## Updates for SOFA Release 12: 2016 May

Changes/updates fall into the following categories:

- 1. The addition of four routines to the Precession/Nutation/Polar Motion section, which deliver long-term  $(+/-200,000~{\rm years})$  precession using the model of Vondrak, Capitaine and Wallace (2011, 2012).
- 2. Introduction of a new section entitled Ecliptic Coordinates. This section consists of six routines dealing with the transformation between equatorial and ecliptic coordinates using either the IAU 2006 precession model or the long-term precession model of Vondrak et al.
- 3. Separate Earth Attitude Cookbooks for Fortran and C users, replacing the existing Fortran-only edition.
- 4. Some documentation corrections.

## FORTRAN Routines

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New routines that implement a long-term precession model:

iau\_LTPB Precession+bias matrix, J2000.0 to date using the Vondrak et al. long-term model.

iau\_LTPECL Precession (Vondrak et al. long-term) of the ecliptic. A
unit vector representing the direction of the ecliptic
pole with respect to the J2000.0 mean equator and equinox.

iau\_LTPEQU Precession (Vondrak et al. long-term) of the equator. A
unit vector representing the direction of the pole of the
equator with respect to the J2000.0 mean equator and
equinox.

Routines comprising a new section on ecliptic coordinates:

iau\_LTECM ICRS (equatorial) to ecliptic rotation matrix using the Vondrak et al. long-term precession.

Updated:

t\_sofa\_f.for Test program, incorporating the ten new routines.

Revisions:

iau\_ATCO13 List of called routines corrected.

iau\_ATIO13 List of called routines corrected.

## ANSI C Routines

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New functions that implement a long-term precession model:

iauLtp Precession matrix, J2000.0 to date using the Vondrak et al. long-term model. A new routine.

iauLtpb Precession+bias matrix, J2000.0 to date using the Vondrak et al. long-term model. A new routine.

iauLtpecl Precession (Vondrak et al. long-term) of the ecliptic. A
unit vector representing the direction of the ecliptic
pole with respect to the J2000.0 mean equator and equinox.
A new routine.

iauLtpequ Precession (Vondrak et al. long-term) of the equator. A
unit vector representing the direction of the pole of the
equator with respect to the J2000.0 mean equator and
equinox. A new routine.

Functions comprising a new section on ecliptic coordinates:

iauEcm06 ICRS (equatorial) to ecliptic rotation matrix using IAU 2006 precession.

iauLteceq Ecliptic coords to equatorial: transformation of ecliptic longitude and latitude (mean equinox and ecliptic of date) to mean J2000.0 right ascension and declination, using the Vondrak et al. long-term precession.

iauLtecm ICRS (equatorial) to ecliptic rotation matrix using the Vondrak et al. long-term precession.

Updated:

sofa.h Addition of prototypes for the ten new functions listed above.

t\_sofa\_c Updated test program incorporating the ten new routines, plus a handful of constants extended to more decimal places.

Revisions:

	iauAtco13	List of called functions corrected.
	iauAtio13	List of called functions corrected.
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Documentation:		
	board.lis	Inclusion of the new board members.
	title.lis	Release number and date updated.
	intro.lis	Updated to reflect the updates and additions of this 12th release.
	sofa_lib.lis	New routines added.
	sofa_pn_f.pdf	SOFA Earth Attitude Cookbook for those using Fortran. The former Fortran-only version was called sofa_pn.pdf. A few typographic corrections have been made.
	sofa_pn_c.pdf	SOFA Earth Attitude Cookbook for those using ANSI C. Like the former Fortran-only version but with function names and argument lists appropriate for the C case.
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