

Implementing the IAU 2006 resolutions in the transformation between celestial and terrestrial reference systems

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Chapter 5 of the IERS Conventions deals with the transformation between celestial and terrestrial reference systems. The IERS 2003 Conventions implemented the IAU 2000 resolutions in that chapter, which introduced a major revision of the procedure used for the transformation between the Geocentric Celestial Reference System (GCRS) and the International Terrestrial Reference System (ITRS). This included refined definitions for the pole (the Celestial intermediate pole, CIP), for the new origin on the equator (designated the Celestial ephemeris origin, CEO, at the time of the resolution) and for the Earth rotation angle (ERA), and the use of the IAU 2000 precession-nutation.

During the period 2003-2006, the IAU Working Group on "Nomenclature for fundamental astronomy" (NFA) was charged with preparing a consistent and well defined terminology associated with the implementation of the IAU 2000 resolutions on reference systems. This working group produced a NFA Glossary providing a number of updated definitions as well as a few newly proposed terms. The working group also provided two resolution proposals that were adopted by the IAU at its 2006 General Assembly as supplements to the IAU 2000 resolutions on reference systems. IAU 2006 Resolution B2 was for harmonizing the name of the pole and origin to "intermediate" and for adopting the default orientation of the Barycentric Celestial Reference System (BCRS) and Geocentric Celestial Reference System (GCRS). IAU 2006 Resolution B3 was for the re-definition of Barycentric Dynamical Time, TDB. In addition, IAU 2006 Resolution B1, recommended by the IAU working group on the "Precession and the Ecliptic" (P&E), was also adopted, which clarifies the definitions of the ecliptic as well as of the precession of the equator and the ecliptic and recommends the adoption of a new precession model, beginning on 1 January 2009. This IAU 2006 precession is both consistent with dynamical theory and compatible with the IAU 2000A nutation theory.

Some of the changes recommended by the IAU NFA working group have already been implemented in updated versions of the IERS Conventions, such as the new nomenclature for the celestial and terrestrial origins on the CIP equator and the corresponding intermediate reference systems. However, other changes have not yet been introduced and the new precession model should also be introduced in order that the IERS procedures are compliant with that model before the 1 January 2009. Introducing these additional changes will be an opportunity to improve the way Chapter 5 is organized and avoid redundancy in formulas or procedures.

This presentation will review the necessary changes to best implement the IAU 2006 Resolutions on reference systems (also adopted by IUGG in 2007) in the IERS Conventions and suggest one method for computing the IAU 2006 matrix transformation for bias, precession and nutation using direct series for X , Y and $s + XY/2$ based on two recent papers (Capitaine & Wallace 2006 and Wallace & Capitaine 2006).