

## **Report of the Section on Carbon and Climate**

The Section on Carbon and Climate (S-CC) virtual (online) annual meeting was held from 17:00-20:00 on October 6, 2025 (US/Canada Pacific time). Tsuneo Ono acted as meeting chair. Eleven members were present, representing the US, Canada, Japan, Korea, and China (*Endnote 1*). Masahiko Fujii and Lawrence Patrick Bernaldo also attended the meeting for the presentation of a new working group regarding Ocean Acidification. The meeting agenda was reviewed and adopted (**Agenda Item 1**; *Endnote 2*).

### **Review on S-CC activities in 2025 (Agenda Item 2)**

Tsuneo Ono reviewed the following three items as this group's major activities after the S-CC 2024 business meeting:

- \*1] Science session in PICES 2024 annual meeting (Ocean acidification and deoxygenation in ocean margin ecosystems: Causes and consequences for ecosystems and fisheries)
  - \*2] Creation of the lists of existing mCDR projects and existing international protocols/manuals for mCDR among PICES countries, as the pre-survey of PICES 2025 mCDR workshop
  - \*3] Assistance for the planning of new working group on ocean acidification.
- Activities 2 and 3 were discussed in Agenda Items 3 and 5, respectively, in the business meeting.

### **Preceding discussion for mCDR WS in PICES 2025 (Agenda Item 3)**

Ono presented a current list of existing mCDR projects and existing international protocols/manuals for mCDR among PICES countries that was created by S-CC members as the pre-survey of PICES 2025 mCDR workshop. Twenty-two mCDR projects from the US, Canada, China, and Japan were listed by this date, but it was suspected that many more projects are missing from the list. The members agreed to continue surveying the overlooked mCDR projects among the PICES countries and to continue updating the list until the mCDR workshop.

The S-CC members had gathered information for four protocols for coastal blue carbon technologies and two protocols for ocean alkalinity enhancement technologies. The question immediately arose whether these protocols are consistent with each other. It was noted that most of these protocols are led by the US and European countries,

raising a question about regional protocols/manuals in Asian countries. These questions will be addressed in the upcoming mCDR workshop.

#### **Reports from collaborating organizations and agencies (Agenda Item 4)**

Shin'ichiro Nakaoka announced the publication of SOCAT 2025 in June. This version includes 41 million pCO<sub>2</sub> data from 1957 to 2024 with the precision of <5 μatm, and 8.2 million CO<sub>2</sub> sensor data (mainly membrane-based sensors) with the precision of 5-10 μatm. The decline in the reporting of annual CO<sub>2</sub> reported after the late 2010s has continued, especially in North Pacific where almost no observation has been made in the area north of 45° N in recent years. This brings potential risks of increased uncertainty in estimation of global air-sea CO<sub>2</sub> flux. Wiley Evans commented that the situation is same in Canadian coast, but the situation might change in next year because a new ship-of-opportunity vessel is in service. Wiley also mentioned that the number of pCO<sub>2</sub> measurements in US/Canada coast may increase when we take mooring data into account. Yuichiro Takeshita wondered about the possibility of inclusion of Argo pCO<sub>2</sub> data in the SOCAT database.

Tsuneo Ono reported on current progress of ISO TC8/WG15, the group working on the creation of standards for several technologies regarding negative ocean carbon emission (in other words, mCDR). Ono was involved in the advisory committee for this ISO WG in Japan and is acting as a liaison between PICES and this WG. The working group recently submitted the Draft International Standard (DIS) of the first chapter that functions as the "introduction and outline" of the whole standard draft series. Although this chapter does not include specific regulations for any individual mCDR technology, Ono requested that S-CC members contact the WG members of this WG in for each country to have input into the DIS.

