Report for:

Date: Wen. 14 May (UTC+8) 10:30-16:10 2nd floor Multi Function Room 4

Session 13: The uncertainty of coastal ecosystem shift to nutrient/pollutant under climate change

Convenor: Bochao Xu and Masahiko Fujii

Rapporteur: Shibin Zhao

Number of participants: ~30 people

1. Major highlights from each presentation

Morning subsection:

Oral Presenter by Masahiko Fujii – Biogeochemical modeling to investigate the impacts of ocean acidification and hypoxia in Tokyo Bay, Japan

Highlight: Ocean acidification in surface and bottom layers and hypoxia in bottom layer have serious impacts on marine organisms by 2100 as anthropogenic CO2 is significantly reduced.

Oral Presenter by Bochao Xu - Submarine groundwater discharge is an important pathway for nutrient entering the China's coastal seas

Highlight: Total SGD to China's coastal seas accounted for 19–54% of nutrient inputs, exceeding inputs from atmospheric deposition and rivers.

Oral Presenter by Dong Xu - Nutrient limitation intensifies negative effects of ocean acidification on silica production of the globally important diatoms

Highlight: Ocean nutrient concentration (N, P, Si) and pH are key environmental driver for the spatial and temporal variation of BSi either in aquaculture system, or coastal ecosystem, or global ocean. Nutrient limitation further intensifies the negative effect of ocean acidification on BSi production. Global models suggest that the BSi production will decrease by 11%~57% by 2100 under the SSp2-4.5 climate scenario.

Oral Presenter by Shibin Zhao - Radioisotopes reveal submarine groundwater discharge as an overlooked nutrient source in coastal seas

Highlight: Radioisotopes such as radon and radium can be easily used to evaluate submarine groundwater discharge (SGD) fluxes in coastal settings. SGD as a significant vector for nutrient inputs into coastal seas however usually was overlooked.

Oral Presenter by Zeng Zhou – From single to multiple processes, from qualitative to quantitative, develop more and better natural balance solution

Highlight: A comprehensive implementation of more ecological protection measures is expected to enhance the resilience and self-recovery capacity of coastal zones in the near future.

Oral Presenter by Joshua Militar Regalado (Online)– Challenges and opportunities in the management of coral reefs miagao, llloilo, Philippines

Highlight: Regular monitoring of MPA effectiveness. MPA effective should be examined regularly.

Oral Presenter by A'an Johan Wahyudi – Introducing Indonesia Marine Biogeochemistry Forum (lMBF): Mainstreaming marine biogeochemistry research and synergizing lMBeR's global objectives

lMBF take a role in advancing marine biogeochemistry in Indonesia. Bridging science, policy, and capacity-building. Next Steps: Expanding lMBF's network and collaborations and encouraging participation in lMBF and lMBeR activities.

Oral Presenter 4 by Yujue Wang – Coastal eutrophication in China: trend, sources, and ecological effects

Highlight: Nutrient loading from terrestrial including river, mariculture, sewage discharge, atmospheric deposition and etc. as dominant nutrient sources matched the coastal eutrophication processes in China coasts.

Oral Presenter 5 by Beatriz Dias (Online) – Through long-lasting and pulse disturbances: How Prince Willam Sound, Alaska, ecosystem functionality behaved throughout three decades

Highlight: Production losses from the oil spill (long-lasting impacts) and marine heatwaves (pulse impacts).

Speed talks: 1 (Mark June S. Consigna)

Highlight: Microplastics could be accumulated in shallow hydrothermal vents ecosystem, for example hydrothermal vent crab Xenograpsus testudinatus.

Speed talks: 2 (Song Ge) -Not shown

Speed talks: 3 (Shengnan Zhang) -Not shown

Speed talks: 4 (Mohammed Ali Humran)

Highlight:

Speed talks: 5 (Zain UI Afifeen Muhammd) – Hourly-resolved marine viral replication in the subtropical Daya bay, northern South China Sea

Highlight: Viral community structure shows significant diel variations.

Speed talks: 6 (Yunying Duan) – Centurial shift of diatom fossils and biogenic silicate effect in northern Yellow Sea

Highlight: shift of diatom could efficiently influence Dsi and carbon burial in the ocean.

Speed talks: 7 (Aicha Berrada) -not shown

Speed talks: 8 (Anxo Paz -online) -not shown

Speed talks: 9 (Alda Sartimbul -online) -not shown

Speed talks: 10 (Marta Coll -online) -not shown

Speed talks: 11 (Juan Jose Ortiz Garcia -online)

Highlight: Covers multiple regional seas to reveal how different warming rates affect species within shared populations, offering key insights into ecosystem resilience.

Speed talks: 12 (Elena Lloret-Llret -online)

Highlight: Spatial variability within the basin is not uniform, with overall changes occurring faster in the western area compared to the eastern side.

Speed talks: 13 (Olayinka Thompson Alasoadura -online) -not shown

2. One paragraph of session summary

The exchange process and flux at the benthic boundary are of great significance to the material balance and health of marine ecosystems, which have been overlooked. This is evidenced or suggested by many presenters, such as 1) Submarine groundwater discharge (SGD) introduces nutrient exceeds that of rivers in more than 60% of the coastal regions. 2) It simulates the spatiotemporal variation patterns of hypoxia and acidification through models, but the deviation is relatively large in summer. 3) Nutrient control is kind of effective, for instance, the nutrient levels in the Bohai Sea have decreased, which is consistent with the phenomenon of reduced occurrence of red tides. However, the phosphate level has risen significantly in the past two years, but the reason is unclear. 4) Human activities may lead to alterations in the process and extent of land-sea interaction in the coastal zone. After restoration, biodiversity has improved significantly, which has a potential impact on marine biogeochemical processes.

Overall, the monitoring of the benthic boundary interface should be strengthened in the future. Specifically, it might be necessary to put SGD into considerations.

3. Suggestions for IMBeR 3.0 from this session (one or two bullet points):

✓ Submarine groundwater discharge (SGD) as an important nutrient pathway should be given more attention.