Abstract for the general public

Earth's climate has fluctuated considerably over its 4.5 billion year history. Some of these climate shifts, recorded in the geological and sedimentary record, have been dramatic and abrupt, resulting in large-scale events such as ocean acidification, sea-level rise and fall, and mass extinctions. The most notable characteristics of the last 2.6 million years of Earth's history are the ice ages, climate shifting from colder ("glacial") to warmer ("interglacial") conditions, with massive ice sheets occupying land in both hemispheres and extending to the ocean during glacials.

The signature of such episodes and its associated environmental changes (such as sea-level fluctuations), and the transitions from ice-covered to ice-free conditions are registered in a wide variety of climate archives, including the seabed and its underlying sediments. The proposed project 'CHARME' seeks to document the physical, biological, and chemical signature of present day glacial retreat recorded and preserved in the seabed. Although the influence of ice sheets on the ocean in the geological past has been studied widely, few studies exist to provide a real-time perspective and "check" on interpretations of ancient sediment records. Such oversight is largely due to the lack of available modern environments suitable for such studies; the proposed work in Antarctica thus represents an unprecedented and unique scientific opportunity. This project will significantly advance our understanding of the effect of retreating ice sheets on ecosystems, revealing their signature in the geological record, and the potential of using specific organism groups to indicate such environmental shifts. Furthermore, the project will also reveal how new, deglaciated territory is colonised by a succession of organisms. Results generated in CHARME will serve as an exceptional blueprint for the interpretation of deglacial to ice-free sediment records of past environments both in polar regions and in temperate areas previously occupied by ice sheets. In this way, this study of present environments will serve as a key to understand the past, to better (and correctly) interpret past glacial dynamics and ice sheet behaviour. In turn, this information will be utilized for the modelling of future ice behaviour and its effect on ecosystem composition and dynamics. The latter aspect of this project is especially timely given the abrupt, greenhouse gas driven climate warming seen since AD 1850 caused by human activity.