Quantifying the Impact of Climate on Human Conflict

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This talk: Climate and conflict

- What is the impact of climate on conflict and violence?

  → Important implications for understanding future climate change impacts and policy priorities

- **Comprehensively assess existing research**, and analyze (and re-analyze) multiple datasets to estimate the impact of climate on conflict across societies, history

- Based on a new paper with **Sol Hsiang** (Princeton)

This talk: Climate and conflict

- Existing research spans multiple academic disciplines (economics, political science, criminology, history, archeology, climate science), timeframes, scattered datasets, statistical methods, and conceptual frameworks

- No comprehensive synthesis or meta-analysis exists

- **Main conclusion:** a striking degree of agreement that high temperatures and other extreme climate outcomes are associated with more violence.

Evidence on climate and violence

- **62 studies** (published, unpublished), using 49 datasets.
- A rapidly expanding field: the median study is from 2011.

- New analysis: we obtained 17 different datasets, and **re-analyzed data from 11 papers and reinterpreted results from 11 others**, sometimes with divergent results and conclusions than the original article.

- Many existing studies do not include year or location fixed effects; include outcomes (i.e., income) as "controls"; do not jointly estimate the impact of climate variables; do not account for spatial clustering and serial correlation.

Evidence on climate and violence

- Three main types of studies:

(1) Historical climatology and paleoclimatology (N=12)

  - Did key historical episodes occur during climatic anomalies, using "tree ring" data?

(2) Experimental psychology studies (N=2)

  - Are lab subjects more aggressive at high temperatures?

(3) Observational studies using panel data (N=48)

  - Is armed conflict more common in high temperature and/or low rainfall years?

(1) Historical climatology and paleoclimatology

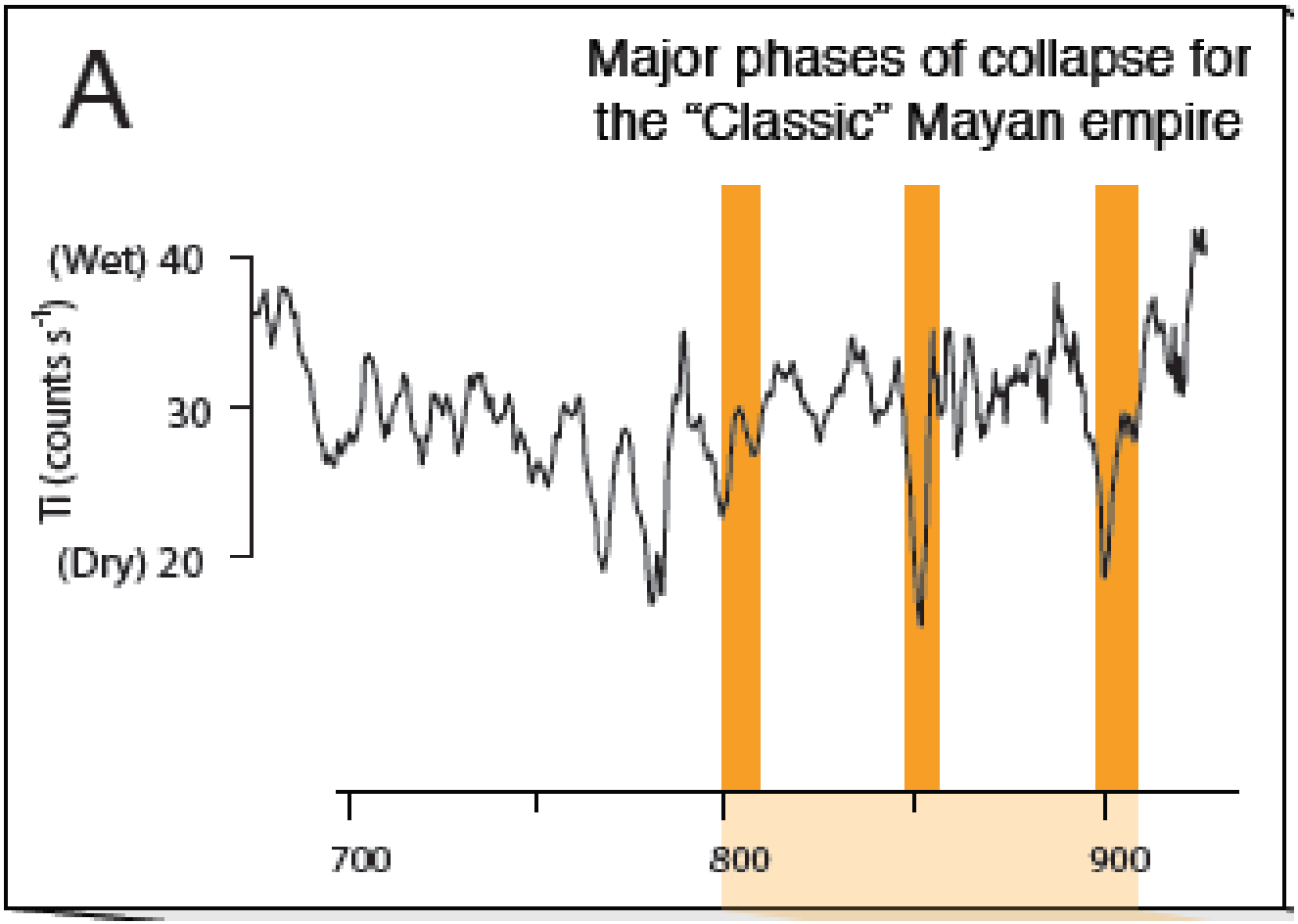
- Evidence from a variety of civilizations (Maya, Angkor Wat, Chinese dynasties, Akkadian empire) that exceptionally dry and/or hot periods are associated with political collapse

