

Journées 2010

SOFA — Standards Of Fundamental Astronomy



**A status report, a review
and look to the future**

Catherine Hohenkerk, Chair SOFA



Paris Observatory
September 20-22

What is **SOFA**?

- IAU “function”, “initiative” – not funded
- IAU Division 1 & Commission 19
- Collection of validated software
- Authoritative algorithms & standard models
- Easily available to users, i.e. from a website
- A board of experts

Current **SOFA** Board

- John Bangert
- Steve Bell (Webmaster)
- Mark Calabretta
- Anne-Marie Gontier
- Catherine Hohenkerk
- Wen-Jing Jin
- Brian Luzum (IERS)
- Zinovy Malkin
- Jeffrey Percival
- Patrick Wallace

Co-opted

- George Hobbs

Past Members: Skip Newhall, George Kaplan, Wim Brouw, Dennis McCarthy

Countries / Institutions / Groups

- Australia
- UK
- France
- Russia
- China
- USA
- Australia Telescope National Facility
- HM Nautical Almanac Office
- Paris Observatory
- Pulkovo Observatory
- Shanghai Observatory
- US Naval Observatory
- University of Wisconsin

Board are Members of IAU Groups

❖ Division 1

– Commissions

- C4 Ephemerides
- C8 Astrometry
- C19 Earth Rotation
- C31 Time
- C52 Relativity

– WG NSFA

– WG ASGT

▪ IERS

▪ Division XII C5

– WG FITS

– WGAD

SOFA's Chronology

- 1994 IAU SOFA : WGAS Div 1 Task Gp
- 1995 Feb: Pat Wallace appointed as Chair
- 1996 Feb: Board Appointed
- 1996 Oct: Inaugural meeting at USNO
- 1997 June: SOFA Centre Appointed
- 2001 Mar: 1st Fortran release [7th]
- 2009 Feb: 1st C release [2nd]
- 2010 January: new website
- 2010 Mar 20 Catherine Hohenkerk, new Chair



Standards of Fundamental Astronomy



Background
Current Software
Register
Cookbook
Software Archive
Reports & Papers
SOFA Board
IAU Division I
IAU Commission 19
IERS

The International Astronomical Union's SOFA initiative has the task of establishing and maintaining an accessible and authoritative set of algorithms and procedures that implement standard models used in fundamental astronomy. The initiative is managed by an international panel, the SOFA Board, appointed through IAU Division I. SOFA also works closely with the International Earth Rotation and Reference Systems Service (IERS) and its reporting commission is IAU Commission 19 "Rotation of the Earth".

These pages provide information on the currently-available Fortran 77 and ANSI C software, how to obtain it and instructions for its use. More detailed documentation and examples for an important subset of the SOFA routines can be found in the cookbook. A selection of reports and papers from the SOFA initiative is also available. Using SOFA software is free of charge under the terms of the [SOFA licence](#). [Registration](#) is not compulsory, but is encouraged as it shows the use being made of the SOFA Libraries and provides users with e-mail notification of bugs and updates.

■ Quick start ...

■ Download the latest release ...

- Latest [Fortran 77](#) release is available ...
[First released 2009-12-31, [revised 2010-01-27](#)]
- Latest [ANSI C](#) release is available ...
[First released 2009-12-31, [revised 2010-01-27](#)]
- A summary of [changes](#) for the new release is available ...

■ News ...

