

Discussion on IERS conventions UAW 2026

- With increasing precision, the price to pay is “inflation” of the standards
- complexity, inconsistencies
- Return to the original spirit : bulk of standards for processing astro-geodetic data or reference model to inter-compare astro-geodetic results
 - Well distinguish essential models from non-essential models in the sense defined above
 - **In summary : Sustainability, Simplicity, Consistency**

Relevant models for conventions

- IERS convention is not intended to promote the models done by some individual or organization, but to serve the scientific community
- The models are not necessarily the “best” ones, have to present a good trade-off between accuracy and simplicity
- Avoid too frequent updates: less models/standards as possible.
- Non-essential model: for instance triaxiality induced long term polar motion of Tab. 5.1 ($\sim 10 \mu\text{as}$) cannot be discriminated from observed polar motion and has not practical interest, but add model for the more prominent effect of the ocean tide ($\sim 100 \mu\text{as}$)?
- In parallel, gather **alternative models** and **models for phenomena not relevant for conventions** but presenting a great interest for interpreting astro-geodetic results. This can be done for each Convention Chapter. This can boost an healthy scientific emulation.

Some examples of non-consistent conventions (non exhaustive list!)

- Chapter 1 (1.1 Numerical standard) : “nominal” angular velocity $\omega = 7.292\,115\,10^{-5}$ rad/s versus angular velocity r defining UT1 from ERA (Chapter 5, Eq. 5.14)

$$ERA(T_u) = 2\pi (0.7790572732640 + r T_u), \quad T_u = (\text{Julian UT1 date} - 2451545.0)$$

with $r = 1.002\,737\,811\,911\,354\,48$ cycle/Sl day, corresponding to the more accurate value

$\omega = 7.292\,115\,146\,706\,95\,10^{-5}$ rad/s consistent with the “Sl day” of 86400 s TAI

- Two different conventions for the imaginary part of the “Tesseral” Love number. From Tab. 6.3 $k_{21} = 0.29830 - i\,0.00144$, but for describing pole tide in Section 6.4 $k_2(\equiv k_{21}) = 0.3077 + i\,0.0036!$

Chapter 5 proposed updates (Jose Ferrandiz)

Changes to content and removals

The length of Chapter 5 can be drastically reduced. There is no longer a need to detail the significant changes in concepts and procedures introduced by the 2000 and 2006 IAU/IUGG Resolutions.

However, the key points of these resolutions must be retained and concisely summarized.

Definitions of axes and origins (e.g., CIP, CIO, and TIO); EOP; precession/nutation models; and CPO.

The corresponding main formulae must be kept. Users are allowed by the former resolutions to choose a parameterization, but the majority of expressions in terms of obliquity and longitude can be removed since CPOs are mostly used in the convenient form dX , dY .

Existing supplementary IERS corrections/models must be clearly stated, as well as how to acknowledge their use if optional. E.g., solid-Earth High-Frequency-Nutation (not those for PM in Chapter 8) or FCN models.

Content added — see *discussion points*

Some potential corrections could be added if agreed upon. They refer to:

Updates by corrections to the precession IAU2006 and nutation IAU2000 models

An account of FCN models that may or may not be offered. They are useful for predicting CPO from the EOP users' perspective, not only for science

Updates to the solid-earth high frequency nutations and UT1 variations (not the ones in Chapter 8)

Chapter 5 proposed updates: Discussion points

Deciding on adopting the use of new CPO (2026?) referred to updated precession & nutation models, improved by adding these corrections to the precession and forced nutations:

1. Updating the precession model to the IAU2006_J2 (Dec. 2025) to solve for the growing dX inaccuracy.
2. Increasing the accuracy further by employing consistent nutations. Correcting planetary nutations with the main analytically derived non-rigid Oppolzer terms is essential. *(A complete replacement would be better, but would require more time to be applied effectively and the update is urgent)*
3. Finally, completing the update of the conventional IERS models by choosing among these options:
 - a) including the already available corrections to IAU2000 corresponding to oceanic effects or BEP refit,
 - b) using semi-empirical corrections to the amplitudes of some nutation periods (~15) fitted to VLBI observations and statistically significant *(after tested with many different CPO solutions)*
 - c) A combination of the former two for increasing the accuracy using less empirical amplitudes

Expected benefits:

A drastic reduction in the WRMS of the CPO, to ~120 μas (<4 mm) for the IVS combined solution.

CPO time series could be corrected immediately without the need for prior reanalysis.

Improved CPO predictions, FCN models, and reference frames are likely based on results from tests conducted so far within the IAU/IAG JWG CIERT.