

Merging GNSS Kinematic Tracks – Using the TanDEM-X Mission in Africa

R. M. S. FERNANDES, Portugal

SUMMARY

The TanDEM-X is a new radar satellite system funded by German Aerospace Center DLR (Deutschen Zentrums für Luft- und Raumfahrt) that intends to generate a global Digital Elevation Model (DEM) with an unprecedented accuracy (12 m resolution on ground, 2 m relative height accuracy for flat terrain).

In order to calibrate and validate the obtained surface, ground kinematic tracks were measured worldwide. In Africa, this was carried out in direct collaboration with SEGAL (Space & Earth Geodetic Analysis Laboratory), a collaborative project between University of Beira Interior and Institute Geophysical Infante D. Luíz, Portugal.

The two measured tracks, one crossing southern Africa from Dar-Es-Salaam, Tanzania to Torra Bai, Namibia, and other crossing western Africa from Conakry, Guinea to near Lake Chad, Niger, had particular characteristics. In fact, due to logistical issues (the need for autonomous support in regions of difficult access), it was decided to perform the tracks using two vehicles. Consequently, we have double measurements of each track since we mounted a receiver in each vehicle.

However, for the calibration/validation phase, the final product must be a single track, the averaged 3D-line of both measured tracks. Attending to the huge amount of observations, it was necessary to define automatic procedures to average the two single tracks.

This is not a simple task since there are many issues related with the vehicle paths. In particular, there were no guarantees that both vehicles were driving exactly on the same line. Examples are overtakes of other vehicles, potholes, and unexpected stops. In addition, they were not driving together in many segments - a 45min difference between both vehicles was defined in order to have a different satellite constellation.

We present here the procedures developed to try to optimize the automatic merging of the single tracks. An important feature is the correct detection of any abnormal deviation of an individual track with respect to the expected direction of the movement since such events cannot be automatic eliminated and manual intervention was necessary.

We use several segments exemplifying different conditions: with and without sky obstructions; driving together or with a time-lag between the vehicle passages.

CONTACT

Mr. R.M.S Fernandes

+ 351 275319891

Email: rmanuel@di.ubi.pt

Portugal