#### **Discussion on new PICES WG proposal for ocean acidification (Agenda Item 5)**

Masahiko Fujii explained his proposal for the new PICES WG, "Comprehensive understanding of ocean acidification in the North Pacific." Kitack Lee is one of four co-chairs of this new working group and will act as a liaison between S-CC and the working group. The main objective of this working group is to make basin-scale synthesis of ocean acidification data in PICES region. Specifically, this WG will make intensive efforts to support excavation and circulation OA monitoring data in Asian countries, with strong collaboration with GOA-ON. These efforts align with several S-CC ToR.

Several questions and comments were discussed regarding implementation plans for the new WG. Jim Christian suggested that the WG should collaborate with additional supporters such as JODC and OCADS, as PICES itself has no database system. He also pointed out that this WG should present a clear set of "final products" to enhance their persuasiveness. The functional difference between this WG and S-CC was also questioned and discussed. The members agreed that, although S-CC is working on coordinating international research studies (S-CC ToR 1) for the wide range of ocean biogeochemical studies including ocean acidification, and sometimes carry out basin-scale synthesis of biogeochemical data (S-CC ToR 6), we do not interpret the "synthesized dataset" by ourselves. This is not included in the current ToR of S-CC. The new OA working group aims to make scientific interpretations of their data set, as well as evaluating its effects on the North Pacific ecosystem. This will differentiate the WG from S-CC and the group will become a complementary partner. Based on these discussions, the members agreed to recommend the approval of this new OA working group to POC and BIO. Fujii will revise his WS proposal based on the comments and discussions made in this meeting.

#### **Discussion for 2025-2026 section business plans (Agenda Item 6)**

Future plans of S-CC's activities after 2025 PICES meeting were discussed. Tsuneo Ono suggested that he will make a brief report of the 2025 mCDR WS with the complete list of mCDR projects and protocols in PICES countries in the 2025-2026 period. There is concern that we might need more discussion time to obtain full understandings and to reconcile members' opinions/awareness against current situations in mCDR communities in addition to this year's workshop. The members, therefore, agreed to discuss a proposal for additional mCDR WS at PICES-2026 after the current year's mCDR WS.

S-CC had held science sessions for OA and ocean deoxygenation issues every two years, and continuation of this session series at PICES-2026 was also discussed. Yuichiro Takeshita proposed a session for OA and OAE (i.e., knowledge for OAE learned from OA studies) and the members agreed to make a session proposal by the deadline (November 24).

***S-CC Endnote 1***

**S-CC participation list**

Members

Yuichiro Takeshita (USA)  
James Christian (Canada)  
Wiley Evans (Canada)  
Xianghui Guo (China)  
Masao Ishii (Japan)  
Shin'ichiro Nakaoka (Japan)  
Tsuneo Ono (Japan)  
Toru Suzuki (Japan)  
Masahide Wakita (Japan)  
Geun-Ha Park (Korea)  
Jeong Hee Shim (Korea)

Observers

Masahiko Fujii (new OA WG)  
Lawrence Patrick Bernaldo (new OA WG)

***S-CC Endnote 2***

**S-CC meeting agenda**

Meeting Agenda (17:00 – 2000 Oct.6 in US/Canada Pacific time, held virtually)

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|---------------|---|
| 17:00 - 17:10 | Opening (Ono)<br>Review and adopt agenda  |
| 17:10 - 17:30 | review on S-CC activities in 2025 (Ono)   |
| 17:30 - 17:50 | preceding discussion for mCDR WS in PICES 2025 (Ono)  |
| 17:50 - 18:30 | Information exchange<br>*SOCAT (Nakaoka)<br>*ISO TC8/WG15 on negative carbon emission (Ono)   |
| 18:30 - 19:00 | Discussion on new PICES WG proposal for ocean acidification<br>(Masahiko Fujii)   |
| 19:00 - 20:00 | Discussion for 2025-2026 section business plans<br>*follow-up for 2025 mCDR WS<br>*support for new OA WG<br>*sessions/workshops in PICES 2026 |
| 20:00         | Adjourn   |