The European Triangulation Net South East (ENSE) Site Descriptions and Coordinates

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Abstract

From 1948 to 1949, the former German Land Survey Office (Institut für Erdmessung, IFE, Bamberg), predecessor of the Federal Agency for Cartography and Geodesy (Bundesamt für Kartographie und Geodäsie, Frankfurt, BKG), was engaged in the adjustment of the European Triangulation Net South East (ENSE), which became one of the partial networks introduced into the definition of the European Datum 1950 (ED50). The ENSE covered the present territories of Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Hungary, The Former Yugoslavian Republic of Macedonia, Moldavia, Romania, Slovenia, Ukraine, and Yugoslavia.

Regarding the above mentioned countries, an overview of unpublished ENSE site descriptions and coordinates compiled from material archived at BKG, is presented in order to answer enquiries recently expressed by various institutions.

The Central European Triangulation Net

Initiated by U.S.A. authorities, in particular the U.S. Army Map Service, a major task carried out by the German Land Survey Office (Institut für Erdmessung, IFE, Bamberg) during the period of 1945 to 1948 was the adjustment of the Central European Triangulation Network, CEN (GIGAS 1949). Originally based on an idea expressed by J.J. BAEYER when founding the *Mitteleuropäische Gradmessungskommission* in 1864, the French geodesist G. PERRIER vehemently favoured the project and the German O. EGGERT made important suggestions for its solution in 1936. Extensive survey activities especially performed in the years around 1945 established, in cooperation with effected national survey agencies, the necessary junctions with existing triangulations in the North, South, and East of Central Europe.

When completing the adjustment, a plan conceived almost 100 years ago had been accomplished. Covering Austrian, Belgian, Czech, Danish, Dutch, French, German, Latvian, Lithuanian, Polish and Swiss territories (Levasseur 1949), the CEN defined a geodetic reference system of fundamental character and universal value for culture and science.

The European Triangulation Net South East

Due to its central position, its size and possibilities for further extensions, the CEN was understood as excellently suited to constitute the nucleus of a European-wide continental net. It was capable for a strained connection of adjacent partial nets. The networks intended for a connection were a South-West-European Net (ENSW), a North-European Net (ENN), a South-East-European Net (ENSE) and a East-European Net (ENE).

After completing the CEN adjustment, the IFE was assigned the adjustment of the European Net South-East (Institut für Erdmessung 1949, see Appendix A). This task was performed during the years 1948 to 1949. The ENSE covered the part of Europe surrounded by the Adriatic Sea, the Eastern part of the Mediterranean Sean and the West coast of the Black Sea plus Italy, Switzerland and the Western part of Austria (see Figure 1). A great number of first-order horizontal angle measurements, numerous base measurements and astronomical observations were used from widely independent state triangulations. Considering available material as fare as possible permitted an establishment of the scale and the orientation of the ENSE referred to the International Ellipsoid. The Southern CEN-border sides belonging to the junctions of Straßburg, Munich, Linz, Budapest, Munkacs, and Rowno were taken over into the ENSE with positions and lengths regarded as definitive. Thus, the ENSE was given a forced connection to the CEN.

Site descriptions and coordinates resulting from the ENSE adjustment are on hand at the BKG for Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Hungary, The Former Yugoslavian Republic of Macedonia, Moldavia, Romania, Slovenia, Ukraine, and Yugoslavia. A typical example for a site description in its original German language is given in Table 1. As an example for the form of additional material available, a reprint of the table of weights concerning the adjustment in the Southern Balkan area and annexed corresponding thoughts by HELLER, LEVASSEUR and GIGAS is given in Figure 2.

ENSE-Site Descriptions and Coordinates – Still of present value

Following a request from the European Commission (EC), a Spatial Reference Workshop examined the options and issues related to a unique European Reference System for spatial data (European Commission 1999). The workshop recommended to adopt the European Terrestrial Reference System ETRS89 for the geo-referencing of the Commission's own data as well as a widespread use of this de-facto standard for future pan-European data products and services

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within all EC member states. The concerned Mapping Agencies were requested to make national transformation parameters and algorithms for transformations to and from ETRS89 available, providing coordinates at the 1-2m level. EUREF, the Sub-Commission for Europe of the Commission X. of the International Association of Geodesy, has been asked to collect and publish all relevant data.

Thus, the derivation of transformation parameters for the transition of coordinates from national reference systems into the modern, unique European-wide reference system is an issue of today's particular significance. Although relations between old systems in South-East European states and the ETRS89 are mainly known due to the creation of the EUREF permanent GPS stations network and the availability of validated EUREF GPS campaigns, it is still an advantageous intention to have as much coordinates in both kinds of reference systems available as possible. This is important especially regarding sites with a long geodetic history. A connection of formerly unconsidered ENSE sites to ETRS89 can lead to the derivation of transformation parameters of improved local value.

A country-wise presentation of ENSE sites and the distribution of EUREF sites as of today is given in Appendix B.

The Availability of Data

The material given in Appendix C is presumed to be at least partly unavailable for the involved countries. The IFE, tasked with the ENSE adjustment during the first years after the Second World War, has not been its owner. The BKG, predecessor of the IFE, understands that the concerned national survey agencies might have an interest in the long-archived site descriptions and coordinates on hand. Transcripts of original documents exist in German language.

References

European Commission: *Short Proceedings – Conclusions and Recommendations.* Document Reference 99006NT, Spatial Reference Workshop, Marne-la-Valee, 29-30 November 1999.

