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The KILI2008 project: Precise measurement of the highest elevation of Africa: Mt. Kilimanjaro

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In October 2008, an international project, called KILI2008, involving 19 researchers from institutions of six different countries, measured the orthometric height of Mount Kilimanjaro, the highest elevation of Africa. This mountain, a dormant volcano, is also considered the highest "stand-alone" (it has an almost perfectly shaped volcano form) and "walkable" (it is not necessary to use special climbing equipment) mountain in the world. Located on the plate boundary between Somalia and Victoria tectonic blocks, Mount Kilimanjaro is constituted by three major volcanic cones, Kibo (the highest), Mawenzi, and Shira and it started to be formed about 750000 years ago.
Several attempts were carried out to observe the precise height of this mountain starting in 1952 when the British Ordnance Survey did the first determination of the height of Uhuru peak (the top of Kibo volcano) by triangulation points. The computed value was 5895m. In 1999, a first attempt to apply spatial techniques (GPS) has been done and a new value of approximately 5893m was obtained. However, the GPS data were obtained using short time of observations and the EGM96 global model was used to convert from ellipsoid height to orthometric height. Due the high uncertainty of this model in this region (reaching several meters), no definitive conclusions could be drawn about the most correct value of the orthometric height of Mount Kilimanjaro.
In this project, we combine GPS (Global Positioning System) data with gravimetric observations. The gravimetric observations were necessary in order to construct a local geoid with sufficient accuracy. Three teams carried out observations during 10 days, with two teams carrying gravimetric around and in the mountain, whereas a third team was doing GPS observations on the top of the mountain.
We present the methodologies and the results achieved. Particular attention is done to the comparison using different software packages and strategies to compute the ellipsoidal height and to derive the local geoid. The differences with respect to the new EGM2008 model are evaluated.
The complete list of the participants in the KILI2008 project can be consulted at http://www.di.ubi.pt/∼rmanuel/kili2008.html