Responses from Japanese BioGEOSCAPES representatives

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1) The preliminary BioGeoSCAPES Mission Statement is “To improve our understanding of the functioning and regulation of ocean metabolism and its interaction with nutrient cycling within the context of a hierarchical seascape perspective”. How can this be improved? Modified?

It appears that "within the context of a hierarchical seascape perspective" is wordy and somewhat vague. Additionally, for Japanese scientists, "elemental cycling" would be more suitable than “nutrient cycling” because we consider the adverse effects of elements (e.g., mercury) on metabolism as well. We, therefore, propose the revised statement for the BioGeoSCAPES Mission as follows:

To advance our understanding of the functioning and regulation of ocean metabolism and elemental cycling on a changing planet.

2) How would YOUR NATION best contribute to BioGeoSCAPES efforts – e.g. fieldwork, laboratory work, modelling, intercalibration efforts, project coordination, data management, bioinformatics?

Amid the COVID-19 pandemic, it would be hard for Japanese scientists to conduct international collaboration practically except for what we can do online. After the pandemic, we would like to mainly contribute to fieldwork activities, especially in the western North Pacific and its adjacent waters (see our responses to Q3 below), which have little been explored in terms of the BioGeoSCAPES Mission mentioned above.

3) What science questions are most important to scientists in YOUR NATION within the broad scope of BioGeoSCAPES on a 10-year timeframe?

Many Japanese scientists try to unravel the functioning and regulation of metabolism in the western North Pacific and its marginal seas, including the Sea of Okhotsk, the Bering Sea, and the East China Sea, using the latest metabarcoding and meta-omics approaches with the state-of-the-art analyses of elements and their isotopes in seawater. The study areas possess unique biogeographical features. For example, intensive spring diatom bloom occurs in the western subarctic Pacific every year, leading to the highest seasonal biological drawdown of CO_2 in surface waters (Takahashi et al., 2002) and the most significant fishery production (FAO, 2020) among the world's oceans. Additionally, biodiversity in the western Pacific is also the highest – primarily coastal taxa from zooplankton to fish in the western Pacific had peaks of diversity and showed clear latitudinal gradients along the coasts of continents (Tittensor et al., 2010). We consider that BioGeoSCAPES would be an excellent platform for characterizing these study areas among the world’s oceans.

FAO (2020) The State of World Fisheries and Aquaculture. https://www.fao.org/3/ca9229en/ca9229en.pdf

Takahashi et al. (2002) Global sea–air CO_2 flux based on climatological surface ocean pCO_2, and seasonal biological and temperature effects. Deep-Sea Res. II., 49, 1601–1602. https://doi.org/10.1016/S0967-0645(02)00003-6

Tittensor et al. (2010) Global patterns and predictors of marine biodiversity across taxa. Nature, 466, 1098–1101. https://www.nature.com/articles/nature09329

4) Are there impediments that the International program could seek to mitigate via training or collaboration?

Japanese scientists should establish the protocols for the sampling and analyses of DNA, RNA, proteins, and metabolites and their data processing (bioinformatics) with those from other countries under the BioGeoSCAPES framework. Additionally, inter-calibration exercises and analyses among nations must be needed for quality assurance (QA) and control (QC).