

New datasets from South American equatorial magnetic observatories

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Here we describe two geomagnetic time series from the South American magnetic observatories Huancayo (Peru) and Tatuoca (Brazil) that are affected by both the equatorial electrojet (due to their proximity to the magnetic equator) and the South Atlantic Magnetic Anomaly. We have filled in gaps and removed errors in the hourly values from Huancayo for 1922 to 2001 and we recovered and calibrated minute mean data from Tatuoca for 2008 to 2016.

The geomagnetic observatory Huancayo in Peru (IAGA code HUA, latitude 12.05° S, longitude 75.30° W, altitude 3313 m) is in operation since March 1st, 1922. The magnetic equator (the line around the globe where the geomagnetic field is horizontal) remained very close to it during its entire period of operation. More information on HUA's early history and its establishment can be found in Johnston et al. (1948). Here we detail the processing of a HUA dataset containing geomagnetic records from 1922 to 2002.

The HUA dataset consists of horizontal, declination and vertical components (H, D and Z) hourly mean values, obtained from two different sources: the World Data Center (WDC) Kyoto and recently digitized handwritten tables (DHT) with data that were previously unavailable. The DHT data fills considerable gaps in the WDC data for the 1960ies, 1970ies and 1980ies (see Figure 1). These two subsets partially overlap in the 1960ies. Here, we provide a final combined WDC-DHT dataset for HUA from 1922 (installation of HUA) to 2001, as HUA became a member of INTERMAGNET (International Real-time Magnetic Observatory Network) in 2002. We have processed all three components of WDC and DHT data, correcting typos, spikes, jumps and we combined them into one final dataset. Furthermore, we also describe the DHT digitisation process and our criteria to decide between the WDC and DHT sets in the overlap periods.

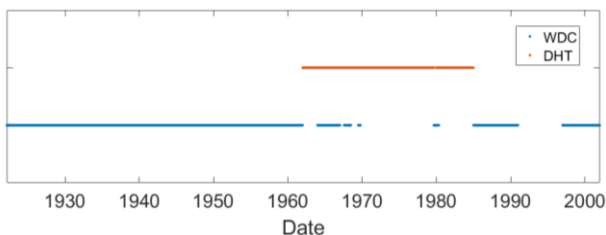


Figure 1: Timeline with WDC and DHT data availability.

While HUA is an equatorial magnetic station since its installation, the geomagnetic observatory Tatuoca in Brazil (IAGA code TTB, latitude 1.20° S, longitude 48.51° W, altitude 10 m) only became an equatorial station in

the last decade, although it has been operated since 1957 by Observatório Nacional (and also by the German Research Centre for Geosciences since 2015, as detailed in Morschhauser et al., 2017). This is due to the strong secular variation of the vertical component in the Brazilian sector that leads to a significant movement of the magnetic equator.

Thus, only part of TTB time series (which is longer than 60 years) is a record of the equatorial electrojet ionospheric current. Here we present the 2008-2016 dataset, as the magnetic equator crossed TTB location in March 2013. This is a processed and calibrated dataset that contains minute means and derived hourly mean values of X, Y and Z components. Two different data subsets were produced according to the observed noise level.

Concerning the removal of artificial disturbances, two versions of the dataset were produced: one in which events of spikes and periods of noise of more than 3 nT (peak to peak) were systematically removed from the records; and a second subset where noise that exceeded 1 nT (peak to peak, by visually checking raw variation 1Hz data magnetograms) was removed from the records, if the noise was not attenuated during the filtering of the 1 Hz data to minute means.

Up to now, both HUA and TTB datasets described in this work were not provided to the scientific community in a final digital format. Thus, our aim is to provide both datasets to the WDC for Geomagnetism, Edinburgh (<http://www.wdc.bgs.ac.uk/>) and to the GFZ Data Services (<http://dataservices.gfz-potsdam.de/portal/>). This would allow new scientific investigations regarding the South American magnetic equator region.

References:

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