Joint SCOR/IAPWS/IAPSO Committee on the Properties of Seawater (JCS)

Report to SCOR and IAPSO on JCS Activities July 2015-June 2016

Membership

Executive	
Rich Pawlowicz (Chair)	Canada
Rainer Feistel (Vice-chair)	Germany
Trevor J. McDougall (Vice-chair)	Australia
Salinity/Density Subgroup	
Frank J. Millero	USA
(Rich Pawlowicz)	Canada
Steffen Seitz	Germany
Hiroshi Uchida	Japan
Stefan Weinreben	Germany
Youngchao Pang	China
Henning Wolf	Germany
pH Subgroup	
Maria Filomena Camoes	Portugal
Andrew Dickson	USA
Daniela Stoica	France
Relative Humidity Subgroup	
Olaf Hellmuth	Germany
Jeremy Lovell-Smith	New Zealand
Thermodynamics	
(Rainer Feistel)	
Numerical Modelling and Applications	
(Trevor J. McDougall)	
Software	
Paul Barker	Australia
Industry Representatives	
Richard Williams (OSIL)	**UK ← Proposed**
Barbara Laky (Anton Paar)	Austria

NB: Former member Paul Ridout (OSIL) has retired.

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Meetings

JCS did not meet as a full group in 2015-16. However, 7 JCS members did attend the 2015 IAPWS Annual Meeting in Stockholm, Sweden (June 29-July 2, 2015), as described in last years report, and it is anticipated a similar number will attend the 2016 IAPWS Annual Meeting in Dresden Germany (September 2016), including the new OSIL representative R. Williams, who is also the new head of the Seawater Service.

Web site

JCS maintains a web site at www.teos-10.org. This site gets 1500-2000 visitors per month (12829 in the past year, with 46965 "unique views" since Oct 2010). Annual downloads have been stable over the past two years.

Web site Item	**Unique downloads June 2011-June 2013**	**Unique downloads June 2013-June 2014**	**Unique downloads June 2014-June 2015**	**Unique downloads June 2015-June 2016**
Manual	920	360	535	552
Getting Started	879	362	558	547
Slides	704	284	374	318
Primer	584	197	289	297
GSW_MATLAB_v3_0	1920	1102	1485	1814
GSW_FORTRAN_v3_	366	222	171	162
GSW_C_v3_0	202	84	133	151
GSW_PHP	-	55	61	43
SIA_VB_V3_0	72	100	46	45
SIA_FORTRAN_V3_0	59	118	58	44

Other Progress

1. Major event was the publication of the Metrologia Review papers (see refs 4-7 below) Since publication in January 2016 these have been heavily downloaded. As of May31:
   Part 1: Overview - 2452 downloads
   Part 2: Salinity - 1524 downloads
   Part 3: pH - 1522 downloads
   Part 4: RH - 2772 downloads
   total: 8270
2. After encouragement from JCS, members of Chinese delegation to 2015 IAPWS meeting published a paper on Chinese Standard Seawater, which provides an independent test of PSS-78 (see ref 8 below).

3. TM is working with several modelling groups to add TEOS-10 support to their code base. It is now available in NEMO.
4. RP/FM carried out a second set of density anomaly measurements in N. Pacific (Line-P program, June 2016) to check on anomalous anomalies found in first survey.
5. RP/HU carried out density anomaly measurements in Canadian Arctic Archipelago (w/ K. Brown, WHOI – Aug 2015), with a second set of samples to be acquired July 2016.
6. FM carried out density anomaly measurements in the deep Arctic (Aug 2015).
7. DS is spearheading an ERMP proposal for pH, pCO2, salinity and chlorophyll calibrations standards that went through a pre-selection and is now being developed into a full proposal (also involves SS, MFC).
8. HU carried out density anomaly measurements in N. Pacific (Izu-Ogasawara Trench to 9500m).
9. SW continued a decadal series of measurements of density anomalies in the Baltic.
10. HU, FM, HW are continuing measurements of density in SSW batches; this information will be collated in a planned publication.
11. HW,HU,SW,RP are still writing the 'Best Practices Guide for seawater Density Measurements' (now at version 13).
12. SS is still investigating instrument effects on conductance measurements.
13. AD continues to provide seawater buffers for pH, and is also a member for SCOR WG147 on speciation (discussing a seawater Pitzer model).

Papers published

1. McDougall, T.J. and P.M. Barker, Comment on ''Buoyancy frequency profiles and internal semidiurnal tide turing depths in the oceans" by B. Kind et al., J. Geophys. Oceans, 119, doi:10.1002/2014JC010066, (2014).

2. Feistel, R.: Salinity and relative humidity: climatological relevance and metrological needs, Acta Imeko 4, 57-61 (2015)

3. Pawlowicz, R., Electrical Properties of Seawater: Theory and Applications, Reference Module in Earth Systems and Environmental Sciences, Elsevier, 11pp, doi:10.1016/B978-0-12-409548-9.09578-6 (2015)

4. R Feistel, R Wielgosz, S A Bell, M F Camões, J R Cooper, P Dexter, A G Dickson, P Fisicaro, A H Harvey, M Heinonen, O Hellmuth, H-J Kretzschmar, J W Lovell-Smith, T J McDougall, R Pawlowicz, P Ridout, S Seitz, P Spitzer, D Stoica and H Wolf:Metrological challenges for measurements of key climatological observables: Oceanic salinity and pH, and atmospheric humidity. Part 1: Overview. REVIEW PAPER. Metrologia, 53 (2016) R1–R11, doi:10.1088/0026-1394/53/1/R1

5. R Pawlowicz, R Feistel, T J McDougall, P Ridout, S Seitz, H Wolf: Metrological challenges for

measurements of key climatological observables, Part 2: Oceanic salinity. REVIEW PAPER. Metrologia, 53 (2016) R12–R25, doi:10.1088/0026-1394/53/1/R12

6. A G Dickson, M F Camões, P Spitzer, P Fisicaro, D Stoica, R Pawlowicz and R Feistel: Metrological challenges for measurements of key climatological observables, Part 3: Seawater pH. REVIEW PAPER. Metrologia, 53 (2016) R26–R39, doi:10.1088/0026-1394/53/1/R26

7. J W Lovell-Smith, R Feistel, A H Harvey, O Hellmuth, S A Bell, M Heinonen, J R Cooper: Metrological challenges for measurements of key climatological observables, Part 4: Atmospheric relative humidity. REVIEW PAPER. Metrologia 53 (2016) R40–R59 doi:10.1088/0026-1394/53/1/R40

8. Li Y., Y. Luo, Y. Kang, T. Yu, A. Wang, C. Zhang, Chinese Primary Standard Seawater: Stability checks and comparisons with IAPSO Standard Seawater, Deep Sea Res. I, 113, 101-106 (2016).

9. R Feistel, J W Lovell-Smith, P Saunders and S Seitz: Uncertainty of Empirical Correlation Equations. Submitted to Metrologia, 26 May 2015, in press.

10. F. Camões, B. Anes, H. Martins, C. Oliveira, P. Fisicaro, D. Stoica, P. Spitzer Assessment of H+ in complex aqueous solutions approaching seawater Journal of Electroanalytical Chemistry, 764, 86-92 (2016).

11. B. Anes, R. B. Silva, H. Martins, C. S. Oliveira, M. F. Camões: Compatibility of activity coefficients estimated experimentally and by Pitzer eqations for assessment of seawater pH Accr. Qual. Ass., 21,1 123 (2016)

12. M.F. Camões, B. Anes: Traceability of pH to the mole, Water,7 4247, 4255 (2015).

R. Pawlowicz

JCS chair, June 28, 2016