

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

Report on activities at JCS workshops, Greenwich UK Sept 2-3, 2013

The IAPWS has been having discussions with the BIPM (the “keepers” of the SI) about collaborating on standards. JCS (and IAPWS) member Feistel has in the past attended meetings of the Consultative Committees on Temperature (CCT) and Amount of Substance (CCQM, confusingly), which handle temperature and chemistry issues respectively. In addition, a top-level meeting took place between several IAPWS and BIPM executives in 2012. At this time BIPM suggested some joint workshops. Since seawater issues seemed a good place to start, JCS took over the responsibility for organizing and coordinating these workshops, which took place during the 16<sup>th</sup> International Conference on the Properties of Water and Steam (ICPWS16) in Greenwich, UK. These combined workshops would be useful to JCS for several reasons, one of which is that we would like to make oceanographic standards traceable to the SI.

Robert Weilgosz (executive director of CCQM) was invited to give a plenary talk at the conference. One interesting point is that environmental needs are now part of the BIPM's vision statement (rather than a focus on just industry and regulation). Following this, there were 3 workshops: one on pH, one on salinity/density issues, and one on relative humidity. Each workshop was co-chaired by two JCS members; one of whom was primarily a research oceanographer or atmospheric scientist (Dickson, Pawlowicz, Hellmuth), and one of which was more metrology-oriented and a BIPM representative (Spitzer and Seitz for CCQM, and Lovell-Smith for CCT). In addition, Stephanie Bell (chair of CCT's Working Group 6 on relative humidity) and Marti Heinonen (CCT) also participated. All JCS members managed to travel to Greenwich (including both industry reps), with the exception of McDougall and Barker, and there was much discussion about sections of the “metrologia” draft paper (which is now over 100 pages in length), especially in pH and RH where many issues are still being resolved.

Each workshop began with a series of short presentations, chosen by Pawlowicz, followed by open discussion with reference to the immediate aims of JCS in that area. A list of tasks were decided on as well as someone in charge of these tasks; JCS will endeavour to make sure they are completed!

### pH Workshop

About 30 people attended this workshop, including many members of the Euromet ENV05 metrology program that included pH and a number of IAPWS members from National Metrological Institutes. Tasks decided on were

1. Define a plausible artificial seawater matrix (based on TEOS-10 Reference Composition) both with and without sulfate, for new measurements in a way that may relate more easily to Absolute Salinity. (Stoica)
2. Write a more cook-book-like document to detail the creation of TRIS buffers (needed for pH calibration in seawater), expanding on the recipe in SOP6a in the CO<sub>2</sub> Best Practices document. More widespread use of such buffers will make pH measurements more available to the wider community (NB – Dickson is currently able to provide small amounts of TRIS buffers on request). (Dickson and Stoica)
3. Investigate the possibility of tracing uncertainties in Pitzer-like models (required for full analysis of uncertainty if such models will be part of a pH definition) (Stoica)

NB: D. Stoica is a member of ENV05 working on pH, but not a member of JCS.

### Salinity/Density Workshop

About 25 people attended this workshop. It was generally felt that different groups were having trouble replicating measurements of (e.g., the density of Standard Seawater), and part of this was because the correct method of using a commercially-available Anton Paar density meter for accuracies smaller than its specification was not obvious. Tasks decided on were

1. Investigate the linearity of the Anton Paar (using heavy water or NaCl solutions). (Wolf)
2. Develop a best practices guide for high precision density measurements (perhaps to go to L&O methods or JOAT) by pooling collective experience (Pawlowicz)
3. Although Standard Seawater is an amazingly successful Practical Salinity standard, its utility for other purposes is

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not as clear because of the way the chemical composition can change in the bottles. Collective experience should be pooled about the chemical composition of SSW and its changes with age (journal article?). (Pawlowicz)

4. Perform some laboratory intercomparisons of density measurements. (Wolf)

NB: Wolf is not a member of JCS, but will likely replace Spitzer after Spitzer's retirement next spring; Wolf is leading the effort to get funding for a follow-on project.

### Relative Humidity Workshop

The RH workshop had only 13 participants, but discussion was lively and technical. The RH section of the “metrologia” draft in particular had not been progressing well but these verbal discussions went a long way towards resolving a number of issues. Tasks decided on were

1. Hold further meeting on the subject at BIPM
2. Write a technical report on the physical basis of RH to circulate among the members of CCT WG-6 to stimulate discussion (Hellmuth)
3. Develop software or at least a comprehensive set of equations to convert between the many different currently-used definitions of RH (timelines and workpackages by end of 2013, to lead to work to be presented at an MMC conference in Solvenia, Sept. 2014) (Hellmuth)

### Future BIPM collaboration

Finally, there was a brief “general” meeting of JCS members and others at the end of the last workshop session. The tasks listed above were reviewed. In addition discussion was held about how to continue. It was felt that IAPWS members (or effectively JCS members with IAPWS affiliations) should attend BIPM working group workshops next year (CCQM in April, CCT in June), and funding should be sought to facilitate such travel. Weilgosz is also keen on having an environmental focus to a CCQ conference in Nov 2014, but details of this are as yet unclear.

R. Pawlowicz

JCS chair, Sept 5, 2013