



New GPS reference station in Brazil

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In 1989, the U.S. National Oceanic and Atmospheric Administration (NOAA) initiated a project, together with the University of Sao Paulo, the Brazilian Institute for Space Research (INPE), and Universidade Presbiteriana Mackenzie (Sao Paulo), to build a very long baseline interferometry (VLBI) radio observatory near Fortaleza, Brazil. The site is on the northeast coast of the country about 4 degrees south of the equator, near the center of the geodetic VLBI network. VLBI is an essential component of the multi-technique combined ITRF, contributing an accurate global scale for the combined frame (together with SLR) and the interconnection to the celestial reference frame.

A 14.2-meter (45-foot) diameter antenna was moved from Green Bank, West Virginia in late 1992, and erected and outfitted by mid-1993. The first full VLBI observing session began on 6 July 1993. In May 1993, NOAA installed a co-located GPS station, FORT, consisting of a dimpled steel disk monument emplaced near a corner of the rooftop of the one-storey control building and an AOA Dorne Margolin model T choking antenna mounted with its preamp fixed 64.3 cm above the reference point. The original antenna was replaced by a similar unit in the same location on 20 March 2000, the only difference being that the low-noise amplifier had been retrofitted with an Ashtech unit. A conical radome has covered the antenna throughout the history of the station. The radome has never been calibrated for its effect on radio wave propagation.

FORT has been part of the IGS network since its installation. Unlike most GPS stations, FORT has access to the ultra-stable H-maser frequency standard that is required for VLBI observations. The importance of having an accurate local tie measured between the reference points of the co-located VLBI and GPS systems was recognized from the beginning. This is indispensable for tying together the technique frames forming the ITRF. There are less than 30 such VLBI-GPS tie sites around the world

and only a handful of those have accurate locally surveyed ties. NOAA personnel led the survey campaign to measure this tie during 11-30 Sept. 1993, with assistance from Brazilian colleagues.

In Sept. 2005, NOAA personnel returned to Fortaleza to install a new, modern GPS station at the site. It was decided that a new receiver should be installed together with a new antenna and antenna mount design a short distance from the old station in order to make improvements in the GPS installation and to provide an observational overlap with the old station. The new station, BRFT, consists of a Leica LEIAT504 antenna (no radome) sitting atop a 1.5-meter tall steel tripod near another corner of the same rooftop. A SCIGN leveling mount is welded to the top of the tripod structure to provide the geodetic reference point. The BRFT receiver is a Leica GRX1200PRO, which also uses the local H-maser standard. Observations began on 6 Sept. 2005. Early geodetic results indicate that the new station performs very well. As was hoped, the new antenna mount design seems to have reduced the effects of code multipath by a large amount. The first 5 months of simultaneous data between FORT and BRFT have been used to determine the local tie between these two GPS reference points to the mm level. This vector can be used to update the local VLBI-GPS tie, although there are indications that the 1993 tie may be biased. A new site survey is planned.