Proposal Outline

Topic	Tracking Essential Climate Variables in Marine Archives from Nordic Seas
Research Theme	Climate Change
Background and Rationale	Monitoring and expanding our knowledge of marine Essential Climate Variables (ECV) is a priority outlined in national strategies and policy documents (e.g. National Marine Research & Innovation Strategy 2017-2021, Innovation 2020, EPA Report 223, etc.) to obtain a "deeper understanding of atmospheric and oceanic systems, the relationships between them, and human impacts on them". One of the key challenges in climate change science is to assess the magnitude of future climate change. Uncertainties associated with predictions remain large due to the shortness of our observational records (at best 150 years) and the absence of high-impact climate events therein to serve as an analogue for future change. This is especially problematic when estimating Arctic climate change because the response in the Arctic is amplified relative to the global mean, making the Arctic the most sensitive and vulnerable environment with regards to global warming. The North Atlantic and Nordic Seas are also one of the most important regions throughout the global oceans for the uptake of atmospheric carbon dioxide (pCO2) having absorbed one fourth of the total fossil fuel emissions since preindustrial times. In the Nordic Seas, the uptake of CO2 is linked to the formation of cold North Atlantic Deepwater (NADW) and thereby the Atlantic Meridional Overturning Circulation. While it is evident that the removal of CO2 from the atmosphere is crucial when considering future climate change, it remains uncertain how (if) a warmer than present ocean will continue to moderate the effect of anthropogenic greenhouse gas emissions. This fundamental question remains to be answered especially since changing rates in CO2 absorptions are not considered in future climate change scenarios. Equally concerning is the potential of acidification and de-oxygenation of North Atlantic deep waters that may irreversibly damage vulnerable deep-sea habitats and their biodiversity.
Scope of Research (Scientific/ Technical Challenge)	This research will support global efforts to improve our understanding of ECVs in the Nordic Seas, which is a key region for the formation of North Atlantic Deepwater and the uptake of atmospheric carbon dioxide (pCO2). Whether or not the Nordic Seas will remain a carbon sink during rapidly warming climates is a fundamental question that remains to be answered. Equally concerning is the potential of acidification and de-oxygenation of North Atlantic Deep Waters that may irreversibly damage vulnerable deep-sea habitats and their biodiversity.

	This fellowship will define a more comprehensive description of biogeochemical processes in the Nordic Seas and will provide transformative insights into how ECVs are recorded in geologic archives to improve the "long-term monitoring, surveying and modelling to understand the processes and feedback mechanisms between the ocean and atmospheric systems" (JPI Oceans). The fellow would ideally have a primary degree in oceanography.
Expected Impact	The fellow will engage with European and international networks and initiatives relating to the Arctic, and explore opportunities for collaboration and securing further research funding under Horizon Europe. This fellowship will help to build national expertise in this research area. The fellow will produce policy briefs for stakeholders, and publish their research findings as widely as possible through peer-reviewed papers, conference presentations, articles, etc.
Specific Collaboration	The fellow will participate in national and international networks including the proposed Arctic network, supporting working groups linked to the Arctic Council. The fellow will provide policy briefs for relevant Government Departments including DAFM, DCCAE and DFAT.
Location of Fellow	Successful Applicant - Higher Education Institute or Public Research Body (Republic of Ireland)
Duration and Funding Available	3-5 years €100,000 per annum maximum (e.g. €400,000 for 4 years duration)
References	IPCC **(2018)** Summary for Policymakers from the IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp AMAP Assessment 2018: Arctic Ocean Acidification. Arctic Monitoring and Assessment Programme (AMAP), Tromsø, Norway. vi+187pp **(2018)**

	Skillful prediction of northern climate provided by the ocean Marius Årthun, Tor Eldevik, Ellen Viste, Helge Drange, Tore Furevik, Helen L. Johnson & Noel S. Keenlyside Nature Communications volume 8, Article number: 15875 **(2017)** Response of Arctic temperature to changes in emissions of short-lived climate forcers. M. Sand, M.; Berntsen, T.K.; von Salzen, K.; Flanner, M.G.; Langner, J. & Victor, J.D. Nature Climate Change volume 6, pages 286–289. **(2016)** Wave Climate in the Arctic 1992-2014 JE Stopa, F Ardhuin, F Girard-Ardhuin Cryosphere **(2016)** Influence of oceanic heat variability on sea ice anomalies in the Nordic Seas P. Schlichtholz Geophysical Research Letters Volume 38, Issue 5 **(2011)** Impact of atmosphere and sub-surface ocean data on decadal climate prediction N. J. Dunstone, D. M. Smith Geophysical Research Letters Volume 37, Issue 2 **(2010**)