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Quality study of the African Geoid model in Algeria

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Geoid determination is a major problem of Physical Geodesy. Today the whole international geodetic and geophysical community is interested in this task and a great number of international workshops and symposiums on this topic are held. At present demands on gravity field determination have increased, mainly through the advent of the Global Positioning System, providing three-dimensional relative positioning with cm accuracy, even over longer distances. In order to transform the purely geometrically defined ellipsoidal heights from GPS into heights related to the Earth's gravity field, that are needed by most users, it is necessary to know the corresponding height reference surface (geoid resp. quasigeoid) with an accuracy comparable to that of GPS and levelling, which is in order of a few cm/100km. There are many examples of the precise geoid models in the developed world. Africa has always lagged behind other continents in terms of geodetic research, and the quest for a precise geoid model is no exception. Although much work has been done on developing geoid models for Africa but these models cannot be said to be either precise or complete. More recently, a collaboration between African geodesists initiated by the commission 2 (Gravity Field) of the International Association of Geodesy in which I am a potential member has led to a project for the computation of the geoid in Africa - the African Geoid Project. The main goal of this paper is to assess the accuracy of African Geoid model in Algeria and consequently to pronounce on the GPS and Levelling networks quality. A new and dense GPS/Levelling network was available principally in the north part of Algeria, allowing significant methodological and statistical studies on how to model differences between the gravimetric geoid and the levelled GPS points. For this purpose, the precise GPS data collected from the international TYRGEONET (TYRhenian GEOdynamical NETwork), ALGEONET (ALGerian GEOdynamical NETwork) projects with baseline length ranging from about 1 to 1000 km have been used. A procedure using collocation technique with outlier detection in GPS and Levelling data

was applied. Several models of trend and local analytical covariance functions were tested. The main outlines the African geoid computation, the available GPS/Levelling data, the developed procedure and the obtained results will be presented. Keywords. Collocation, TyrGeoNet project, covariance functions.