Ginan - A new and flexible Multi-GNSS Precise Point Positioning (PPP) Toolkit

Dr. Simon McClusky
Senior Fellow, Research School of Earth Sciences, Australian National University

Abstract

Ginan is a multi GNSS (Global Navigation Satellite System) capable analysis centre software developed by Geoscience Australia in partnership with industry and academic partners. Ginan is a fully open-source software based the SSR (State Space Representation), PPP (Precise Point Positioning) model and is capable of computing and using precise positioning products, to both deliver real-time correction products and services as well as operate as user PPP positioning engine.

Ginan is a modern multi-threaded C++ application that utilizes industry standard high-performance libraries, the software configuration is managed through industry standard YMAL (YAML Aint Markup Language) files. At its core of Ginan is a robust Kalman filter that is tightly coupled with a data pre-processor and orbit integrator enabling both real-time processing of industry standard RTCM3 data messages streams and post processing using IGS positioning products.

Ginan can be used for many geodetic and positioning activities such as the computation of daily coordinate solutions, kinematic tracks, precise satellite orbit determination of GNSS and LEO satellites, satellite clocks & biases, atmospheric modelling, data QA/QC and more.

In this paper we will focus on Ginan's capabilities got geophysical applications by demonstrating its multi-GNSS single station precise point positioning capabilities. We will be comparing the positioning performance achieved when using a single GNSS satellite constellation (Ie GPS only) to the multi GNSS solution utilizing all 4 global GNSS constellations (GPS, Galileo, Glonass and Beidou). We will evaluate both the absolute positioning precision and accuracy using various data spans from 1 hour to 24 hours, as well as evaluating positioning convergence time, Ie., the amount of time required different multi-GNSS combination solutions require to meet a specific positioning accuracy threshold. Finally we will benchmark Ginan's kinematic mode precise position capability against a traditional differential short baseline RTK solution.