

# Procedures of the Joint SCOR/IAPWS/IAPSO Committee for the Properties of Seawater (JCS) for updating TEOS-10

R. Pawlowicz (Chair)  
Draft Version July 2, 2015

## Background

In 2010-2012, a number of governmental and non-governmental organizations formally adopted the Thermodynamics Equation of Seawater 2010 (IOC et al., 2010) as the official description of the thermophysical properties of seawater. This manual, as well as a set of software libraries and other textual material intended to help the practitioner, is provided to users via a web site ([www.teos-10.org](http://www.teos-10.org)).

Due to its complexity, it was foreseen even at the time of initial acceptance that the TEOS-10 standard would require ongoing maintenance over the years. Such maintenance could include simple textual changes (to correct grammatical and typographic errors in the text and mathematical formulas), complex textual changes (to improve the usability and utility of the manual), more complicated changes to underlying algorithms and/or their description, or perhaps conceptual changes in emphasis that would be necessary to incorporate future changes, e.g., in efforts to make measurements traceable to the International System of Units (SI).

In addition, it was intended that software libraries produced in conjunction with TEOS-10 would become more comprehensive over the years, including additional material not strictly described by TEOS-10 but which would be of use to ocean scientists and engineers. The Joint SCOR/IAPWS/IAPSO Committee on the Properties of Seawater (JCS) was set up to oversee all such maintenance tasks.

Left unspecified at the time was the formal procedure by which such changes could be made to the standard. This purpose of this document is then to outline these procedures, which are intended to

- a) ensure CORRECTNESS of the printed text and formulas,
  - b) document TRACEABILITY of numerical calculations made at different times using different versions,
  - c) provide a level of INDEPENDENT EVALUATION,
  - d) ensure that changes are made in an OPEN and TRANSPARENT fashion,
- in order to ensure that the credibility and reputation of the TEOS-10 standard is maintained at a high level in the ocean community.

The scale of changes that may occur range from trivial, to complete replacement of the standard. The procedures outlined here are only meant to be applied to changes small enough that the name "TEOS-10" is kept. It is possible that future improvements to the description of seawater properties may result in a completely

new standard; other more elaborate procedures would be necessary to formalize adoption of any such newer standard.

## Definitions

**“TEOS-10”**: The TEOS-10 standard is defined by the description contained in the manual:

IOC, SCOR, and IAPSO, 2010, *The international thermodynamic equation of seawater – 2010: Calculation and use of thermodynamic properties*.  
Intergovernmental Oceanographic Commission, Manuals and Guides No. 56,  
UNESCO (English), 196 pp.

It is this manual which forms the official description of the standard and is an official product of JCS, adopted by parent and other organizations.

**“Getting Started”, “TEOS-10 primer”, “TEOS-10 lecture notes”**: These and other documents available on the web site are maintained primarily by their individual authors, and are NOT official products of JCS.

**“GSW”**: Rather than force all users to independently implement the TEOS-10 standard, JCS recommends a suite of software (provided in a number of different computer languages) as the preferred method by which users can make calculations. However, GSW is NOT an official product of JCS.

**“Web site”**. The web site [www.teos-10.org](http://www.teos-10.org) provides a convenient method whereby information about TEOS-10 and JCS can be accessed. The web site is an official product of JCS, but it may provide BOTH official and non-official products.

## Procedures for changes to TEOS-10

1. The Change Proposer (P) publishes a paper in a scientific journal (or some equivalent externally peer-reviewed process). Note: this step may proceed in parallel with steps 2-6.

2. A “Proposed Modification”, written by P, is sent to the chairman of JCS.

The “Proposed Modification” is at this stage a brief description of the work to be done.

3. The “Proposed Modification” is circulated by the chair to JCS and interested parties (e.g., IAPWS task groups), as appropriate, for comments.
4. The chair of JCS appoints an Independent Evaluator (IE), with the agreement of JCS. For small changes the IE may be the chairman.

5. If agreement on the desirability of the proposed changes exists, then the IE permits the P to create an edited 'beta' version of TEOS-10.

The 'beta' version should be identified with a unique date and the word 'beta' or 'draft' on the title page and elsewhere as necessary. Changes may be highlighted or otherwise indicated with editing marks, and are also described on the 'changes' page.

6. The IE then examines the beta version and any associated non-official documents and software. Steps 5-6 may be iterated until the IE is satisfied.
7. The IE then circulates the 'beta' version to JCS and interested parties for comments.
8. Comments are summarized in an 'Evaluation Report'. If general agreement exists among the members of JCS (this may or may not be formalized with a recorded vote), the 'beta' version becomes the current official version.

The word 'beta' or 'draft' is removed from the title page and elsewhere as necessary and any highlighting is also removed. The web site is updated to reflect this new version, and older versions as well as the Evaluation Report is archived.

9. All Changes are reported to 'parents' in annual updates or in whatever other way seems most suitable.

Note: As GSW is not an official product of JCS, changes in GSW may precede, follow, or be simultaneous with official updates to TEOS-10, but it would be preferable if they were simultaneous.

### **Procedure for changes to the Web Site**

Web site changes will follow the general procedures outlined above, except that formal written reports are not necessary. However, the principle that changes only become official with the general agreement of JCS should be followed.

### **Change History**

June 30, 2015: Proposed procedure was presented to the IAPWS Subcommittee on Seawater and Working Group on the Thermophysical Properties of Water and Steam. A number of small changes were made, and the procedure accepted.

July 2, 2015: This formal document was produced, including background and definition material.