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A LARGE CATALOGUE OF OBSERVATIONS OF SATURNIAN SATELLITES

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Abstract. COSS08 is a new catalogue of observations of the eight major Saturnian satellites which presents more than 130 000 observations (over 6 000 nights) from 1874 to 2007. The catalogue provides astrometric positions in a consistent format. The corrections applied for the reduction (refraction, aberration, phase effects) are indicated and when it was possible, the instrument and catalogue of reference star are also indicated.

1 Introduction

The eight major Saturnian satellites have been observed since their discovery during the 18th and the 19th. The first compilation of observations giving astrometric positions of Saturnian satellites is provided by Strugnell & Taylor (1990, ST90) with 51 000 observations from 1874 to 1989 in a consistent format. Harper & Taylor (1994, HT94) have extended this catalogue adding 15 000 observations from 1894 to 1922. Since 1989, many observations have been published in many different format. COSS08 (Catalogue of Observations of Saturnian Satellites) includes the observations of the previous catalogues and new ones published since 1989 and also old ones (before 1989) left out of the previous catalogues. All the observations are provided in a consistent format and the corrections (refraction, aberration, phase,...) applied for the reduction are indicated. The catalogue provides more than 130 000 observations (over 6 000 nights) of the eight major satellites of Saturn from 1874 to 2007 (Desmars et al., 2009).

2 The observations

The first observations of the catalogue are the micrometer measures from USNO made in 1874. The last observations of COSS08 are from Flagstaff in 2007. COSS08 is a compilation of four different sources:

- Observations from ST90 (reference 1-61): 51 000 observations (over 3500 nights) from 1874 to 1989. Some observations published in ST90 were reduced again and published in new articles. So these observations have been replaced by the new ones in COSS08.
- Observations from HT94 (reference 101-243): 15 000 observations from 1894 to 1922 most of them are micrometer measures.
- NSDC database (reference 420-552): The Natural Satellites Data Center provides data on natural satellites, published in different format (Arlot & Emelyanov, 2009).
- The recent observations (reference 600-608): 9 900 observations published recently and not included in NSDC.

3 Corrections of the reduction

To compare the positions given by a dynamical model with observations, we have to apply some correction like time scale, light time, aberration, refraction and phase effects. The time scale is uniform in COSS08. All the

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observations are in UTC and TT (terrestrial time) is indicated for information. The light time is not corrected. The refraction, aberration phase effects are not necessary corrected by the observers. Sometimes, they have cleary indicated if these corrections were made. In that case, we have indicated 0 if the correction was made and 3 if the correction was not made. Most of time, the corrections are not indicated. In that case, we have adopted some rules. For example, if observations were made before 1950 (mostly micrometer observations) then we have assumed that no correction was made (we note 3 for the paramater). For observations after 1950 (mostly photographic plates), the corrections are assumed to be made. Nevertheless, many exceptions can be revealed. Finally, computing O-C with and without corrections allows to conclude.

4 The catalogue

The full catalogue is available on CDS (http://cdsweb.u-strasbg.fr/) or on web server of the IMCCE[1]. Each line provides many parameters such as the date of observation, the coordinates of the measure, the reference system and frame, the corrections of refraction, aberration and phase effects and the residuals of each observation (see Desmars et al., 2009, for details).

The O-C were computed with TASS1.7 model (Vienne & Duriez, 1995) according to the corrections. They are purely indicative. The distribution of the observations is not homogeneous (Fig1).

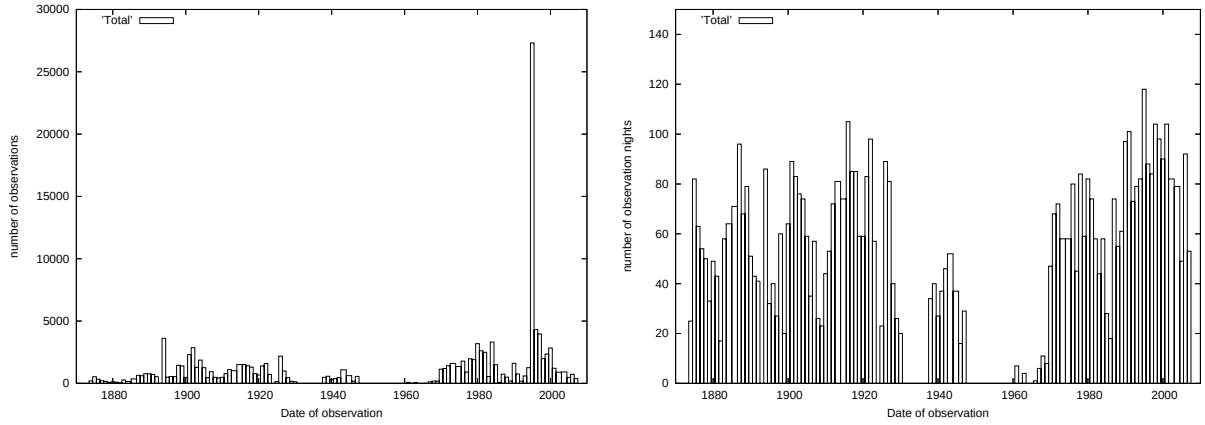

Fig. 1. Histogram of number of **Left:** observations **Right:** observation nights, at each opposition.

5 Conclusion

COSS08 is composed of more than 130 000 observations from 1874 to 2007. This catalogue can be used to fit dynamical model of the motion of Saturnian satellites. The large period covered allows also the detection of long-term perturbations in the satellite motion. Tidal effects may be detected by measuring an acceleration of the satellites (Lainey et al. 2007). Finally, we encourage observers to publish their data in the COSS08 format.

References

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[1] ftp://ftp.imcce.fr/pub/databases/NSDC/saturn/raw_data/position/1874-2007_S1-8_COSS08.data.txt