# Validation of CODE-GIM and Regional Ionosphere Model (RIM) for Single Frequency GNSS PPP Solution using Bernese GNSS software - Case Study: Egyptian Nile Delta

**Ashraf Abdallah (Germany), Agag Tarek (Egypt) and Volker Schwieger (Germany)**

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**SUMMARY**

Egypt is quickly constructing many infrastructures such as roadways and railways; further, it is developing new cities like the New Al-Alamin and the New Capital city. GNSS supports the controlling of geodetic networks, developing a local ionospheric model, and estimating the tectonic plate movements; as well, it is needed for infrastructure planning and constructing. Due to the un-coverage of the international GNSS service (IGS) network in North Africa, in January 2012, the Egyptian surveying authority (ESA) established the first permanent Egyptian continuously operating reference stations (CORS) network. This network is covering the Nile valley and its delta. In this study, a developed regional ionosphere model (RIM) is modelled for obtaining a single-frequency precise point positioning (SF-PPP) solution for the Nile delta. The RIM model is developed using 9 stations for six consequence days 202-207/2019. Bernese GNSS V. 5.2 has been used for modelling using code phase geometry-free linear combination (P4). This model has a spatial resolution of 2.5o×5o and a temporal resolution of 2 h. The SF-PPP solution obtained by the developed model is validated by processing five stations and compared with the solution obtained by using the CODE-GIM model. The RIM model showed for SF-PPP solution a mean error of 0.06 m in the east, 0.10 in the north, and 0.30 m in height. In comparison to the CODE-GIM model, this solution is improved by about 60% in, 70%, and 67% in east, north, and height, respectively.