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Exploring links between geodynamics and climate change

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Combating global climate change remains one of the greatest challenges facing humanity in the coming decades. Whilst oceanographers, ice sheet dynamicists, and atmospheric modellers all have an obvious role to play in leading efforts to tackle this problem, there remain many aspects that require careful consideration and cross-disciplinary interaction in other areas of the geosciences. In this talk, I will use selected examples to illustrate important links between geodynamics and climate change, including improving our understanding of its potential impacts and mitigation. The first concerns the role of mantle convection in influencing palaeo sea-level records and ice sheet dynamics. For example, Pliocene interglacial periods are commonly invoked as potential climatic analogues for the near-future conditions expected in our warming world, but there is considerable uncertainty over the extent to which important sea-level indicator sites have been perturbed, post-deposition, by convection-induced dynamic topography. The second link involves the growing shortage of metals that are key to the manufacture of technologies for low-carbon energy generation and storage. Tackling this shortfall requires an improvement in our ability to locate new, high-grade metal deposits, particularly those buried beneath shallow sedimentary cover. Novel geodynamical insights into the geological processes responsible for ore genesis will form a core component of narrowing the exploration search-space, and we have recently demonstrated this approach for sediment-hosted metal deposits. Through these case studies, I will show that it is primarily through developing an environment of cross-disciplinary discussion and financial support that our community is most likely to progress in understanding the potential impacts of climate change and how we may mitigate against them. Although one of the least well-studied components, the solid Earth is increasingly being recognised as a critical part of the climate system. Researchers working in topics as diverse as rock mechanics, seismology, convection modelling, and geochemistry all have a crucial role to play.