Grids & Datums

Republic of SURINAME

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The Grids & Datums column has completed an exploration of every country on the Earth. For those who did not get to enjoy this world tour the first time, *PE&RS* is reprinting prior articles from the column. This month's article on The Republic of Suriname was originally printed in 2002 but contains updates to their coordinate system since then.

Inhabited by Carïb and Arawak tribes prior to European settlement, the coast of Suriname was sighted by Columbus in 1489. Spain officially claimed the area in 1593, but Portuguese and Spanish explorers gave the area little attention. Various attempts made to settle the area in the 17th century failed until the first permanent settlement was established in 1651 by the British Lord Willoughby of Parham, governor of Barbados. Suriname became a Dutch colony in 1667 according to the Treaty of Breda. The colony did not flourish, however, and there were numerous uprisings by the imported slave population as well as conflicts between the native tribes and the whites. Many of the slaves fled to the interior and established the five major Bush Negro tribes in existence today – the Djuka, Saramaccaner, Matuwari, Paramaccaner, and Quinti. Suriname became independent on 25 November 1975. The backbone of the Suriname economy is the export of alumina, produced since 1941 after investments made by ALCOA. The majority of aluminum (75%) used by the United States during WW II originated in Suriname.

The area of Suriname is slightly larger than Georgia; it borders Brazil (597 km), French Guiana (510 km), and Guyana (600 km). The terrain is mostly rolling hills with a narrow coastal plain with swamps. The lowest point is within the coastal plain at –2 meters, the highest point is Juliana Top at 1,230 meters. Most of Suriname is tropical rain forest, and the majority of the 434,000 population lives within 30 km of the northern Atlantic Ocean coast.

In April and May of 1886, observations were made by Captain Haan of the Steamer Surinam for the mean difference in longitude between the stone stair landing of Paramaribo and the flagstaff of Rickett Battery in Bridgetown, Barbados by three time transfers. In May of 1886, similar observations were made between Paramaribo and the upper signal of the St. Marthe and St. Pierre Battery in Martinique. With computations obtained from the U.S. Navy as well as additional Dutch measurements, the stone stair landing in Paramaribo was finally determined to have an astronomical longitude of Λ_o = 55° 29' 02.0" West of Greenwich.

In Annals Hydrographique, the French remarked that in 1880, Dutch Lieutenant de Vaisseau de Première Classe Mulder (Full Naval Lieutenant), observed a similar longitude that differed by only approx. 6 arc seconds; a remarkable feat, because it was done with chronometers!

Topographic mapping began in 1947 when 1:40,000-scale aerial photography was flown by KLM Aerocarto. The initial control was based on the Paramaribo Datum of 1947 where, according to J. B. Wekker, Φ_o = 5° 49' 25.40" North and Λ_o = 55° 09' 09.20" West of Greenwich. This datum was referenced to the Bessel 1841 ellipsoid, where a = 6,377,397.155 m and 1/f = 299.152828. For mapping, the Kaart van Suriname Rousilhe Stereographic Grid was used where the latitude of origin, φ_o = 4° 07' N, the central meridian λ_o = 55° 41' W, the scale factor at origin was unity, the False Easting = 300 km, and the False Northing = 775 km. The map compilation was performed by Centraal Bureau Luchkartering (CBL). The area north of 4° N was mapped at 1:40,000 scale, and the entire country was mapped at 1:100,000 scale.

During the 1960s a new primary triangulation network was based on HIRAN - SECOR – BC4 – PC-1000 – Doppler Transit observations in Suriname. (An aspect of these geodetic systems is that I am so old, I have had some association with all of them except for the PC-1000!) The new local system is known as the Zanderij Datum of 1962 where Φ_o = 5° 26' 53.45" North± 0.10", Λo = 55° 12' 19.04" East of Greenwich ± 0.10", and the reference azimuth from RM No. 1 to Az. Mk. measured from south α_o = 261° 59' 18.89".

Photogrammetric Engineering & Remote Sensing
Vol. 85, No. 11, November 2019, pp. 784–785.
0099-1112/19/784–785

doi: 10.14358/PERS.85.11.784

According to John W. Hager, " … the station name of HIRAN 14 AMS 1962 and latitude and longitude values (seconds only) of 53.25" and 19.22". This is a difference of 8.27 meters. The equipment in 1962 was quite bulky and I think that this later value represented the HIRAN antenna position and that the astro was located the 8.27 meters away. Another reason for having the astro point and the antenna some distance apart is that they would be making the HIRAN measurements simultaneous with or before they would complete the astro observations." The ellipsoid of reference for the Zanderij Datum of 1962 is the International 1924 where a = 6,377,388 m and 1/f = 297. The projection adopted for this datum is the Suriname Gauss-Krüger Transverse Mercator Grid, where the Central Meridian λ_o = 55° 41' W, the False Northing = zero, and the False Easting = 500 km. Two scale factors at origin have been noticed with this grid: m_o = 0.99975 and m o = 0.9999, the latter observed on some 1:50,000-scale maps dated around 1978. The most common scale factor for the Suriname TM Grid is m_o = 0.99975.

In 1996, the U.S. National Geodetic Survey observed a number of positions with GPS receivers, one point being "008 Astro ECC 19" where φ = 5° 26' 54.62257" N and λ = 55° 12' 19.04" W. Although this is a different point than the old datum origin, the similarity of the coordinates show how close the NAD83 Datum is to the old Zanderij 1962 Datum. Proof of the pudding is the three-parameter shift values published by NIMA in TR8350.2, 03 January 2000 where from Zanderij to WGS84: ΔX = –265m ± 5m, ΔY = +120m± 5m, and ΔZ = –358m ± 8m. The NIMA solution was based on five collocated points. Thanks for a lot of help on Suriname go to John W. Hager and to Mark Nettles.

Update

A fascinating account of a boundary recovery survey used in the Guyana-Suriname Maritime Boundary Delimitation by David H. Gray of Ottawa Canada is found at:

https://pdfs.semanticscholar.org/6bc4/c38aa6bdbac5a7359a6714d90eb9e9193ae8.pdf

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This column was previously published in PE&RS.

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On my Intel i7/32GB RAM computer, these files were generated in less than five seconds at the command prompt! To be fair, you can also generate the files using the LP360 GUIs following the LP360 user-manual instructions, but for large projects involving several hundred .LAS files, the command prompt is really convenient. And do not forget, you can call these programs from scripts.

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