

Uncertainties in projecting climate-change impacts in marine ecosystems - DTU Orbit (08/11/2017)

Uncertainties in projecting climate-change impacts in marine ecosystems

Projections of the impacts of climate change on marine ecosystems are a key prerequisite for the planning of adaptation strategies, yet they are inevitably associated with uncertainty. Identifying, quantifying, and communicating this uncertainty is key to both evaluating the risk associated with a projection and building confidence in its robustness. We review how uncertainties in such projections are handled in marine science. We employ an approach developed in climate modelling by breaking uncertainty down into (i) structural (model) uncertainty, (ii) initialization and internal variability uncertainty, (iii) parametric uncertainty, and (iv) scenario uncertainty. For each uncertainty type, we then examine the current state-of-the-art in assessing and quantifying its relative importance. We consider whether the marine scientific community has addressed these types of uncertainty sufficiently and highlight the opportunities and challenges associated with doing a better job. We find that even within a relatively small field such as marine science, there are substantial differences between subdisciplines in the degree of attention given to each type of uncertainty. We find that initialization uncertainty is rarely treated explicitly and reducing this type of uncertainty may deliver gains on the seasonal-to-decadal time-scale. We conclude that all parts of marine science could benefit from a greater exchange of ideas, particularly concerning such a universal problem such as the treatment of uncertainty. Finally, marine science should strive to reach the point where scenario uncertainty is the dominant uncertainty in our projections

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