Pattern scaled climate change scenarios: are these useful for adaptation?

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I. Introduction:

Pattern scaling methods are commonly used to generate scenarios of climate change for the quantification of its potential impacts on different subsystems. While generic limitations of the pattern scaling approach are well documented [1], the implications these hold for adaptation decision making are not always made clear. The goal of this work is to discuss the errors that are expected a priori and the extent to which pattern scaling is a reliable tool for the quantification of the likely impacts of climate change.

II. Pattern scaling

Pattern scaling is used to generate climate change scenarios under changes in anthropogenic forcings that have not been simulated by full GCMs, but can be simulated quickly and cheaply by simpler energy balance climate models. It assumes that the anthropogenic climate change signal at any region and/or time horizon $T^*(x,y,t)$, is linearly related with the change in global mean temperature for the corresponding forcing scenario and period $T(t)$, and that the spatial pattern of change $P(x,y)$ remains constant at any time horizon or forcing scenario. That is:

(1)

$P(x,y)$ is obtained using a full GCM run under a particular forcing, as the pattern that minimizes the distance between the simulated change $T(x,y,t)$ and the pattern scaled change $T^*(x,y,t)$. Thus $P(x,y)$ is the pattern that he