- E.g., **the Maya civilization** experienced three extended multi-year droughts in the 9th century AD that are thought to have precipitated its collapse (Haug et al. 2003, *Science*)

- Collapse of the 9th century Chinese Tang dynasty linked to the same extended drying (Yancheva et al. 2007, *Nature*)

Historical climatology examples

Mexico



(2) Experimental psychology studies

- Laboratory studies find impacts of ambient temperature on subject aggression; possible hormonal channels.

- Vrij et al. (1994): **Dutch police in a training exercise** were more likely to shoot at a simulated intruder when randomly placed in a high temperature room (27^{o} C / 80^{o} F) than at lower temperature (21^{o} C / 70^{o} F).
- Does aggression lead to "escalation" of potential conflicts?

- Kenrick et al. (1986): high temperatures are linked to more horn honking in a field experiment, when experimenters deliberately stood still when lights turned green

(3) Observational studies using panel data

- The largest number of studies estimate impacts of climate on national-scale violence, often on armed civil conflict

- **Miguel, Satyanath and Sergenti (2004)** were first to show that civil conflict is more likely following adverse rainfall shocks across African countries during 1981-1999. Rainfall correlates with GDP growth (IV first stage)

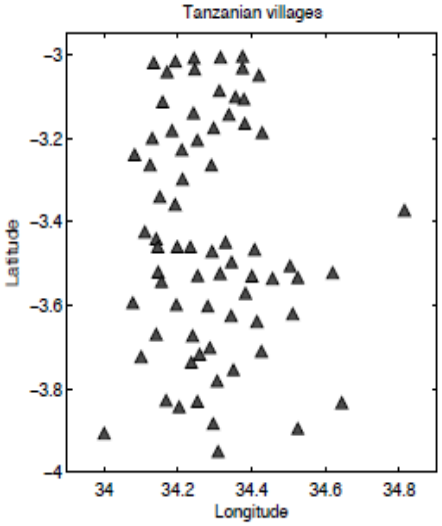
- Building on MSS, recent studies regress outcome *y* on weather deviations, and country and time fixed effects:

