

## LOCAL DETERMINATION OF THE GEOID IN THE BUENOS AIRES PROVINCE

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### ABSTRACT:

This study is included in a research project in development in the Universidad Nacional del Sur, directed by investigators and teachers of the Universidad Nacional de La Plata. It deals with the shape of the geoid in the South zone of the Buenos Aires province and it is part of a whole project between the Universidad Nacional de La Plata, the Ministerio de Obras y Servicios Publicos and the Universidad Nacional de Rosario.

By means of high precision GPS determinations, carried out on points of orthometric known datum, (realized with the classic technique of leveling) and in combination with gravity measurements, it is search to determine the geoid position.

As it is known, the GPS observations give to a receiver, placed in just any point of the earth, terrestrial coordinates in a system of coordinates that have the following features: geocentric, Cartesian and defined by a racking group of stations which locations are perfectly known. That coordinates can be transform in geodesic latitude and longitude and ellipsoidal height, related to a reference ellipsoid, that in the case of GPS system is the WGS84.

The longitude and latitude obtained can be incorporated, by the means of transformations, to the different nets of planimetric reference. On the other hand, the ellipsoidal height, it is not compatible with the traditional altimetric nets. When one says "height" or the "level" of a specific point, it is referred to the orthometric height: height referenced to the geoid, the equi - potential surface of the terrestrial field of gravity that is the best approximation of the medium level of the sea and that is used as a reference surface in the altimetric problems.

They are not the same coordinates: the height obtained by GPS ( $h$ ) is a mathematical coordinate, that is referred to the ellipsoid distance-measured point; whilst the orthometric height ( $H$ ) of a point is a physical coordinate, referenced to a equi - potential surface as the geoid, and it is referred to the geoid distance - measured point.

To obtain the orthometric height from the ellipsoid height, one has to use the relation:  $H = h - N$  where  $N$  is the separation geoid - ellipsoid, measured along the perpendicular (normal) to the ellipsoid, also denominated "geoid ondulation". Let recall that, although the ellipsoid is the mathematical approximation of the geoid, there are differences because the adjustment is not perfect.

The achievement of a regional model of geoid, by the knowledge of the  $N$ , will permit the utilization of all the potential of the system GPS in the altimetric and traditional problems, since one can know  $H$  (orthometric height) from  $h$  ( ellipsoidal height), bringing a great precision in large leveling and a cheapening in the costs of the altimetric measurements of great scale.

Also the whole observations will form a geodesic net of support for either geodesic or topographic work in this zone and they will need the constraints with the POSGAR net. In the past May, this net was adopted as the geodesic referenced system of Argentina.