

French Approach to Modernize Its Vertical Reference System

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SUMMARY

French IGN (Institut géographique national) is, in France, the guardian of geodetic and leveling references. As early as the year 2000, when French Geographical Institute (IGN) was establishing a new geodetic infrastructure, namely RGF93, , French geodesists were questioned themselves on the Vertical Reference System (VRS) infrastructure. Should we keep the materialized network of benchmarks? How to maintain them ? How to tie together the traditional leveling survey and the GNSS based survey in order to increase the productivity and to save the costs ? Under the National Council for Geographic Information (CNIG), a survey to users, conducted between 1998 and 2000, highlighted a) the need for a leveling network both better distributed and maintained, b) its condition would be continuously controlled, c) the need to allow access to national vertical reference at a millimeter level, d) a strong wish not to change the existing reference. The so-called “triplets” proposal was therefore to specify that any inhabited area (village of over 200 inhabitants) is less than 5 km from a “triplet”. That is to say a group of at least three markers around, tied together by precise leveling and allowing the user a quick stability control by conventional leveling methods. Eventually, France will be covered by more than 13,000 triplets (about 14% of the current network). The steps of the process: 2000-2005 : to control the network by a systematic field scouting. 2001-2006 : to equip areas that do not meet the specification of triplets by an innovative method of leveling assisted by GPS (NIVAG.) 2007-2020 : to maintain the triplets with stability verification by precision spirit leveling, to survey each ellipsoidal height (RGF93) obtained by GNSS using RGP, which will subsequently allow to control the overall stability of the triplet. The 13,000 GNSS leveled markers will allow to build a new elevation grid (ellipsoidal height RGF93 vs normal altitude IGN69), the accuracy is expected to reach one centimeter level within 90% of the French territory. A high resolution conversion grid to the European Vertical Reference (EVRS) will also be developed. Thus, the user will have the option to tie its worksite in altitude with the following accuracies: millimeter (1 to 5 mm) by accurate spirit leveling from triplets sub-centimeter (0.5 to 1 cm) ultra-precise GNSS and the use of new elevation grid. centimeter (1 to 5 cm) by standard technology such as GNSS RTK