SUMMARY OF THE DISCUSSION ON "NOMENCLATURE IN FUNDAMENTAL ASTRONOMY" DURING THE JOURNÉES 2004

N.CAPITAINE
Chair of the IAU Working Group on "Nomenclature for Fundamental astronomy"

This discussion took place on Tuesday 21 September 2004 (1700-1830), during the Journées 2004 in Paris, after Session III "Nomenclature in fundamental astronomy" chaired by D.D. McCarthy and including the following contributions:

"Report of the NFA Working Group" by N. Capitaine,
"3D representation of the Non-Rotating Origin" by O. de Viron and V. Dehant,
"Implementation of the new nomenclature in the Astronomical Almanac" by C. Hohenkerk,
"Post-IAU-2000 nomenclature for the telescope pointing application" by P. Wallace,
"The ICRS, BCRS and GCRS: astronomical reference-systems and frames in the framework of Relativity, problems of nomenclature" by M. Soffel M., S. Klioner.

The following points were introduced by the panel, composed of N.Capitaine, C.Hohenkerk, C.Ma, D.McCarthy, M.Soffel and P.Wallace, and were submitted to the audience for comments and discussion:

(1) The draft NFA WG recommendations,

(2) The draft Resolution proposal to the IAU 2006 GA,

(3) The WG explanatory documents,

(4) Future actions of the NFA Working Group.

The discussion on these points is summarized below.

(1) The draft NFA Working Group recommendations (see Annex to this summary)

The discussion concluded by supporting Recommendations 1 to 12, except for, in Recommendation 9, the comment on the use of Greenwich meridian which was considered unnecessary by a number of participants.

The most contentious points in the other recommendations were:
- in Recommendation 3, whether "intermediate" was the best term for the CIP/CIO triad,
- in Recommendations 5 and 6, whether to use "system" or "frame"; this was debated not only for the "intermediate frame/system" itself, which is quoted in this recommendation, but also for the ICRS/ICRF,
- in Recommendation 8, whether "right ascension" could legitimately be used for CIO based positions,

but the final conclusion was to support these Recommendations.

The conclusion on the system/frame question was using "system" in the broadest sense as possible (especially in the case of the intermediate system), but keeping "frame" for the set of coordinates as with the ICRF; a suggestion by M. Soffel to suppress the use of "frame" was debated but not supported, especially because of the necessity of having ITRF in the terrestrial case. Using special designations for particular realizations of the "intermediate celestial system" was supported, but not for the ICRS or ITRS which are considered as being theoretical ideal versions of the ICRF and ITRF, respectively, although a certain asymmetry was recognized between the celestial and terrestrial cases (e.g. special designations exist for the ITRF, such as ITRF2000, but not for the ICRF).

In Recommendation 12, there was the requirement that "ITRF prime meridian" be replaced by "ITRF zero-meridian" which was to be verified, and agreed afterwards, by the ITRS IERS Product Center (C. Boucher).

(2) The draft Resolution proposal to the IAU 2006 GA (see Annex to this summary)

This proposal was supported, except by one participant who was strongly against.

(3) The NFA Working Group explanatory documents (see the NFA website)

- B1 NFA document (Chart)
  There have been some criticisms of showing all the successive steps and giving them names: a suggestion to leave the chart as it is, simply adding an introductory sentence explaining that these steps are set out "as supplementary information for the general user community", was agreed. Some warning should also be given regarding the step from the intermediate terrestrial system to the local system that in fact it would require a more complicated process in the General Relativity framework in order to achieve a microarcsecond accuracy.

- B2 NFA document (summary of terms and definitions)
  There was a consensus that a more complete list of acronyms and abbreviations was needed to be added to the Chart.

- B3 NFA document (terminology list)
  This document will be revised when the ICRS/BCRS/CRS issue is clarified.

- The ICRS/BCRS/GCRS issue
  The recent WG question on how the GCRS is defined from ICRS was discussed in detail; the conclusion was that regarding the WG documents and recommendations, it may be simply necessary to specify at the start that the BCRS is considered together with the cosmological hypothesis of non-rotation of the directions of quasars [1]; introducing a new name for the GCRS that has its axes aligned to those of the ICRS was debated but without any definitive conclusion.

(4) Future actions of the NFA Working Group

Further educational efforts were strongly recommended. Part A of the NFA explanatory document is considered as being a key document to be realized by the WG. The 3D representation of the Non-Rotating Origin presented by O. de Viron will be made available (through a link to the appropriate URL) after some improvements on the NFA web page.

[1] More recent discussions with Sergei Klioner leads me to think, that in this case, we can assume in addition, that the BCRS considered here, has its spatial axes fixed to those of the ICRS; this would avoid having to introduce a new name for the GCRS that has its axes aligned to those of the ICRS.

ANNEX

IAU Division I Working Group on

"Nomenclature for Fundamental Astronomy" (NFA)

NFA Working group recommendations and guidelines on terminology

(Draft 5, 14 December 2004)

Introduction

The WG recommendations on nomenclature are the result of the work of the IAU Working Group on "Nomenclature for Fundamental Astronomy" (NFA) from October 2003 to September 2004 (cf. NFA Newsletters 1 to 5, NFA Questionnaires A and B, and WG comments and answers to the questions of Newsletters 4 and 5). A draft Resolution is proposed to be submitted to the IAU 2006 General Assembly in order to approve the proposed terminology.

