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

Report to SCOR on JCS Activities Jun 2022-Jun 2023

Membership

JCS Executive			
Rich Pawlowicz (Chair)	Canada		
(temporarily vacant)			
Steffen Seitz (Vice-chair)	Germany		
Salinity/Density Taskgroup		**Chemical Speciation Taskgroup**	
(Rich Pawlowicz) (Chair)		David Turner* (Chair)	Sweden
(Steffen Seitz)		(Simon Clegg)	
Hiroshi Uchida	Japan	Peter Croot*	Ireland
Ryan Woosley	USA	Claudia Foti*	Italy
Yohei Kayukawa	Japan	Martha Gledhill*	Germany
pH Taskgroup		Mathis Hain*	USA
Andrew Dickson (Chair)	USA	Pablo Lodeiro*	Spain
Maria Filomena Camoes	Portugal	Sylvia Sander*	Germany
Daniela Stoica	France		
Simon Clegg	UK		
Frank Bastkowski	Germany	**Expert subgroup: Numerical Modelling**	
Relative Humidity Taskgroup		Trevor J. McDougall	Australia
Olaf Hellmuth (Chair)	Germany	**Industry Representatives**	
Jeremy Lovell-Smith	New Zealand	Richard Williams (OSIL)	UK
Rainer Feistel	Germany	Christine Bachler* (Anton Paar)	Austria
Stephanie Bell	UK		
Expert subgroup: Thermodynamics		**Expert subgroup: Software**	
(Rainer Feistel)		Paul Barker	Australia

*Proposed New Members

The membership of JCS will be expanded by 7 in the new Chemical Speciation Taskgroup. Our industry representative at Anton Paar is being replaced on retirement of Barbara Laky. The Salinity/Density Taskgroup has shrunk with the retirement of Frank Millero and Youngchao Pang.

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Meetings

No in-person meetings of JCS occurred over the past year. A planned JCS virtual meeting for January 2023 was postponed. However, the proposed membership of the new Chemical Speciation Taskgroup has been finalized and they have been holding regular (monthly) virtual meetings as part of software finalization from the completion of SCOR WG 145, and the development of a website containing that software (marchemspec.org)

Web site

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	Unique downloads June 2016-June 2017	Unique downloads June 2017-June 2018	Unique downloads June 2018-Apr 2019	Unique downloads May 2019-May 2020	Unique downloads May 2020-June 2021	Unique downloads June 2021-June 2022	Unique downloads June 2022-June 2023
Manual	920	360	535	552	418	427	349	472	479	482	530
Getting Started	879	362	558	547	427	475	349	444	460	483	479
Slides	704	284	374	318	219	248	204	272	272	231	272
Primer	584	197	289	297	222	217	187	253	260	226	268
Thermodynamics Lecture Notes								22	34	30	27
Thermodynamics Overview								24	27	27	23
GSW MATLAB_v3_0	1920	1102	1485	1814	1235	1552	1233	1556	1504	1747	1897
GSW FORTRAN_v3_	366	222	171	162	127	116	82	98	83	92	87
GSW_C_v3_0	202	84	133	151	85	96	59	81	58	49	57
GSW_PHP	-	55	61	43	29	60	28	52	22	22	21
SIA_VB	72	100	46	45	45	48	43	47	47	38	30
SIA_FORTRAN	59	118	58	44	36	42	37	42	31	33	31

JCS maintains a web site at www.teos-10.org. This site gets 750-1300 visitors per month (10,753 in the past year, with 87,397 "unique views[1]" since Oct 2010). Annual downloads of most items are stable, although there has been a gradual increase over the past few years in downloads of the GSW Matlab toolbox. GSW software is also available from a github repository (github.com/TEOS-10) for developers and those interested in contributing to the software, and recently third parties have implemented parts of the software in Excel (Martins and Cross, 2022, Technical note: TEOS-10 Excel–implementation of the Thermodynamic equation of Seawater-2010 in Excel, Ocean Sci., 18 (3), doi.org/10.5194/os-18-627-2022).

