

Report for the year 2018 and future activities

SOLAS 'Korea'

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PART 1 - Activities from January 2018 to Jan/Feb 2019

1. Scientific highlight

The Ocean Research Stations in the Yellow Sea and East China Sea:

Two research platforms have been additionally built in the Yellow Sea since the first platform (the Ieodo Ocean Research Station) was built in 2003 on the submerged Ieodo Rock in the East China Sea. All three research platforms were designed to detect various environmental parameters over the long term including ocean pH, sea level rise, and ocean



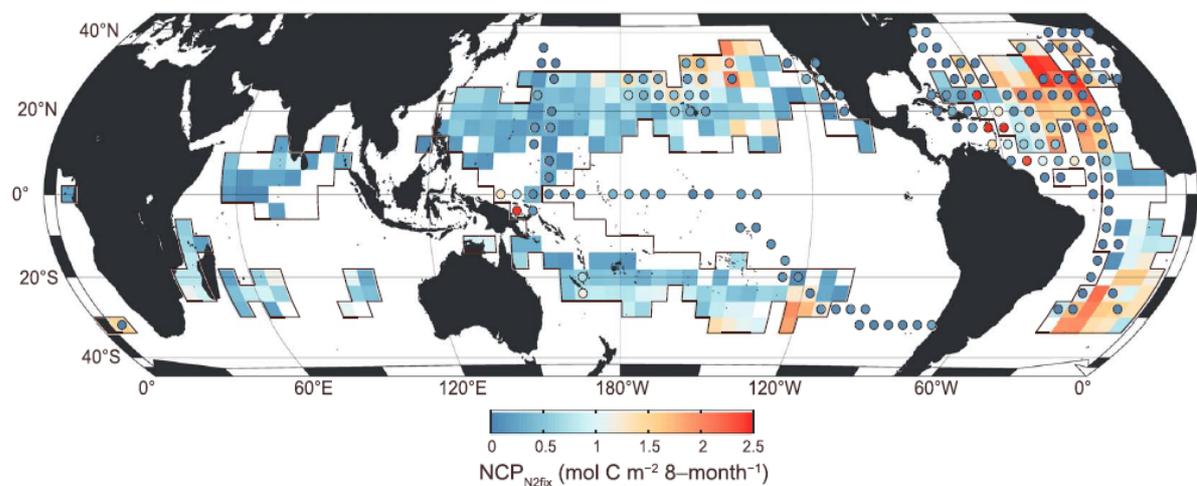
temperature. Moreover, the research conducted on the platforms has expanded to include studies of air-sea interactions related to variables such as heat, and anthropogenic gases. Most notably, in the parts of the Yellow and East China seas surrounding these research platforms, the levels of nitrogen from anthropogenic sources have increased acutely

due to the rapid growth of population and industrial activity in northeast Asian countries. These unparalleled perturbations in northeast Asia have markedly increased reactive nitrogen fluxes into the Yellow and East China seas, via atmospheric transport and deposition and riverine flux. The increasing addition of reactive nitrogen to these seas is expected to lead to significant changes in the upper ocean nitrogen and carbon cycles and in phytoplankton biomass. Therefore, all three stations will serve as the research platforms for investigating how anthropogenic input of nitrogen changes the ocean nitrogen and carbon cycles. The three research platforms are open to international collaborations and are jointly maintained by Korea Hydrographic and Oceanography Agency and the Korea Institute of Ocean Science and Technology.

2. Activities/main accomplishments in 2018 (projects, field campaigns, events, model and data intercomparisons, capacity building, international collaborations, contributions to int. assessments such as IPCC, interactions with policy makers or socio-economics circles, social sciences, and media).

Global net community production in ocean gyres (international collaboration):

An international team comprised of researchers from Korea (Young-Ho Ko and Kitack Lee, Pohang University of Science and Technology; Sung-Ho Kang, Korea Polar Research Institute; and Eunil Lee, Korea Hydrographic and Oceanographic Agency) and the USA (Taro Takahashi, Columbia University; and David Karl, University of Hawaii) assessed net community production across the vast, nitrate-depleted ocean gyres. This international research used large data sets of seawater pCO₂ comprising approximately 6.5 million data; this enabled accurate resolution of the seasonal evolution of pCO₂ in the oligotrophic gyres. In particular, the combination of this data set with a surface alkalinity data set and the established thermodynamic model for the seawater carbonate system should enable the seasonal evolution of dissolved inorganic carbon in the ocean gyres to be accurately resolved. The analysis was based on summing the seasonal reduction in the concentration of dissolved inorganic carbon in the surface mixed layer, corrected for changes associated with various factors (salinity variation, net air-sea CO₂ flux, horizontal C advection, non-Redfield diffusive C and N fluxes and anthropogenic nitrogen deposition). Their analysis yielded a value of 0.6 ± 0.2 Pg of C, which occurred during the warming period in the nitrate-depleted ocean. This value is consistent with the previously reported global N₂ fixation rates and suggests that N₂ fixation by microorganisms is a major driver for this NCP



3. Top 5 publications in 2018 (only PUBLISHED articles) and if any, weblinks to models, datasets, products, etc.

Nam, S., Kim, D.-j., Lee, S.-W., Kim, B. G., Kang, K.-m., & Cho, Y.-K. (2018). Nonlinear internal wave spirals in the northern East China Sea. *Scientific Reports*, 8(1), 3473. doi:10.1038/s41598-018-21461-3

Kim, D., Jeong, J.-H., Kim, T.-W., Noh, J. H., Kim, H. J., Choi, D. H., Kim, E., Jeon, D. (2017). The reduction in the biomass of cyanobacterial N₂ fixer and the biological pump in the Northwestern Pacific Ocean. *Scientific Reports*, 7, 41810. doi:10.1038/srep41810

Ko, Y. H., Lee, K., Takahashi, T., Karl, D. M., Kang, S.-H., & Lee, E. (2018). Carbon-Based Estimate of Nitrogen Fixation-Derived Net Community Production in N-Depleted Ocean Gyres. *Global Biogeochemical Cycles*, 32(8), 1241-1252. doi:10.1029/2017GB005634

Kwon, H. K., Kim, G., Hwang, J., Lim, W. A., Park, J. W., & Kim, T.-H. (2018). Significant and conservative long-range transport of dissolved organic nutrients in the Changjiang diluted water. *Scientific Reports*, 8, 12768. doi:10.1038/s41598-018-31105-1

4. Did you engage any stakeholders/societal partners/external research users in order to co-produce knowledge in 2017? If yes, who? How did you engage?

PART 2 - Planned activities for 2018/2019 and 2020
1. Planned major field studies and collaborative laboratory and modelling studies, national and international (incl. all information possible, dates, locations, teams, work, etc.). Study on atmospheric DMS dynamics in Iceland:
2. Events like conferences, workshops, meetings, schools, capacity building etc. (incl. all information possible).
3. Funded national and international projects / activities underway.
4. Plans / ideas for future projects, programmes, proposals national or international etc. (please indicate the funding agencies and potential submission dates).
5. Engagements with other international projects, organisations, programmes etc.

Comments

