INVESTIGATION ON GPS HEIGHTING ACCURACY WITH USE OF TROPOSPHERIC MODELS IN COMMERCIAL GPS SOFTWARES FOR DIFFERENT HEIGHTS

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1.INTRODUCTION

GPS pseudorange and carrier-phase measurements are affected by several random and systematic errors. These errors are originated from satellites, receivers and signal propagation through the atmosphere . Neutral atmosphere is consisting of the troposphere, tropopause and stratosphere. The combined effect of the electronically neutral atmosphere is called tropospheric refraction .The effective height of atmosphere in terms of tropospheric refraction is about 50 km .

2. GOAL OF STUDY

Different tropospheric models used in Trimble Geomatics Office and Leica Geo-Office commercial GPS processing software packages for comparison.

For this purpose GPS observations had been done at nine stations at different heights for three hours running in Konya city on May 2009. The baselines were computed with software packages. The most suitable tropospheric models were investigated on GPS heighting accuracy.

3. TROPOSPHERIC MODELS

- Hopfield
- Saastamoinen
- Essen-Froome Differential
- Goad and Goodman
- The Neil
- Black

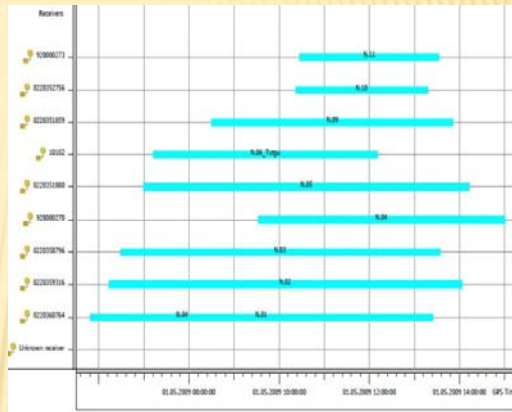# STATION POINTS IN PROFILE
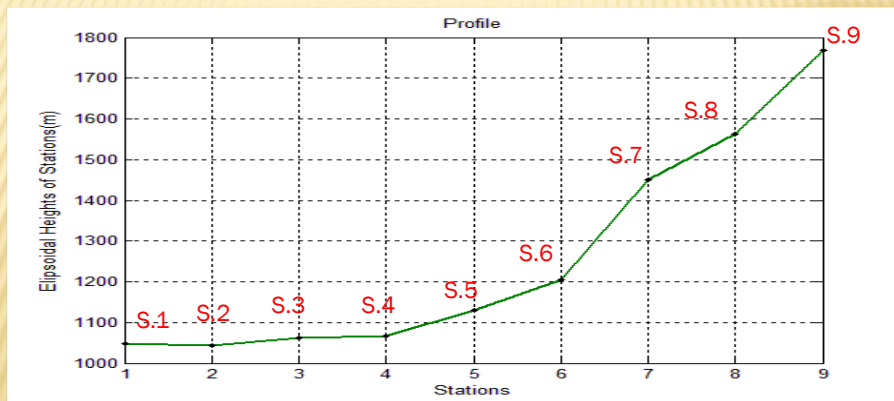
4.PROCESSING

Observations have been processed in Trimble Geomatics Office 1.6 (TGO) and Leica Geo Office 5.0 (LGO) software. Point "N.06" has used as fixed point in inner constraint. The point coordinates are in ITRF 96 reference coordinate system and 2005.00 reference epoch on GRS-80 ellipsoid.