[1] The method of computing "unique views" changed in 2019.

A draft JCS website, separate from http://www.teos-10.org/, has been completed, with plans to "go live" once arrangements for hosting and the provision of a suitable domain name have been finalized.

A further website for the MarChemSpec software (marchemspec.org), allowing for users to use it via a web interface, is also under development.

Other Progress

1) SS and others are involved in a MINKE project related to CTD calibrations.
2) Specific negative salinity anomaly data for the Red Sea were obtained by HU during joint KAUST-JAMSTEC cruises in 2022 and 2023
3) The Chemical Speciation Taskgroup released the first version of the MarChemSpec software, and presented the software at two workshops following the OCB summer workshop at Woods Hole in June 2023.
4) MH is Working with partners to adopt MarChemSpec speciation in the GENIE Earth System Model framework and for Boron-isotope pH proxy development.
5) SC and others in the pH and Chemical Speciation Taskgroups are reviewing data from an ongoing measurement program, to be completed at the end of 2023, that will be used to create a speciation model for pH buffer solutions (for both metrological and practical purposes).
6) OH and RH Taskgroup is working towards a study on RF/TEOS-10 based psychrometry.

Papers published

1) M.P. Humphreys, J.F. Waters, D.R. Turner, A,G. Dickson and S.L. Clegg. Chemical speciation models based upon the Pitzer activity coefficient equations, and including the propagation of uncertainties: Artificial seawater from 0 to 45 °C. *Marine Chemistry*, 244, 104095. doi: http://dx.doi.org/10.1016/j.marchem.2022.104095
2) S.L. Clegg, M.P. Humphreys, J.F. Waters, D.R. Turner, and A.G. Dickson. Chemical Speciation models based upon the Pitzer activity coefficient equations, including the propagation of uncertainties. II. Tris buffers in artificial seawater at 25 °C, and the seawater 'Total' pH scale. *Marine Chemistry*, 244, 104096. doi: 10.1016/j.marchem.2022.104096
3) S.L. Clegg, J.F. Waters, D.R. Turner, and A.G. Dickson. Chemical speciation models based upon the pitzer activity coefficient equations, including the propagation of uncertainties. III. Standard seawater from the freezing point to 45 °C, including acid-base equilibria, *Marine Chemistry,* 250, 104196. doi: 10.1016/j.marchem.2022.104196
4) R. Feistel, O. Hellmuth, and J. W. Lovell-Smith (2022) Defining relative humidity in terms of water activity. Part 3: Relations to dew-point and frost-point temperatures, Metrologia, 59 (4), https://doi.org/10.1088/1681-7575/ac7185
5) R. Feistel and O. Hellmuth, (2023), Thermodynamics of Evaporation from the Ocean Surface, Atmosphere 14, 560, https://doi.org/10.3390/atmos14030560
6) Uchida, H., M. Oe and M. Wakita (2023): History of batch-to-batch comparative studies of International Association for the Physical Sciences of the Oceans Standard Seawater, Chapter 7 in Chemical reference materials of ocean science: history, production, certification and current status, Akihiko Murata and Cheong Chikako (eds.), Springer, (in press)

7) Uchida, H., M. Wakita, A. Makabe, A. Murata, Changes in the Composition of International Association for the Physical Sciences of the Oceans Standard Seawater, Chapter 8 in Chemical reference materials of ocean science: history, production, certification and current status, Akihiko Murata and Cheong Chikako (eds.), Springer, (in press)
8) Christoph Waldmann, Philipp Friedrich Fischer, Steffen Seitz, Manuela Köllner, Jens-Georg Fischer, Markus Bergenthal, Holger Brix, Stefan Weinreben and Robert Huber, A Methodology to Uncertainty Quantification of Essential Ocean Variables, Frontiers in Marine Science 15, 2022, Sec Ocean Observation, Vol 9, 2022, https://doi.org/10.3389/fmars.2022.1002153

R. Pawlowicz

JCS chair, July16 2023