

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

### Report to SCOR on JCS Activities Jun 2023-Jun 2024

#### Membership

<b>JCS Executive</b>			
Rich Pawlowicz (Chair)	Canada		
(temporarily vacant)			
Steffen Seitz (Vice-chair)	Germany		
<b>Salinity/Density Taskgroup</b>		<b>Chemical Speciation Taskgroup</b>	
(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
<b>pH Taskgroup</b>		Mathis Hain	USA
Andrew Dickson (Chair)	USA	Pablo Lodeiro	Spain
Maria Filomena Camoes	Portugal	Laura Haffert*	Germany
Simon Clegg	UK		
Frank Bastkowski	Germany		
		<b>Expert subgroup: Numerical Modelling</b>	
<b>Relative Humidity Taskgroup</b>		Trevor J. McDougall	Australia
Olaf Hellmuth (Chair)	Germany	<b>Industry Representatives</b>	
Jeremy Lovell-Smith	New Zealand	Richard Williams (OSIL)	UK
Rainer Feistel	Germany	Christine Bachler (Anton Paar)	Austria
Stephanie Bell	UK		
<b>Expert subgroup: Thermodynamics</b>		<b>Expert subgroup: Software</b>	
(Rainer Feistel)		(temporarily vacant)	

\*Proposed new member

Membership has decreased with the departure of Daniela Stoica (pH Taskgroup) and our software expert Paul Barker; both have left the field. Sylvia Sander (GEOMAR) has left the speciation group, and has been replaced by Laura Haffert, also from GEOMAR.

#### Meetings

No in-person meetings of JCS occurred over the past year. The Chemical Speciation Taskgroup has held 5 virtual meetings over the past year. An in-person meeting is being planned at the Busan IAMA-IACS-IAPSO Joint Assembly in 2025.

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### Web site

JCS maintains a web site at [www.teos-10.org](http://www.teos-10.org). This site get around 1000 visitors per month. Annual downloads of most items are stable, with the GSW Matlab toolbox being the most downloaded item (between 1500-2000 times a year). GSW software is also available from a github repository ([github.com/TEOS-10](https://github.com/TEOS-10)) for developers and those interested in contributing to the software. At present, however, the loss of our software subgroup member, who maintained these sites, means that continued upkeep is uncertain.

A draft JCS website, separate from <http://www.teos-10.org/>, was completed in 2023, 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](http://marchemspec.org)), allowing for users to perform calculations via a web interface, is also under development. However, both have been stalled by a lack of resources (time, money, and web expertise).

### Other Progress

- 1) SS and others are involved in a MINKE project related to CTD calibrations, and are applying for another project that includes improvements to pH measurements in seawater.
- 2) RP was part of a submitted SCOR WG proposal (on salt intrusions in rivers) which required improvements in the handling of rivers in TEOS-10.
- 3) MarChemSpec has been accepted as a project within the UN Ocean Decade, which runs from 2021– 2030. Joining the UN Ocean Decade is part of the speciation groups efforts to gain improved international visibility and encourage greater use of their modelling tools.
- 4) Version 1.10 of MarChemSpec has been released. The new feature is that the modelled natural water can be equilibrated to values of carbonate system parameters (alkalinity, total dissolved inorganic carbon, pH, or pCO<sub>2</sub>).
- 5) New thermodynamic measurements on Tris in a range of salt solutions have been carried out for MarChemSpec at three National Metrology Institutes (PTB, Germany; NMIJ, Japan; and NIST, USA. The final measurements at NIST are very close to completion.
- 6) As part of an effort to improve the representation of acid-base systems in the seawater electrolyte, CF has completed measurements on borate/boric acid in sodium and magnesium chlorides.
- 7) An upgrade of the trace metal part of MarChemSpec is currently under way through analysis of collections of critically assessed stoichiometric constants.
- 8) SC has submitted a proposal to the joint NERC/NSF program: *Seawater pH: Bridging the Gap Between Free and Total pH Scales From Estuaries to the Deep Ocean, and Application to Current Sensors*

### Papers published

- 1) R. Pawlowicz and R. Yerubandi, 2023, **Water as a Substance**, Chapter 2, Wetzel: Limnology, 4th edition, editors J. Smol and I Jones, Elsevier, <https://shop.elsevier.com/books/wetzels-limnology/jones/978-0-12-822701-5>

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- 2) Feistel, R.; Hellmuth, O. (2024): Correction: Feistel, R.; Hellmuth, O. Irreversible Thermodynamics of Seawater Evaporation. *J. Mar. Sci. Eng.* 2024, 12, 166. *J. Mar. Sci. Eng.* 12, 1431. <https://doi.org/10.3390/jmse12081431>
- 3) B. R. Carter, J. D. Sharp, A. G. Dickson, M. Álvarez, M. B. Fong, M. I. García-Ibáñez, R. J. Woosley, Y. Takeshita, L. Barbero, R. H. Byrne, W.-J. Cai, M. Chierici, S. L. Clegg, R. A. Easley, A. J. Fassbender, K. L. Fleger, X. Li, M. Martín-Mayor, K. M. Schockman, Z. Aleck Wang (2024) Uncertainty sources for measurable ocean carbonate chemistry variables. *Limnology and Oceanography* **69**, 1, 1-21.
- 4) B. R. Carter, J. D. Sharp, M. I. García-Ibáñez, R. J. Woosley, M. B. Fong, M. Álvarez, L. Barbero, S. L. Clegg, R. A. Easley, A. J. Fassbender, X. Li, K. M. Schockman, Z. Aleck Wang (2024) Random and systematic uncertainty in ship-based seawater carbonate chemistry observations. *Limnology and Oceanography*, in press.

R. Pawlowicz

JCS chair, Aug 12 2024