Study of Length Differences from Topography to Map Projection within the State Coordinate Systems for some Countries on the Balkan Peninsula

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SUMMARY

All geodetic measured quantities from the physical surface of the Earth are reduced to the geoid and surface of adopted reference ellipsoid through applying corrections on the measured values, as well projected to the map projection. Before calculating the Cartesian coordinates of points in a formal state geodetic coordinate system, the horizontal lengths between points on topography surface first should to be reduced from the relief to mean see level (geoid), then from the geoid to the reference ellipsoid, and projected from the ellipsoid into the map projection.

Up to now, within the research analyses have been performed for defining of most appropriate State Plane coordinate system, the choice of most suitable national map projection is usually based on the requirements of accurate representation of the earth surface with minimum distortions. During the literature review for definition of state coordinate systems, analyses of the successive length differences between points on earth surface to a flat state map projection were not found. Recognition of the length differences for whole country areas mapped on the State Plane coordinate system are very important data for many geodetic applications, e.g. high accuracy geodetic measurements, surveying works, combination of GNSS and total station measurements, transformation of local geodetic networks from free oriented in to the state coordinate system, etc.

One of main objectives of this research is developing and providing national datasets of lengths' differences on a grid with cells 1x1 km covering national territories of several Balkan countries. Assessment and comparison of successive length differences between four surfaces (earth surface, geoid, ellipsoid, and map projection) have been realized through calculation of mean linear deformations of 1km lengths, dispersion of differences, maximum and minimum difference values, and their positive, negative or zero differences. By calculated values, the differences between the real length on earth surface and on a map projection were evaluated, in order to have overview on

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the quality of state geodetic coordinate systems, by comparing them with distortions in state map projections

In this paper results from performed research analyses of state coordinate systems of some Balkan countries will be presented, in order to contribute to the methodology for choosing a most appropriate national map projection.