The European Vertical Reference System (EVRS) – development and latest results

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The history of the European Vertical Reference System goes back to the 1st General Conference of the Central European Triangulation in 1864, where the resolution was adopted to compare the European sea levels by leveling and establish a European datum point.

In the 1950s, the United European leveling network (UELN) was established in the western part of Europe and the Uniform Precise Leveling Network (EPNN) in the eastern part. Both networks were re-measured in the 1970s.

In 1994, the work at the UELN was resumed. The data of the network were substituted by current first order leveling networks of the countries. The new political conditions in Europe allowed to extend the network step by step towards the East. In 1999, first results were handed over to the participating countries under the name UELN-95/98. In 2000, the first definition of the European Vertical Reference System was given (EVRF2000).

After the update and expanding of the network, a new realization of EVRS was computed in 2008. The results were distributed under the name EVRF2007. For expressing gravity-related heights on land, INSPIRE requires to use EVRS within its geographical scope.

Since 2008, the data of 15 countries have been replaced in whole or in part. Furthermore, the network was extended by the data of Russia, Belarus and Ukraine. That's why a new realization of EVRS will be presented to the European countries on the next EUREF Symposium in Tallinn in May 2019. The heights have been determined from leveling data of 28 European countries.

According to the definition of EVRS the results are given as geopotential differences and additionally as normal heights. The heights are computed in the zero tidal system. The datum is on the level of NAP, realized by 13 datum points with their heights from EVRF2007. Parts of the network have a kinematic characteristic. That concerns northern Europe which is in the area of influence of the postglacial rebound, and the territory of Switzerland. For these areas the observations have been reduced to the epoch 2000 using point velocities.

EVRF2019 contains for the first time the measurements through the Channel Tunnel between France and Great Britain.

The adjustment of the network results in a standard deviation of 1.1 mm for 1 km leveling. However, accuracy and currentness of the data are not homogeneously distributed in the network. A variance component estimation is used to compare the accuracy of the subnetworks of the countries.