

TIME AND LATITUDE PROGRAMS AT THE NATIONAL OBSERVATORY OF
BRAZIL

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The National Observatory of Brazil was established in 1827 to study the problems of latitude and time. Time and latitude programs are still an important part of its work, but are now accompanied by increasing activity in the fields of geophysics, astrophysics and radio astronomy.

I do not intend to dwell upon historical aspects of the Time Service of the National Observatory, but will draw to your attention the transmission of electrical time signals between Portugal and Brazil by submarine cable in 1880, and a systematic study of seasonal irregularities in the rotation of the Earth from 1949 to 1955 (1).

Installation of an atomic-clock system began in 1955, and in 1978 this comprises 12 atomic clocks, operating in Rio de Janeiro, São Paulo, Atibaia, Natal and Brasília. The clocks, separated by distances of up to 1200 km, are intercompared by a TV network (2) supplemented by monthly clock transportation. The two methods maintain a national atomic-time scale with an interval error of less than 0.1 μ s.

About 2 comparisons per year have been made with standards from BIH, NBS, USNO and the Observatorio Naval Argentino.

Between 1924 and 1932 Lelio I. Gama made a long series of observations using a visual zenith tube identical with those of the International Latitude Service. This series, comprising 13 000 pairs of observed stars, was published in 1977 (3) and is a unique contribution to this field in the Southern Hemisphere in the first half of this century.

The latitude program has now been improved by the installation of a Danjon impersonal astrolabe. The new program, intended to continue Gama's research, is being carried out in cooperation with the Astronomical and Geophysical Institute of the University of São Paulo.

The astrolabe was installed in January 1977 and a regular program of observations was started in May 1977. We were concerned that our observations might be spoiled by our location within a city of 6 million people, but by taking precautions we have been able to obtain promising results; a special air-extraction system has been arranged in order to reduce local disturbances (4) and the astrolabe has been installed high in the dome to minimise the internal light path.

This arrangement has proved to be excellent for observing the Sun and Venus during the daytime. A planetary positions program is now in progress and regular solar observations to study the position of the equinox are to be started.

The main purpose of the astrolabe is, however, to provide data for the time and latitude programs. Observations of 396 stars in 12 groups have been in progress since May 1977; preliminary analysis shows internal errors of about 7 ms in time and 0.1 arcsec in latitude for each group, with a typical observing error of about 0.3 arcsec for a single star.

The first results will be published in October 1978.

- (1) L. Muniz Barreto - 150 Anos de Astromia no Brazil - in preparation.
- (2) I. Mourilhe Silva - Comparação de relógios atômicos por meio de cadeias de televisão - MSc Thesis - ON, 1974.
- (3) L. I Gama - Variação de Latitude do Rio de Janeiro (1924.3 - 1931.3) - ON , 1977.
- (4) V. A. d'Avila, A. H. Andrei, J. L. Penna, and M. Queiroz, - Cuidados com a refração de sala na instalação do astrolábio Danjon no Observatório Nacional - XXIX Annual Meeting from SBPC, 29, pp 500-501, 1977.