NERC Changing Arctic Ocean: Implications for marine biology and biogeochemistry

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The Arctic is responding in unknown ways to profound changes in the physical environment as well as to multiple natural and anthropogenic events that place stress on Arctic ecosystems. The scale of the challenges facing the Arctic is immense and is further compounded by the rapid rate of change.

To address the uncertainties generated by climate change in the Arctic Ocean, NERC has invested £16 million in the research programme ***"Changing Arctic Ocean: Implications for marine biology and biogeochemistry."*** The over-arching goal of this 5-year (2017-2022) flagship programme is to understand how change in the physical environment (ice and ocean) affects the large-scale ecosystem structure and biogeochemical functioning of the Arctic Ocean. The science outputs will address the potential major impacts and refine projections of change for future ecosystem services.

At the core of the programme are four large, NERC-funded projects that started in February 2017. A further 12 projects joined the programme in July 2018, co-funded by NERC and the German Federal Ministry of Education and Research. This co-funding of research projects by the UK and Germany represents a first, and brings with it benefits for the programme's international collaboration, access to large-scale research infrastructure, and advantages of shared scientific expertise. The programme has more than 200 scientists, from 32 UK and German research institutions, working with Arctic teams in 15 other countries to meet the programme's objectives.

The focus of the 16 projects spans many of the effects of warming on the Arctic Ocean's ecosystem, driven principally by the cascade of impacts from the retreat and thinning of sea ice: e.g. release of chemical pollutants and plastics from melting sea ice; exposure of the ocean's surface to the atmosphere and the release of climate-sensitive gases; alteration of the balance of nutrient concentrations due to ocean circulation changes and the "Atlantification" of the Arctic Ocean; release of soil nutrients and toxins to the Arctic Ocean from permafrost thaw; the impact of surface ocean changes on the seafloor, including carbon sequestration.

With an extensive array and variety of approaches employed to monitor change in the Arctic, substantial datasets are being generated that cover physical, chemical and biological parameters of change in the Arctic Ocean. In this contribution, we summarise these as well as outlining the scope of the programme and the focus of the projects.