

DIVISION A / FUNCTIONAL WORKING GROUP STANDARDS OF FUNDAMENTAL ASTRONOMY (SOFA)

STANDARDS D'ASTRONOMIE FONDAMENTALE

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Catherine Y. Hohenkerk

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Jeffrey Percival,
Wendy Puatua,
Scott Ransom,
Nick Stamatakos,
Patrick Wallace,
Toni Wilmot**

TRIENNIAL REPORT 2018-2021

1. Background

Standards Of Fundamental Astronomy (SOFA) is a Functional Working Group of Division A, and continues its task of establishing and maintaining an accessible and authoritative set of algorithms and procedures that implement standard models used in fundamental astronomy.

This service for the astronomical community and others is facilitated by the SOFA website at www.iausofa.org, which provides access to the Fortran and ANSI C software libraries. However, the content is reliant on the expertise of the international Board members. This report highlights the need for SOFA to continue.

2. The software & website

The latest release of SOFA (17a) was made on 2021 February 24. During the triennium there have been three major releases and one minor release. The scope of the software has been expanded considerably in the past twenty years, from the original 27 astronomy Fortran routines in 2001 to 189 in both Fortran and ANSI C today. Of these 59 are canonical and directly support IAU resolutions. At every release there are improvements to the documentation within the code and/or the Cookbooks, which mostly clarify issues and occasionally correct typographical errors.

We thank all our users for sending in their reports and suggestions. Recent input has

in particular led to improvements in the control of rounding errors, especially important in some of the timescale conversions. Over the last three years there have also been a few bugs, including one that inherited a sign error from a printed paper. Fortunately these have been rare and not problematic. But the reports do show that the SOFA software is being used.

For completeness the cookbook *SOFA Vector–Matrix Library*, joins the three others; *SOFA Tools for Earth Attitude*, *SOFA Time Scale and Calendar Tools* and *SOFA Astrometry Tools*. This latest cookbook explains the 55 support routines and was issued in the 17th release (2021 January).

It is unclear how to measure the use of SOFA, as website statistics are no longer available. We do currently have 930 registered users for email notification of new releases. This is an increase of 109 during the last three years. Registered users are not necessarily individual users. It is worth noting that the website not only provides a means to download the libraries, but individual routines may be viewed and copied. Any of the four cookbooks for Fortran or ANSI C, or any of the documentation, may also be viewed/downloaded.

Among our users we note that there are three recognized third-party implementations of SOFA. There is the JAVA version by Dr Paul Harrison of Jodrell Bank Centre, University of Manchester. Essential Routines for Fundamental Astronomy (ERFA), produced by the AstroPy group, is a library which copies the ANSI C version, but it is not IAU badged and thus it is no longer “read only” and thus may be changed by anyone. Lastly there is the World Wide Astronomy (WWA) version, by Attila Abrud, which is a set of C# algorithms and procedures.

3. Board Members

Since the last GA in 2018 there have been changes to the membership of the Board. Soon after the GA we welcomed Nick Stamatakos of the US Naval Observatory and Toni Wilmot of HM Nautical Almanac Office, who as relatively new is included as a ‘training member’ and thus available to help both the Chair and the webmaster. Bill Folkner of the Jet Propulsion Laboratory and Brian Luzum of US Naval Observatory have stepped down. The latest member, Maria Davis of US Naval Observatory, who joined in January 2021, has been appointed by the International Earth Rotation and Reference Systems Service (IERS) as their representative as Brian Luzum’s replacement. We thank those who have stepped down for their years of service and warmly welcome our new members.

4. Closing remarks

The SOFA libraries continue to provide the astronomical community with a set of well-tested independent standard routines that support IAU resolutions. This gives users the tools for easily implementing and learning about fundamental astronomy algorithms and procedures, such as time scales, Earth attitude, precession, for use in research, in applications, and importantly in testing their particular implementation. This IAU service should continue.

I acknowledge and thank all the Board members and their host institutions for their work, in particular Patrick Wallace, who provides the coding, and the web-master, Steven Bell. The Board also thank the United Kingdom Hydrographic Office (UKHO) for hosting the SOFA website (www.iausofa.org).

Catherine Y. Hohenkerk

