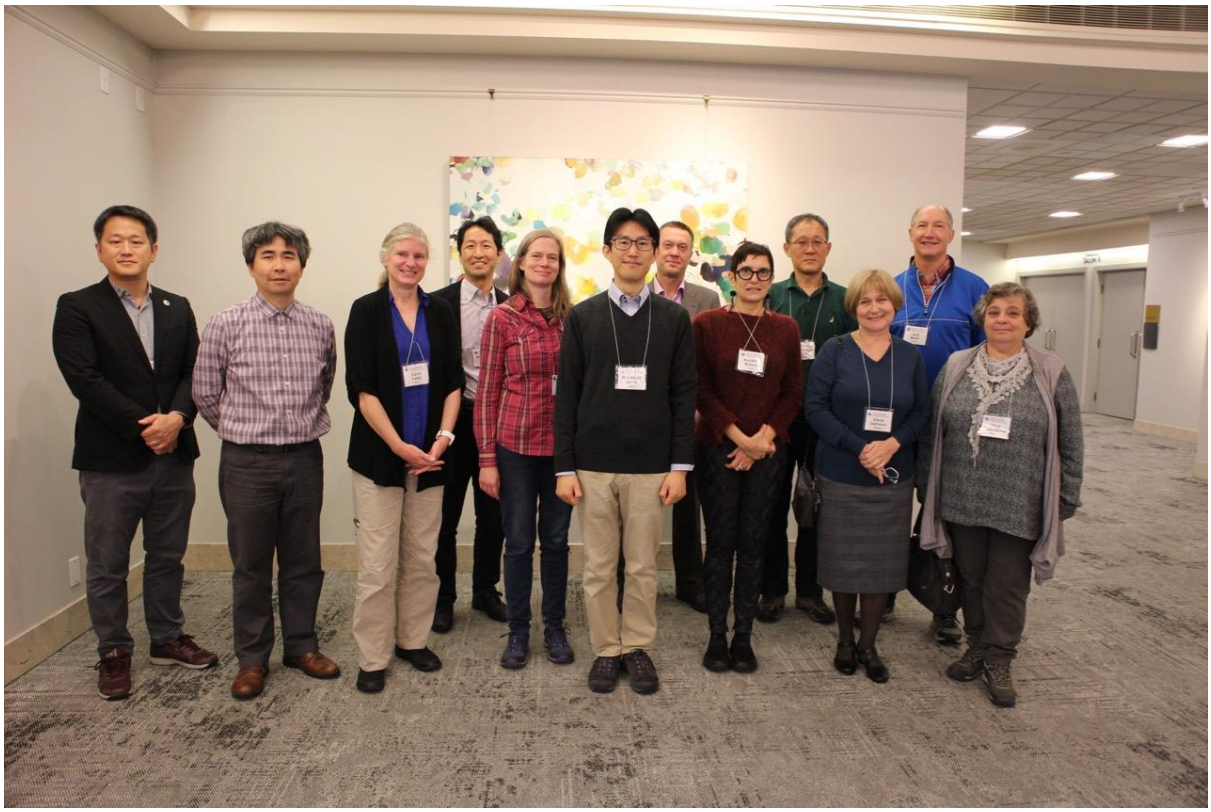
# Report of Working Group 38
# on *Mesoscale and Submesoscale Processes*

The third business meeting of the Working Group on *Mesoscale and Submesoscale Processes* (WG 38) was held in Victoria, Canada, from 9:00 to 12:30 on October 19, 2019 during PICES-2020. Ten WG members and two observers participated in this ½-day meeting, (***WG 38 Endnote 1***). The meeting was co-chaired by Dr. Annalisa Bracco (USA) and Dr. Hiromichi Ueno (Japan). This report summarizes discussions at the meeting over some of the Agenda Items (***WG 38 Endnote 2***). An informal meeting was also held during lunch time on October 23, 2019 and seven WG members and one observer participated.



Participants of the third business meeting of WG 38 at PICES-2019, Victoria Canada. Left to right: Daisuke Hasegawa, Sung Yong Kim, Carol Ladd, Yoshikazu Sasai, Tetjana Ross, Hiromichi Ueno, Andrey Andreev, Annalisa Bracco, Young-Gyu Park, Elena I. Ustinova, Jack A. Barth, Olga O. Trusenkova.

## AGENDA ITEM 2
**Progress report of review paper on mesoscale eddies in the North Pacific**

Progress on sections/subsections of review paper on mesoscale processes and their impact in the North Pacific was reported (***WG 38 Endnote 2***).

## AGENDA ITEM 3
**Discussion: Review paper on mesoscale eddies in the North Pacific**

The following details about the review paper were discussed.

Title:
The title was changed to “Review: Oceanic Mesoscale processes and their impact in the North Pacific”.

Order of coauthors:
The order was decided as H. Ueno, A. Bracco and A to Z.

