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Some key facts for the realization of a modern National Geodetic Reference System/Frame: The Hellenic case

Dimitrios Ampatzidis [a*], Alexandros Konstantinidis [a], Konstantinos Papatheodorou [a]

[a] *Department of Surveying and Geomatics Engineering-International Hellenic University, dampatzi@ihu.gr, akonsta@ihu.gr conpap@ihu.gr*

* Dimitrios Ampatzidis, *dampatzi@ihu.gr*

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Abstract:

The realization of a modern National Geodetic Reference System/Frame (NGRSF) for each country plays a crucial role in many applications, such as cadastre, public works, and, lately, the monitoring of climate change (at least at the local scale).

The idea of a national geodetic reference system is quite old; the first attempts date back to the 18th century. The majority of national geodetic datums were oriented for the needs of each country separately, ignoring any regional or global sense of connection. The advent of the satellite era revolutionized the meaning of the geodetic reference system, allowing interconnection at the regional or/and global level. The establishment of the International Terrestrial Reference System (ITRS), which is materialized in its numerous realizations (International Terrestrial Reference Frames-ITRFs), provides a plethora of solutions for the realization of a geodetic reference system/frame in a pure modern sense. In addition, the European Terrestrial Reference System of 1989 (ETRS89) is a rigorous regional densification of ITRF, which is constrained to follow the motion of the Eurasian plate.

The main advantage of the modern NGRSF is the accurate 3D positioning. Furthermore, the NGRSF should provide solid and reliable information about the geodynamic processes, through the estimation of 3D velocities. However, there are some issues that should be considered and solved. The first one is the connection of a modern NGRSF with the old geodetic infrastructure. This may not be a simple task, since the fact that the old geodetic datums carry significant inconsistencies. In addition, a solid and rigorous mathematical procedure should be implemented, which allows the connection of the NGRSF ITRFs or/and a regional Terrestrial Reference Frame, in order to be consistent with the state of the art in accurate positioning.

In the present study, we will discuss the NGRSF situation in Greece, its challenges, and some thoughts for future research in this direction, taking into account the geophysical perplexity of the Hellenic Area.

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