Establishment of Regional GNSS Network for Tropospheric Tomography

Emine Tanır Kayıkçı, Yasemin Şişman, Selma Zengin Kazancı, Research Assistant, Cansu Beşel, Research Assistant, Seldanur Çelik, Project Scholar (Turkey) and Mesut Demircan, Research Assistant

Key words: Engineering survey; GNSS/GPS

SUMMARY

ESTABLISHMENT OF GNSS REGIONAL NETWORK FOR TROPOSPHERIC TOMOGRAPHY

*Emine Tanır Kayıkçı1, Yasemin Şişman2, Selma Zengin Kazancı1, Cansu Beşel1, Seldanur Çelik1, Mesut Demircan3

1 Karadeniz Technical University, Department of Geomatics Engineering, 61080 Trabzon/Turkey

2 On Dokuz Mayıs University, Department of Geomatics Engineering, 55139 Samsun/Turkey

3 Turkish State Meteorological Service, 06120, Ankara/Turkey

ABSTRACT

In Turkey, severe weather events have increased severely since the beginning of the 2000s. In 2015, the numbers of severe weather events, 959, have reached a record level. More than one fourth of these events are flood and heavy rain. Blacksea Region has been affected by hydrological origin severe weather events. Moreover, according to climate change scenarios until 2100, it has been foreseen that East Blacksea Region will be one of the regions where severe weather events, especially heavy rain and flood, will increase related to climate change. This situation states a necessity for reliable weather monitoring and prediction system.

Precitable water vapor (PWV) can be estimated via GNSS meteorology by using Zenith
Tropospheric Delay (ZTD) estimated at GNSS stations and meteorological data. By using a regional network of GNSS reference stations, it is possible to recover estimates of the slant wet delay (SWD) to all satellites in view. SWD observations can then be used to model the vertical and horizontal structure of water vapor over a local area, using a tomographic approach.

This study introduces the research project of “Using Regional GNSS Networks to Strengthen Severe Weather Prediction” which has been performed at Department of Geomatics Engineering of Karadeniz Technical University and explain criteria to establish GNSS network for tropospheric tomography. The first aim of the project, to determine of atmospheric water vapor distribution by GNSS meteorology and GNSS tomography software developed by ourselves using observation data of network designed with 2 new constructed GNSS reference station, 10-20km apart from Samsun rawisonde station and to compare of independent techniques derived water vapor distribution. Water vapor distribution derived by GNSS meteorology and GNSS tomography will be compared with water vapor distributions derived by independent techniques such as rawisonde and numerical weather models (NWM). Therefore, it is targeted to perform accuracy analysis of water vapor distributions derived by GNSS meteorology and GNSS tomography. Additionally, GNSS tomography model applied in Samsun test region will be applied in a small network designed by TRAB Permanent GNSS station, TRBN CORS-TR station and a new constructed GNSS station near to those stations in Trabzon.

*Corresponding Author, etanir@ktu.edu.tr