovira in 1882-1883, and reported to the IAG. Commission. Placed in National Astronomical Observatory of Madrid was linked to Potsdam twice (1901 and 1903). Now it's 120 years since his measurements in the National Astronomic Observatory of Madrid. And it is also 100 years since the first relative measurements with Von Sterneck Pendulums made by Dr. Oscar Hecker in his travel through the Atlantic Ocean (Potsdam, Rio de Janeiro, Lisbon, Madrid) in 1901.



Fig 1. Old absolute gravity

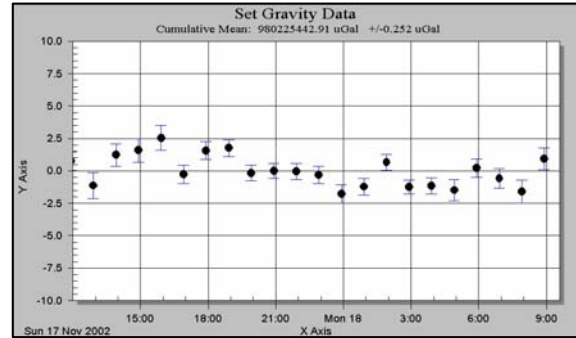
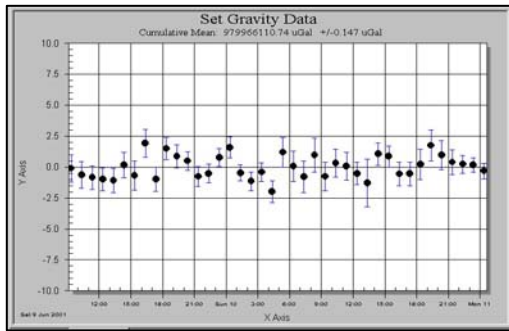
2. The new spanish gravimetric network



Eight years later Antonio los Arcos and Príamo Cebrián also measured absolute values of gravity following Barraquer's method. They chose Pamplona (October 1892), La Coruña (August and September 1893) and Barcelona (November and December 1893); only by Antonio los Arcos are observations in Observatorio Astronómico of San Fernando (October and December 1894), and Rafael Aparici and Arturo Mifsut in Valencia (Autumn 1895), Eduardo Escribano in Granada (1897) and finally Príamo Cebrián and Felipe de la Rica in Valladolid (1901). A total of eight stations including Madrid. Also Vigo (La Guía) station is reported as relative in the IAG Meetings.

In the past two years the National Geographic Institute of Spain (IGNE) purchased a new free fall absolute gravity device by Micro-G Solutions named FG5#211 and in order to observe a zero and first order gravity network in peninsular Spain (red triangle stations shown in figure 5) and at least one point in every island (Balearic Islands and Canary Islands). Also another A-10#006 absolute gravity meter (10 microgal accuracy) for the first network observation has been purchased. These networks will serve for geodetic (supporting the new High Precision Levelling Network), geophysical and geodynamic purposes.

During the last decade, BKG of Germany performed absolute measurements in Alicante, Granada, Ceuta, Tarifa, and San Fernando; FGI of Finland in Valle de los Caídos (Madrid) and I. Marson of Italy in Fabra's Observatory and CEM (Madrid).



In 2001 nine stations have been observed by FG5#211 belonging to IGNE: The first station was observed in the library of the National Astronomic Observatory of Madrid, three points at the BIPM during ICAG2001 absolute gravimeter comparison [5], the laboratory of gravimetry in the IGN facilities, two points in the CEM (Spanish Center of Metrology in Tres Cantos, Madrid), Geophysical Center of Sonseca (Toledo) and Geophysical Observatory of San Pablo de los Montes (Toledo).

In 2002 the following stations have been measured: Madrid (IGN-A and IGN-B) , Miracle (Lleida), Fabra Observatory (Barcelona), Ebre Observatory (Roquetes, Tarragona), Puig (Valencia), Málaga, Valle de los Caídos (Madrid), Geophysical Center of Sonseca (Toledo) and Geophysical Observatory of San Pablo de los Montes (Toledo), Santiago de Compostela, Spanish Center for Metrology (CEM-A and CEM-Hg, Tres Cantos) and Logroño Geophysical Observatory. An example of Fabra station already observed in Madrid and Barcelona as well as the projected stations are shown in figures 3, 4 and 5, respectively.

Results of these stations and their relative connections are taking part of the UEGN2002 project to get a new european gravimetric reference network. Some of them appeared in the figure of the report “Unified European gravity reference Network 2002 (UEGN2002): a status report” (A. Kenyeres, G. Boedecker, O. Francis) presented in Greece in August 2001 [3].

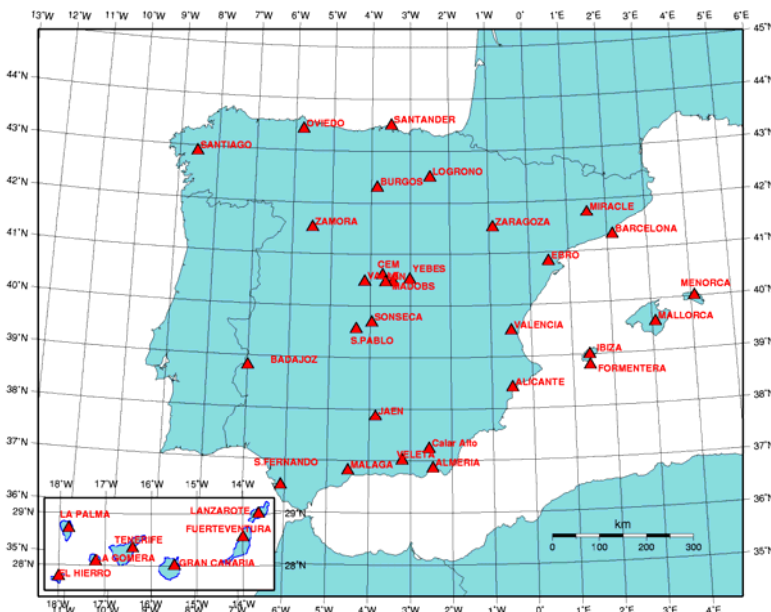


Fig 5. New projected absolute zero order gravity network of Spain.

It would be desirable that these and more proposed stations widely fulfil the international standards of the International Absolute Gravity Base-Station Network (IAGBN) [2] and all our efforts will be driven to that purpose so that this work could be widely accepted and useful for the scientific community.

3. Referencias

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