GIGAS, E.: *Zum Geleit.* In: Das Zentraleuropäische Dreiecksnetz. Veröffentlichungen des Instituts für Erdmessung, Nr. 1, Bamberger Verlagshaus Meisenbach, Bamberg 1949.

Institut für Erdmessung: *European Triangulation Net South-East*, First Volume, Comprehensive Report on the Structure and Adjustment of the Net. Institut für Erdmessung, Bamberg 1949, not published.

LEVASSEUR K.: *Das Zentraleuropäische Dreiecksnetz.* In: Das Zentraleuropäische Dreiecksnetz. Veröffentlichungen des Instituts für Erdmessung, Nr. 1, Bamberger Verlagshaus Meisenbach, Bamberg 1949.

Figures, enclosures:

Figure 1: Sketch of the European Net South-East (ENSE)

The following figures and annexes are not published in this volume, but in internet *http://homepage.oma.be/eurefnew/EurefHome.html*

Figure 2: Reprint of an original table of weights and annexed corresponding thoughts by Heller, Levasseur and Gigas in German language

Table 1: A typical ENSE-site description in its original German language

Annex A: European Triangulation Net South-East, First Volume, Comprehensive Report on the Structure and Adjustment of the Net, Reprint of the introductory chapters

Annex B: Country-wise presentation of ENSE sites and EUREF sites

Annex C: Site descriptions and coordinates of the European Triangulation Net South-East (Country-wise excerpts to be delivered to corresponding national land survey representatives only)

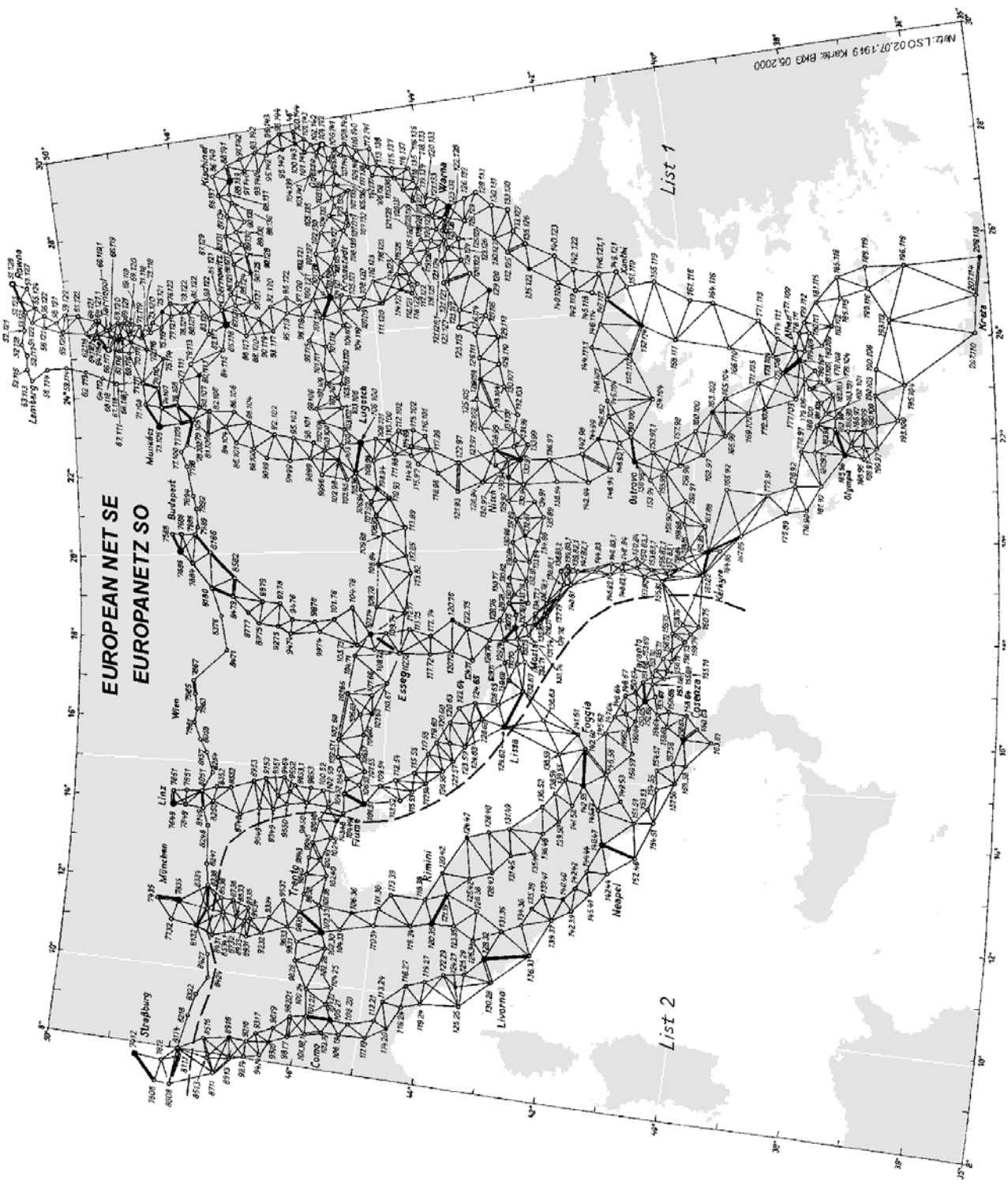

Figure 1: Sketch of the European Net South-East (ENSE)