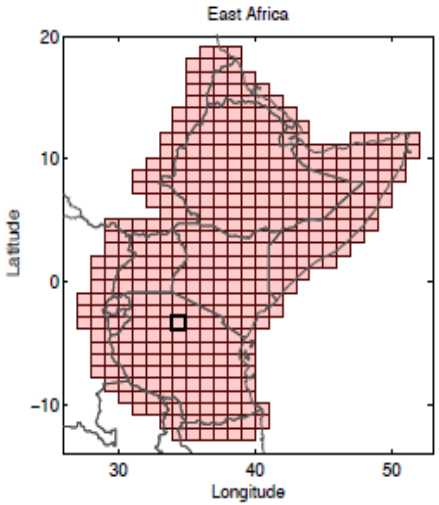
$$y_{it} = \alpha + \beta_1 Temp_{it} + \beta_2 Precip_{it} + \eta_i + \delta_t + \varepsilon_{it}$$

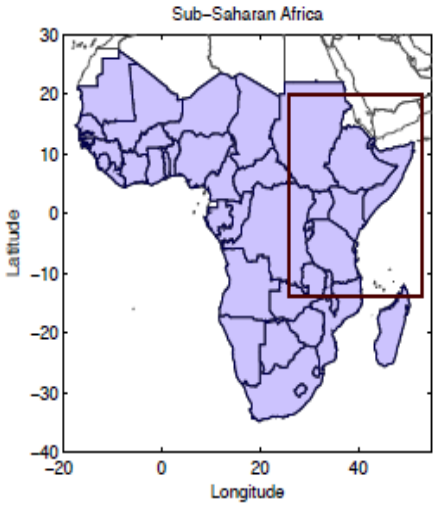
(3) Observational studies using panel data

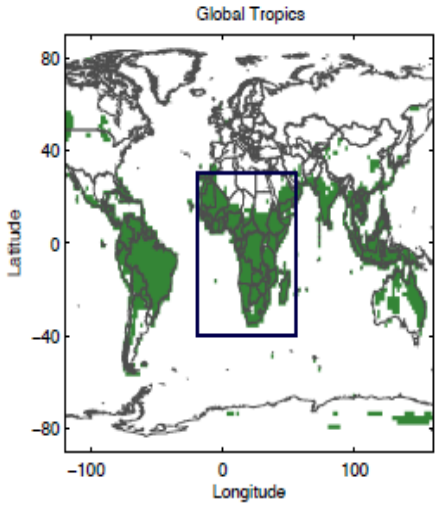
- The results are remarkably consistent: a**ll 24 empirical studies** that focus on temperature estimate a positive association between higher temperatures and violence. This pattern seems extremely unlikely to happen by chance.
- 16 of 18 rainfall studies have a consistent sign
- Three quarters are statistically significant at 95% confidence.
- Holds at scales ranging from the village, to region, country and the globe, using a common statistical specification.

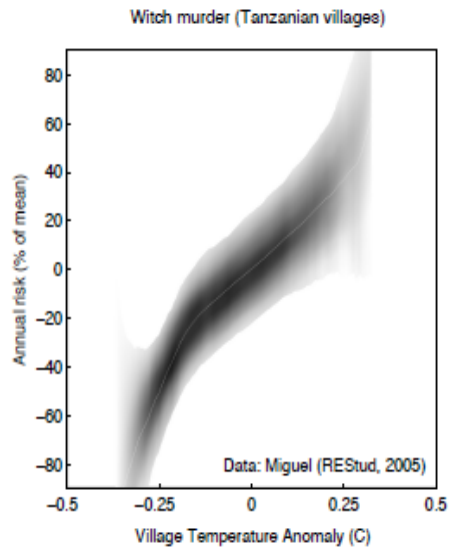
Temperature and violence in Africa, across scales

