# Predicting Displacement Effects of Tectonic Movements on the Kenyan Geodetic Reference Frame Network (KENREF)

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**SUMMARY**

The East African Rift System (EARS) is a developing divergent plate boundary and Kenya lies on two tectonic plates: the Nubian plate to the west and the Somalian plate to the east. Studies show that the Somalian plate is pulling away from the rest of the continent that comprises the Nubian plate. Tectonic movements have an effect on a geodetic reference frame depending on the station velocities.

This research set out to investigate the current magnitude and rate of horizontal and vertical movements between the two blocks separated by the Kenyan Rift Valley by carrying out GNSS static measurements at selected Kenyan Geodetic Reference Frame (KENREF) stations. The GNSS data was then processed to determine the KENREF station velocities and the magnitude of tectonic movements and therefore deduce the effect of the tectonic movements on the accuracy of coordinates of the control network and in turn the survey measurements done based on these control stations. The results of this research will contribute to the definition of KENREF and African Geodetic Reference Frame (AFREF).

For this research the Zero Order KENREF Network station coordinates were adopted as the reference for the study. The KENREF Network was observed and computed in December 2012, (a total of eighteen stations were observed in three sessions and each station was observed for at least five days)

A second epoch of observations was carried out in October 2019 using integrated geodetic grade commercial multi-constellation and multifrequency GNSS receivers. A total of five KENREF stations were selected for this research and observations were made for 24 hours at each of the five stations concurrently. Data analysis was done using Bernese version 5.2 and GipsyX software and

the results obtained show that all the KENREF stations have an average horizontal displacement of 35mm/year. These results are consistent with IGS station velocities as computed by JPL. Two more epochs of observations will be taken at the same stations to validate the consistency of these results.