RTX Correction Accuracy and Real-Time Data Processing of the New Integrated SeismoGeodetic System with Real-Time Acceleration and Displacement Measurements for Earthquake Characterization Based on High-Rate Seismic and GPS Data

Leonid Zimakov (1), Jared Raczka (1), and Sergio Barrientos (2)

(1) Trimble Navigation Ltd, (2) National Seismological Center, University of Chile

We will discuss and show the results obtained from an integrated SeismoGeodetic System, model SG160-09, installed in the Chile (Chilean National Network), Italy (University of Naples Network), and California. The SG160-09 provides the user high rate GNSS and accelerometer data, full epoch-by-epoch measurement integrity and, using the Trimble Pivot™ SeismoGeodetic App, the ability to create combined GNSS and accelerometer high-rate (200Hz) displacement time series in real-time. The SG160-09 combines seismic recording with GNSS geodetic measurement in a single compact, ruggedized package. The system includes a low-power, 220-channel GNSS receiver powered by the latest Trimble-precise Maxwell™6 technology and supports tracking GPS, GLONASS and Galileo signals. The receiver incorporates on-board GNSS point positioning using Real-Time Precise Point Positioning (PPP) technology with satellite clock and orbit corrections delivered over IP networks. The seismic recording element includes an ANSS Class A, force balance triaxial accelerometer with the latest, low power, 24-bit A/D converter, which produces high-resolution seismic data. The SG160-09 processor acquires and packetizes both seismic and geodetic data and transmits it to the central station using an advanced, error-correction protocol with back fill capability providing data integrity between the field and the processing center.

The SG160-09 has been installed in three seismic stations in different geographic locations with different Trimble global reference stations coverage The hardware includes the SG160-09 system, external Zephyr Geodetic-2 GNSS antenna, and both radio and high-speed Internet communication media. Both acceleration and displacement data was transmitted in real-time to the centralized Data Acquisition and Processing Centers for real-time data processing. Command/Control of the field station and real-time GNSS position correction are provided via the Pivot software suite. Data from the SG160-09 system was used for seismic event characterization along with data from traditional stand-alone broadband seismic and geodetic stations installed in the network.

Our presentation will focus on the key improvements of the network installation with the SG160-09 system, RTX correction accuracy obtained from Trimble Global RTX tracking network, rapid data transmission, and real-time data processing for strong seismic events and aftershock characterization.