ANNOUNCEMENT

The International Thermodynamic Equation of Seawater – 2010 (TEOS-10) to replace EOS-80

SCOR/IAPSO Working Group 127 on the “Thermodynamics and Equation of State of Seawater” has recommended the adoption of a new thermodynamic description of the properties of seawater, called the International Thermodynamic Equation Of Seawater – 2010 (TEOS-10 for short). This thermodynamic description of seawater properties, together with the Gibbs function of ice, has been endorsed by SCOR and IAPSO and has been adopted by the Intergovernmental Oceanographic Commission (IOC) at its 25th Assembly in June 2009 to replace EOS-80 as the official description of seawater and ice properties in marine science. The TEOS-10 computer software, the TEOS-10 Manual¹ and other documents may be obtained from www.TEOS-10.org.

A notable difference of TEOS-10 compared with EOS-80 is the adoption of Absolute Salinity to be used in scientific journals to describe the salinity of seawater and to be used as the salinity argument in the TEOS-10 algorithms that give the various thermodynamic properties of seawater. Note, however, that we strongly recommend that the salinity that is reported to national databases remain Practical Salinity as determined on the Practical Salinity Scale of 1978 (suitably updated to ITS-90 temperatures as described in the TEOS-10 Manual¹). The practice of storing one type of salinity in national databases (Practical Salinity), but using a different type of salinity in publications (Absolute Salinity), is exactly analogous to our present practice with temperature; in situ temperature is stored in databases (since it is the measured quantity), but the temperature variable that is used in publications is a calculated quantity, being either potential temperature or Conservative Temperature.

The more prominent advantages of TEOS-10 compared with EOS-80 are

• The Gibbs function approach allows the calculation of internal energy, entropy, enthalpy, potential enthalpy and the chemical potentials of seawater as well as the freezing temperature, and the latent heats of freezing and of evaporation. These quantities were not available from EOS-80 but are essential for the accurate accounting of “heat” in the ocean and for the consistent and accurate treatment of air-sea and ice-sea heat fluxes.

• For the first time the influence of the spatially varying composition of seawater can be systematically taken into account through the use of Absolute Salinity. In the open ocean, this has a non-trivial effect on the horizontal density gradient, and thereby on the ocean velocities and heat transports calculated via the “thermal wind” relation.

• The new salinity variable, Absolute Salinity, is measured in SI units (e.g. g kg$^{-1}$).

• The thermodynamic quantities available from TEOS-10 are totally consistent with each other, while this was not the case with EOS-80.

All oceanographers are now urged to use the new TEOS-10 algorithms and variables to report their work. To avoid confusion while the use of Practical Salinity in scientific publications is phased out, authors and editors are requested to ensure that during the period of change, published values of salinity are specifically identified as being either Practical Salinity with the symbol $S_p$ or Absolute Salinity with the symbol $S_A$.

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Prof. Dr. Wolfgang Fennel, President, Scientific Committee on Oceanic Research
Prof. Lawrence A. Mysak, President, International Association of the Physical Sciences of the Ocean

¹IOC, 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. -- A shorter summary of the salient features of TEOS-10 and the associated computer software is also being prepared for publication as IOC, SCOR and IAPSO, 2010: User’s guide to the international thermodynamic equation of seawater – 2010. Intergovernmental Oceanographic Commission, Manuals and Guides No. 56 (abridged edition), UNESCO.