■ **PLEASE NOTE:** 2010 July 20 / SOFA web sites

SOFA Centre

www.iausofa.org

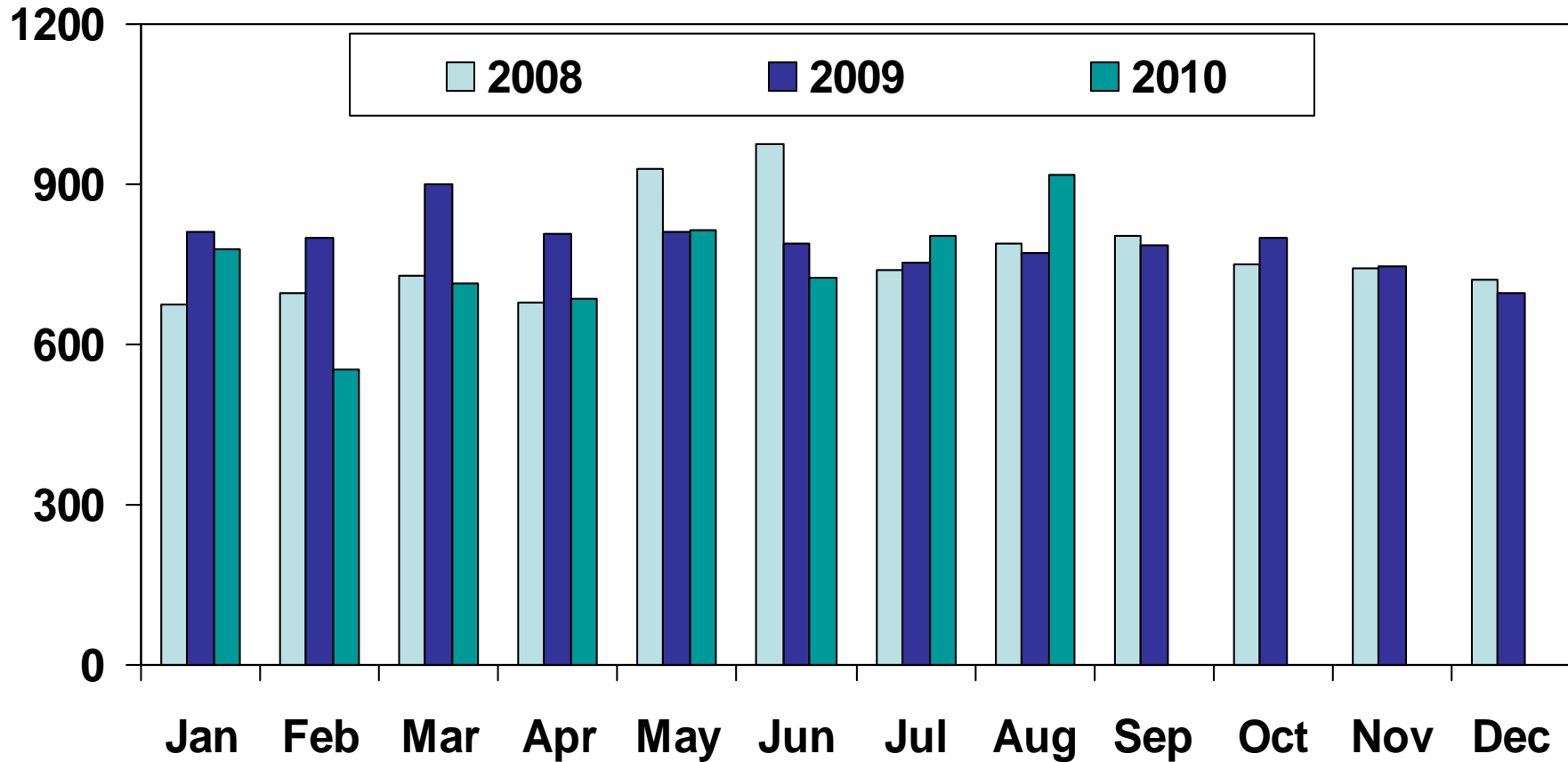
sofa@ukho.gov.uk

- Website Host – UK Hydrographic Office
- Availability – 24/7 : Space ~1/2 GB
- Webmaster – a Board member
- Downloads:
 - Software collection
 - Manual(s), Cookbook(s), reports, ...
- Archive of previous releases
- Registration for e-mail updates

Thank You



Unique Visitors / Month to SOFA



■ > 100 Countries

■ SOFA (Astro.) in Wikipedia

Contents of SOFA Website

Fortran & C Libraries

Routines

- 52 Utility (vector/matrix)
- 113 Astronomy
- Support
- Canonical

Documentation

- Manuals
- List of Constants π , etc
- Cookbooks
- **makefile** script to install the library
- **Validation** programs
t_sofa_f.f & t_sofa_c.c

SOFA's Astronomy Routines

- Calendars
- **Timescales**
- Earth Rotation and Sidereal Time
- Ephemerides
- Fundamental Arguments
- **Geocentric/Geodetic Transformations**
- Precession/Nutation/Polar Motion
- Star Space Motion
- Star Catalogue Conversions
- Obsolete routines

New Things Since ...

- ...



Standards of Fundamental Astronomy



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■ Register

If you wish to receive information via e-mail on updates and bug fixes for SOFA software, please complete the following form. The information you provide will only be used for SOFA-related issues and will not be made available to other parties.

■ Subscribe

Please enter your e-mail address twice to join our mailing list and indicate your preference for the software distribution:

Input e-mail address:

Input e-mail address again:

