

## ***Interactive comment on “Climate change as a driver of future human migration” by Min Chen and Ken Caldeira***

**Anonymous Referee #2**

Received and published: 20 May 2020

This manuscript examines aims at examining the effects of future climatic changes on people's incentives to migrate. Starting with econometric results based on historical (i.e., 1960-2005) climatic (temperature and precipitation), population density, and geographical data, the authors make projections of the climatic variables under the four Representative Concentration Pathways (RCPs) on future (i.e., 2006-2100) population density. They report that climate change may soon force hundreds of millions of people to migrate mostly from warm tropical and subtropical countries to cooler temperate countries (i.e., regions of the Northern Hemisphere). In addition, individual countries such as India, Nigeria, and Democratic Republic of Congo are predicted to have the greatest number of people with additional incentives to migrate, while China, Russia, and the USA are expected to exhibit greater attractiveness and hence become migra-

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tion destinations. The manuscript, without any doubt, studies an interesting and very important question in the academic and policy worlds. It also shows a methodological sophistication and rigor, but provides evidence in support of propositions, which are already known (see for example the IPCC 5th AR (2014) and the 1.50C Report (2018)). Unfortunately, I believe that this manuscript does not advance our understanding of the climate-migration relationship and as a result, it does not make any significant contribution to the relevant literature. Hence, I simply cannot recommend publication of this manuscript. There are three main reasons: 1. Although the article cites some literature on the relationship between climate change and migration (alas, a relatively old one that focuses only on a positive relationship), it does not really engage with this literature. As such, no attempt is made to explain what we know and what we don't know. This makes it impossible for the reader to see what new knowledge this paper is bringing to the table. As far as I can see, this paper does not really advance on the state of knowledge on climate change and migration. 2. The authors do acknowledge that migration is inherently multicausal, i.e., migration decisions depend on economic, social, demographic, political, and environmental/climatic factors. However, at the end they chose to examine the climate-migration nexus in a direct and consequently deterministic manner, and make big and bold claims, which have huge implications of how the social consequences of climate change could be dealt with, based on false and naive assumptions. It can still be possible to examine within this multi-causal context what the impact of the climate has been and to examine its influence – but to fully categorize it as something separate, and to base predictions, numbers and conclusions on that, is overly simplistic. A good start is to read the 2010 Foresight report on environmental change and human migration and resulting publications from Black et al (2011). For a good overview of the debate see Piguet (2013) and McLeman/Gemenne (2018). 3. The manuscript also disregards many years of similar research: for instance, Hsiang and Sobel (2016) show that tropical populations would have to travel distances greater than 1000 km over less than a century if global mean temperature rises by 2 °C over the same period (they also present a figure very similar to Figure 1 the authors present

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in the manuscript, albeit the authors use different RCPs). Similarly, a 2018 World Bank study predicts that climatic changes, in particular drought, may cause as many as 143 million people to be displaced within Latin America, Sub-Saharan Africa, and South Asia by 2050 (Kumari Rigaud et al. 2018). Hence, I can't see how this manuscript brings anything new to the table.

Black, Richard; W Neil Adger, Nigel W Arnell, Stefan Dercon, Andrew Geddes & David SG Thomas (2011) The effect of environmental change on human migration. *Global Environmental Change* 21: 3-11. Foresight Migration and Global Environmental Change. Final Project Report. London: The Government Office for Science, (2011). Available at: <http://www.bis.gov.uk/foresight/migration> Hsiang, S.M. and A.H. Sobel (2016) Potentially extreme population displacement and concentration in the Tropics under non-extreme warming. *Scientific Reports* 6: 25697. McLeman, Robert & François Gemenne (2018) Environmental migration research: Evolution and current state of the science. In Robert McLeman & François Gemenne (ed.) *Routledge Handbook of Environmental Displacement and Migration*. London: Routledge, 3-16. Piguet, Etienne (2013) From "primitive migration" to "climate refugees": The curious fate of the natural environment in migration studies. *Annals of the Association of American Geographers* 103(1): 148-162. Rigaud, Kanta Kumari; Alex de Sherbinin, Bryan Jones, Jonas Bergmann, Viviane Clement, Kayly Ober, Jacob Schewe, Susana Adamo, Brent McCusker, Silke Heuser & Amelia Midgley (2018) *Groundswell: Preparing for Internal Climate Migration*, World Bank (<https://openknowledge.worldbank.org/handle/10986/29461>).

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Interactive comment on Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2019-79>, 2020.