Reference model is Hopfield and reference elevation mask is 15° in LGO software. Other models as Saastamoinen, Essen-Frome, Hopfield, Black, Goad and Goodman, Neill in TGO were used with different elevation mask 0°, 5°, 10° and 15°

4.1 BASELINES & SESSION PLAN
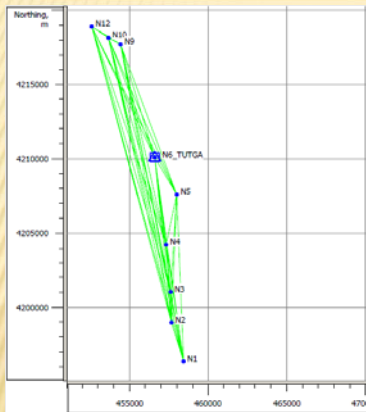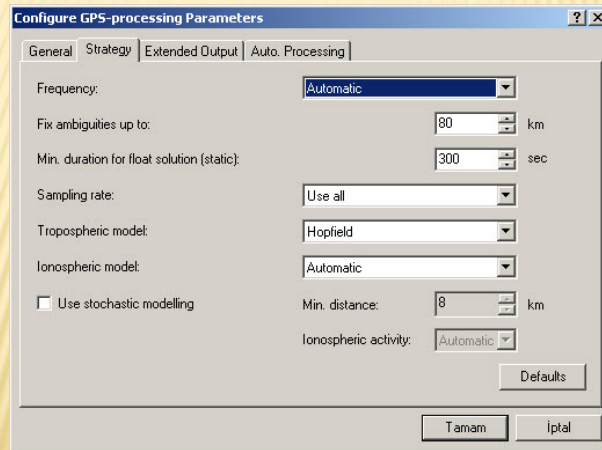

Baselines between Station Points   Sessions Plan
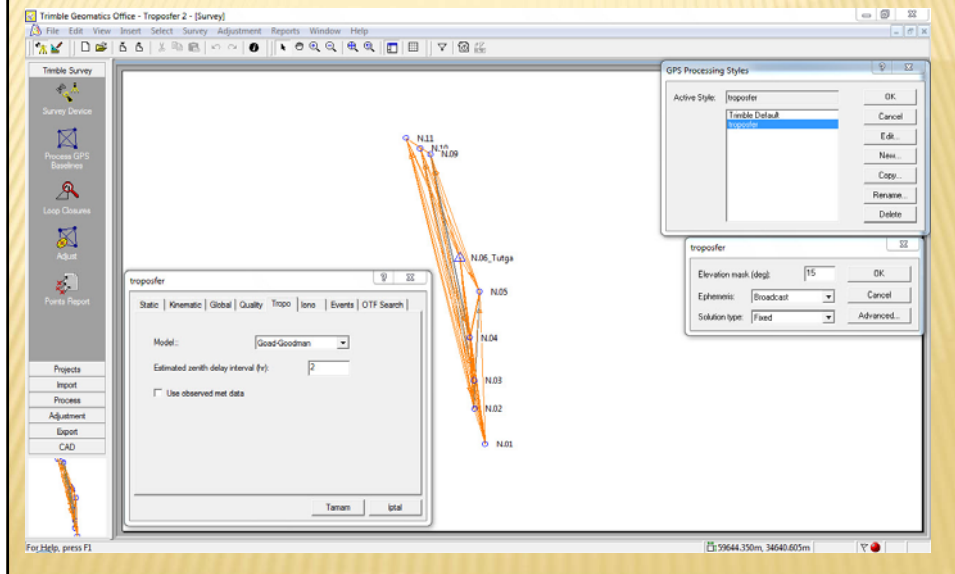
LEICA GEO-OFFICE PROCESSING STEPS

CHOOSING OF TROPOSPHERIC MODEL IN PROCESSING

TRIMBLE GEOMATICS OFFICE PROCESSING STEPS

RESULTS

The analysis of the performance of the different tropospheric models is based on a comparison against cut off angle, for a one day at nine stations distributed around Konya city,therefore a small variety of climatic conditions.

Different elevation angles, ranging from 0° to 15 ° for each elevation angle, a different tropospheric models has been used.

Reference model was Hopfield, for the best solution and closest to reference model was Essen-Froome model in LGO software package.

The best solution was Saastamoinen model in TGO software.But in this model mask angle in 0° did not has a solution.

The tracking of low elevation angle satellites is therefore to be avoided because the uncertainties in modeling both the wet and dry tropospheric delay are amplified at low elevation angles.