Software Distribution type Fortran & C Fortran only C only

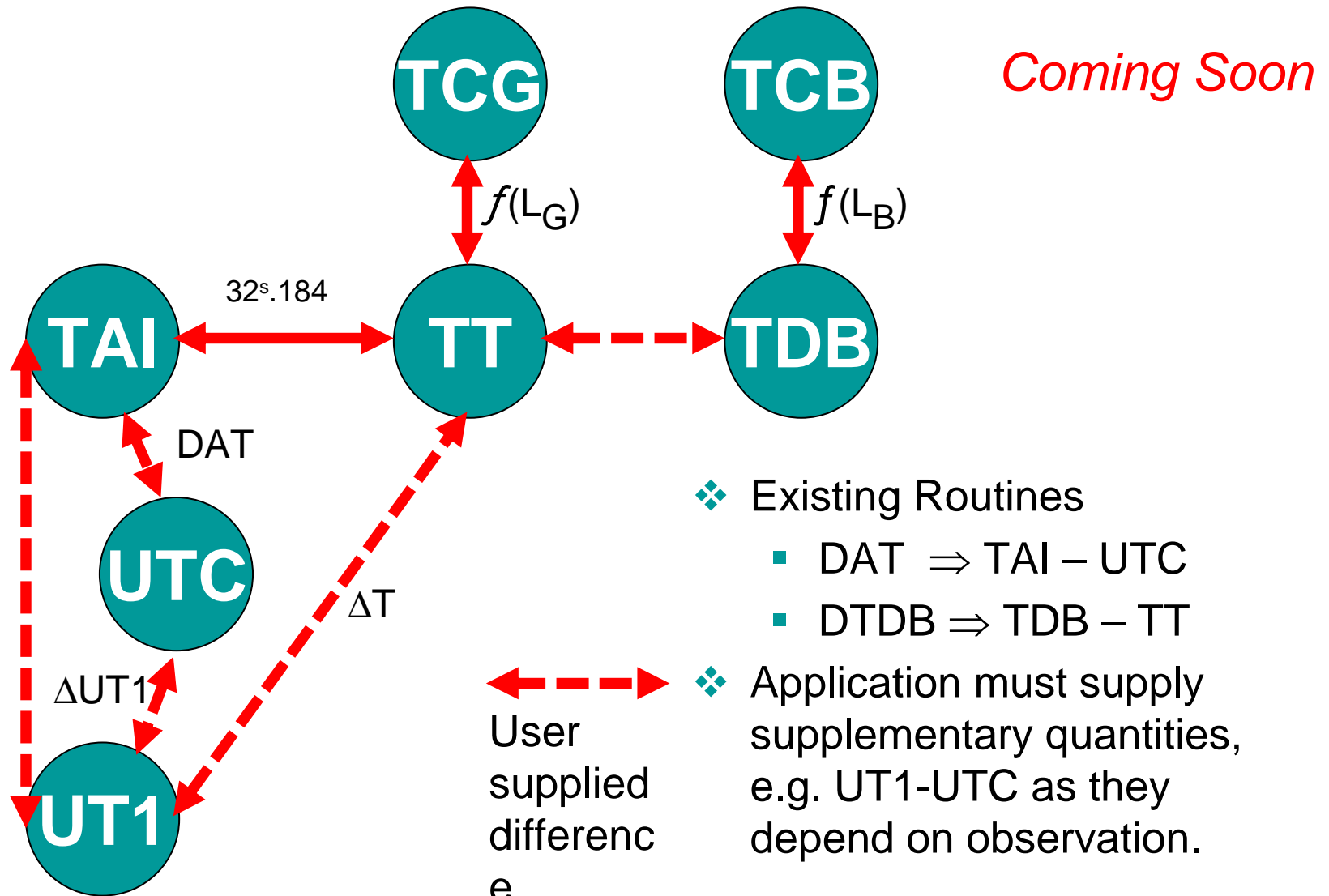
■ Unsubscribe

Please enter your e-mail address twice to remove your e-mail from our mailing list.

5 Geodetic / Geocentric Routines

- $a, f, \lambda, \phi, h, \Rightarrow x, y, z$: GD2GCE
- $a, f, x, y, x \Rightarrow \lambda, \phi, h$: GC2GDE
- EFORM - Reference ellipsoids (a, f)
 - WGS84
 - GRS80
 - WGS72
- GD2GC - Geodetic \Rightarrow Geocentric
- GC2GD - Geocentric \Rightarrow Geodetic

SOFA's Time Conversions



Coming Soon

... Time : Routines

❖ Decoding/Support routines

- Deal with year, month, day, hour, minute, seconds & **Leap Seconds**
- DTF2D – Civil date \Rightarrow SOFA date pair (JD)
- D2DTF – SOFA date pair (JD) \Rightarrow Civil date
- TF2D – h m s \Rightarrow days
- TF2A – h m s \Rightarrow radians
- AF2A - $^{\circ} ' '' \Rightarrow$ radians

SOFA Cookbooks

- SOFA Tools for Earth Attitude

- CIO, CIP, X , Y , s , s'
- Precession, Nutation, Polar motion
- Earth Rotation angle
- Sidereal time

- SOFA Time Scale & Calendar Tools

- TAI, UT1, UTC
- TT, TCG, TCB, TDB
- Civil Date, JD, h, m, s, $^{\circ}$ ' "

**Coming
soon**



Look to the Future

- Next Release – Coming Soon
- More routines
 - Transformations from BCRS to GCRS
 - Parallax, Light-time, Light-deflection, aberration
 - Other algorithms?
- Position within the Division 1
- Commission 4 : Ephemerides Access?

Removal of Old **SOFA** Web sites

- **Please Update your Bookmarks**
- Old websites removed at next release
 - www.iau-sofa.rl.ac.uk
 - www.iau-sofa.hmnao.com
- The website address is

www.iausofa.org

Thank You

- Host institutions of Board members
- UKHO for hosting the SOFA website
- SOFA Board members & Webmaster
- George Hobbs for his help with testing the time routines
- SOFA Board thanks Patrick Wallace for his leadership & continuing contribution

❖ THANK YOU to all