REPORT OF THE IAU WORKING GROUP ON CARTOGRAPHIC COORDINATES AND ROTATIONAL ELEMENTS OF THE PLANETS AND SATELLITES

M. E. Davies, Chairman
The Rand Corporation, Santa Monica, California, U.S.A.

V. K. Abalakin
Institute for Theoretical Astronomy, Leningrad, U.S.S.R.

C. A. Cross
Northwich, Cheshire, England

R. L. Duncombe
University of Texas, Austin, Texas, U.S.A.

H. Masursky

B. Morando
Bureau des longitudes, Paris, France

T. C. Owen
State University of New York, Stony Brook, New York, U.S.A.

P. K. Seidelmann
U.S. Naval Observatory, Washington, D.C., U.S.A.

A. T. Sinclair and G. A. Wilkins
Royal Greenwich Observatory, Sussex, England

Y. S. Tjuflin
Central Research Institute of Geodesy, Air Survey, and Mapping (TsNIIGAiK), Moscow, U.S.S.R.

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Abstract. This paper is the entire report of the IAU Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites, including three annexes. Tables give the recommended values for the directions of the north poles of rotation and the prime meridians of the planets and satellites. Reference surfaces for mapping these bodies are described. The annexes discuss the guiding principles, given in the body of the report, present explanatory notes, and provide a bibliography of the rotational elements and reference surfaces of the planets and satellites, definitions, and algebraic expressions of relevant parameters.

1. Introduction

The IAU Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites was established as a consequence of the adoption of the following resolution at the IAU General Assembly at Grenoble in 1976:

"Commissions 4 and 16 noting that
(a) confusion exists regarding the present rotational elements of some of the planets"
extensive amounts of new data from radar observations and by direct imaging from spacecraft have made cartography of the surfaces of the Moon, Mercury, Venus, and Mars a reality

c) there will be an extension of these techniques to the mapping of larger satellites of Jupiter and Saturn in the near future

assert that

(a) to avoid a proliferation of inconsistent cartographic and rotational systems, there is a need to define the rotational elements of the planets and satellites on a systematic basis and to relate the new cartographic coordinates rigorously to the rotational elements

and therefore recommend that

(1) Commission 4 (Ephemerides) and Commission 16 (Physical Study of Planets and Satellites) establish a Joint Working Group to study the cartographic coordinates and rotational elements of the planets and satellites and to report recommendations thereon at the next general assembly of the IAU” (Trans. IAU 16B, p. 144, 1977).

In preparing the recommendations given in this report, the Working Group adopted the guiding principles that have been previously adopted by Commission 16 at the IAU General Assembly at Brighton in 1970, namely:

1. The rotational pole of a planet or satellite which lies on the north side of the invariable plane shall be called north, and northern latitudes shall be designated as positive.

2. The planetographic longitude of the central meridian, as observed from a direction fixed with respect to an inertial coordinate system, shall increase with time. The range of longitudes shall extend from 0° to 360°” (Trans. IAU 14B, p. 128, 1971).

The technical arguments in support of, and in opposition to, both of these principles have been reviewed; these arguments were considered at the time of the adoption in the preparation of numerous maps of both planets and satellites, and the Group considers the advantages that are claimed for other principles are not sufficient to justify the adoption of new principles. Because of historical usage, longitudes on the Moon and Earth are measured from 0° to 180° east and west of the prime meridian. Thus these bodies are exceptions to the general rule. The Group does, however, recommend that the rotational elements and cartographic coordinate systems be specified more simply and uniformly than in the past.

The rotational elements define the direction of the axis of rotation and the rate of rotation relative to an inertial coordinate system. The values of the elements given later in this report are based, where possible, on recent observational determinations. These elements, especially those for the satellites, vary with time, but it is sufficiently accurate to adopt simplified models of these motions; in particular, short-period nutations are ignored.