Submissions:
WG 38 will submit the review paper to *Progress in Oceanography* by around January 2020.

Regional divisions:
North Pacific was re-divided into 4 regions:
Region 1: California Current System (previous Region 4)
Region 2: Northeastern North Pacific and the Bering Sea (previous Region 3)
Region 3: Western boundary of the North Pacific and marginal seas (previous Regions 1 and 2)
Region 4: Open North Pacific (previous Regions 5 and 6)

Format of Subsections 3.1–3.4
WG members agreed that:
A similarly formatted map with current name etc. should be prepared for each subsection.
A table summarizing eddy characteristics should be added to each subsection.

AGENDA ITEM 4
**Discussion: Road map for final report**

WG members agreed that the final WG report would be prepared soon after the review paper was accepted by *Progress in Oceanography*. The tentative contents are as follows:

Executive Summary
1. Introduction
2. General characteristics of mesoscale eddies in the North Pacific and their impact on chlorophyll-a distribution
3. Regional summaries
4. Synthesis: similarities and differences across the North Pacific
5. Concluding Remarks
6. General suggestion on meso/submeso for the next step

Appendix 1 WG 38 Terms of Reference
Appendix 2 WG 38 Membership
Appendix 3 WG 38 Annual Reports and Topic Session/ Workshop Summaries

AGENDA ITEM 5
**Other business**

The WG submitted a 1-day Topic Session proposal for PICES-2020 entitled “*Upper ocean energetics from mesoscale, submesoscale to small-scale turbulence in the North Pacific*” (***WG 38 Endnote 3***).

***WG 38 Endnote 1***

**WG 38 participation list**

Members

Annalisa Bracco (USA, Co-Chair)
Hiromichi Ueno (Japan, Co-Chair)
Daisuke Hasegawa (Japan)
Sung Yong Kim (Korea)
Carol Ladd (USA)
Young-Gyu Park (Korea)
Tetjana Ross (Canada)
Yoshikazu Sasai (Japan)
Olga O. Trusenkova (Russia)
Elena I. Ustinova (Russia)

Members unable to attend

China: Xiaopei Lin, Bin Xiao, Dongfeng Xu, Yisen Zhong
Japan: Sachihiko Itoh
Russia: Maxim V. Budyansky, Sergey Prants
USA: Irina Rypina

Observers

Andrey Andreev (Russia)
Jack A. Barth (USA)

***WG 38 Endnote 2***

**WG 38 meeting agenda**

1. Welcome and Introduction. Goals of the day (Annalisa Bracco & Hiromichi Ueno)
2. Progress report of review paper on mesoscale eddies in the North Pacific
   Abstract: H. Ueno
   Section 1 (Introduction): H. Ueno
   Section 2 (General characteristics of mesoscale eddies in the North Pacific and their impact on chlorophyll-*a* distribution): H. Ueno
   Section 3 (Regional summaries)
      Subsection 3.1: Y. Sasai
      Subsection 3.2: D. Hasegawa
      Subsection 3.3: H. Ueno
      Subsection 3.4: A. Bracco
      Subsection 3.5: Y.-G. Park
      Subsection 3.6: T. Ross
   Section 4 (Similarities and differences across the North Pacific): A. Bracco
   Section 5 (Concluding remarks): H. Ueno
3. Discussion: Review paper on mesoscale eddies in the North Pacific
4. Discussion: Road map for final report

***WG 38 Endnote 3***

**Proposal for a Topic Session on**
**"*Upper ocean energetics from mesoscale, submesoscale to small-scale turbulence in the North Pacific*"**
**at PICES-2020**

Convenors: Yisen Zhong (China), Bo Qiu, (U.S.A.), Sung Yong Kim (Korea), Yusuke Uchiyama (Japan)

Duration: 1 day

The ocean circulation is characterized by turbulence on a wide range of scales from a few centimeters to thousand kilometers. The energy balance is achieved by transferring energy from planetary-scale forcing to microscale dissipation. One of the major efforts that have been made during the recent decades is to understand how the energy is transferred from mesoscale, submesoscale to small-scale turbulence. In particular, a full spectrum of oceanic submesoscale works bridge the gap between mesoscale and small-scale by discovering forward energy cascade at this range. The submesoscale dynamics are most active in the upper ocean. They are spawn in the mesoscale eddies generated by large-scale flow instability, or near the ocean front including plume front in the coastal water. The predictability and sensitivity of the numerical forecast models that include such processes is still unclear. This session invites all studies from mesoscale, submesoscale to small-scale (including surface/internal waves, boundary layer processes, *etc*.) that contribute to the understanding of energy cascade in the PICES region as well as their applications in the ocean prediction system. We also welcome research about the impact of those processes on the transport of heat, carbon or other biologically or climatically important tracers in the upper ocean.