This draft of the WG Recommendations and Resolution takes into account the discussion that was organized on 21 September 2004 during the "Journées 2004" in Paris.

Separate NFA explanatory documents provide additional information for supporting the following NFA WG recommendations. Part A of these documents reports on the basis for the IAU Resolutions and their implementation and Part B provides more detailed implementation of the proposed terminology by means of the "Chart for transformation from ICRS to observed places" (Part B1), the "Summary of terms and definitions" (Part B2) and the "Terminology list" (Part B3).

WG Recommendations

1. *Using existing terms (e.g. right ascension) in extended ways for the terminology associated with the new paradigm with a clear specification*, rather than introducing new names,

2. *Using "equinox based" and "CIO based" for referring to the classical and new paradigms, respectively*,

Comment: the "Celestial/Terrestrial Intermediate Origin" with the acronym CIO/TIO is proposed here as the updated terminology to replace the IAU 2000 "Celestial/Terrestrial Ephemeris Origin" with the acronym CEO/TEO (see below items 3. and 4. and the proposed Resolution),

3. *Using "intermediate" to describe (i) the moving geocentric celestial reference system defined in the IAU 2000 Resolutions (i.e. containing the CIP and the CIO), and (ii) the moving terrestrial system containing the CIP and the TIO)*,

Comment: the term "intermediate" has been chosen to specify that these systems are intermediary systems between the geocentric celestial system and the terrestrial system, which are realized by using the models, constants and procedures that are conventionally accepted; it conventionally separates the instantaneous celestial orientation of the Earth into components we label polar motion (in the terrestrial system) and precession-nutation (in the celestial system),

4. *Harmonizing the name of the pole and the origin to "intermediate" and therefore changing CEO/TEO to CIO/TIO*,

5. *Using "system" in a broad sense rather than "frame" in this context of the intermediary system/frame*,

6. *Using special designations for particular realizations of the intermediate celestial system*,

Comment: this applies for example to "the IAU 2000A system" to designate the system which is realized by transforming the geocentric celestial system GCRS to the intermediate system using the IAU 2000A precession-nutation and associated frame biases at J2000 (the GCRS being transformed from the BCRS by using the coordinate transformation specified in the IAU 2000 Resolution B1.3),

7. *Keeping the classical terminology for "true equator and equinox" (or "true equinox based") for the classical equatorial system*,

8. *Choosing "equinox right ascension" and "CIO right ascension", respectively (or "RA with respect to the equinox/or CIO"), for the azimuthal coordinate along the equator in the classical and new paradigms, respectively* (Note that right ascensions and declinations with respect to the ICRS are usually designated by α_{ICRS}, δ_{ICRS}),

Comment: this is to be specified only once in the presentation of a paper if there is some risk of misunderstanding. Afterwards, "right ascension" alone is sufficient,

9. *Giving the name "equation of the origins" to the distance between the CIO and the equinox along the intermediate equator, the sign of this quantity being such that it represents the CIO right ascension of the equinox, or equivalently, the difference between the Earth rotation angle and Greenwich apparent sidereal time*,

10. *Retaining "apparent places" and "mean places" in the equinox based system*,

11. *Not introducing "apparent intermediate places" in the CIO based system, but introducing instead "intermediate places"*,

12. *Using "ITRF zero-meridian" to designate the plane passing through the geocenter, ITRF pole and ITRF x-origin and using, if necessary "TIO meridian" to designate the moving plane passing through the geocenter, the CIP and the TIO.*

Additional points

- *Considering a terminology associated with other types of apparent places, although it can be required for specific use, has not been considered as being essential for common astronomical use and is therefore not part of the NFA WG terminology recommendations*,

- *no WG consensus having been reached for having strict rules for using or not using capitals for names for origins, poles and systems, no recommendation on this issue is proposed by the WG.*

Draft Resolution to be submitted to the IAU GA 2006

Recommendation from the Division I IAU Working Group on "Nomenclature for Fundamental Astronomy" (NFA)

Complementary terminology associated with the IAU 2000 Resolutions

The XXVIth General Assembly of the IAU

NOTING

1) the adoption of resolutions IAU B1.1 through B1.9 by the IAU General Assembly of 2000, and

2) that the International Earth rotation and Reference Systems service (IERS) and the Standards Of Fundamental Astronomy (SOFA) activity have made available the models, procedures, data and software to implement these resolutions operationally, and that the Almanac Offices have begun to implement them beginning with their 2006 editions.

RECOGNISING

1) that using the designation "intermediate" to refer to both the pole and the origin of the new systems linked to the Celestial Intermediate Pole and the Celestial or Terrestrial Ephemeris origins, defined in Resolution B1.7 and B1.8, respectively would improve the consistency of the nomenclature, and

2) that the name "Conventional International Origin" with the potentially conflicting acronym CIO is no longer commonly used to refer to the reference pole for measuring polar motion as it was in the past by the International Latitude Service,

RECOMMENDS

1. that the designation "intermediate" be used to describe the elements of the moving reference system defined in the 2000 IAU Resolutions,

2. that the terminology "Celestial Intermediate Origin" (CIO) and "Terrestrial Intermediate Origin" (TIO) be used in place of the previously introduced "Celestial Ephemeris Origin" (CEO) and "Terrestrial Ephemeris Origin" (TEO), and

3. that authors carefully define acronyms used to designate elements of astronomical reference systems to avoid possible confusion.