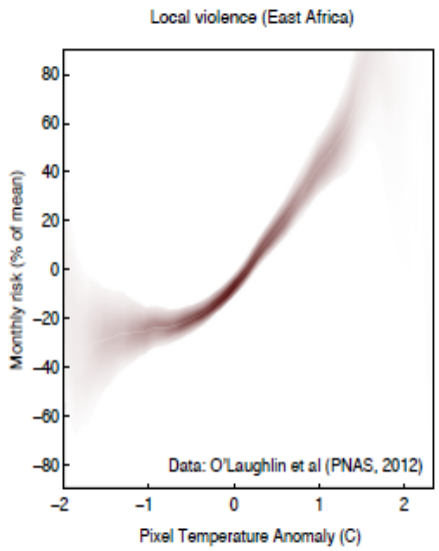


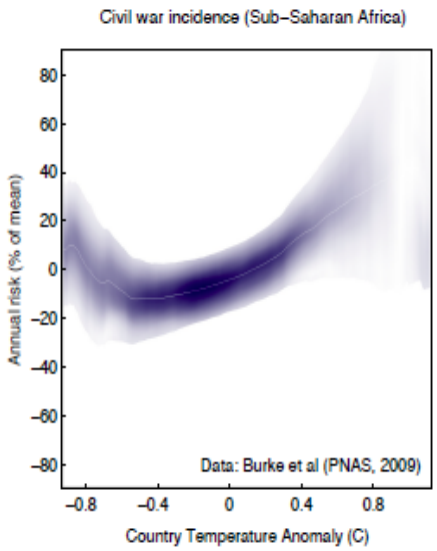


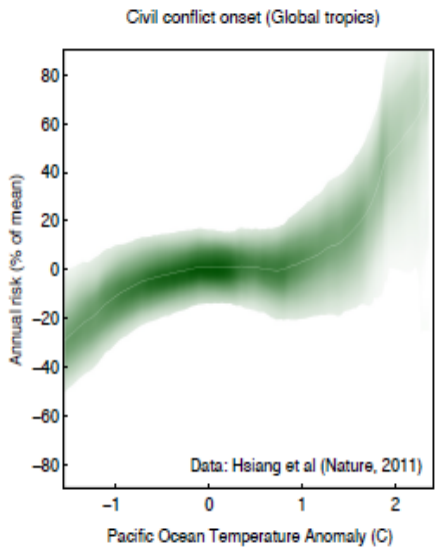






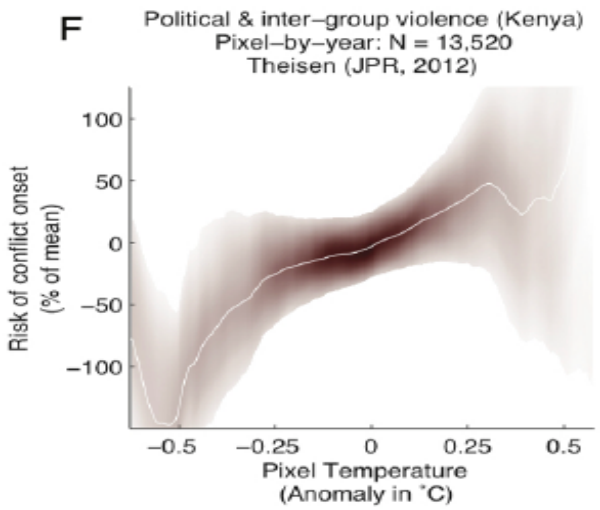




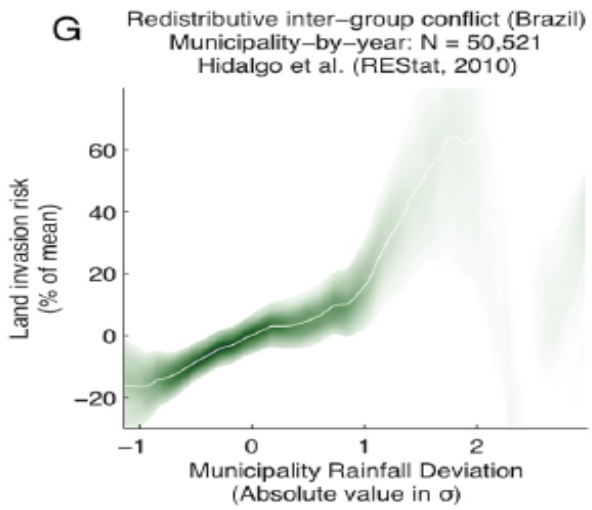


Climatic impacts on intergroup violence, crime

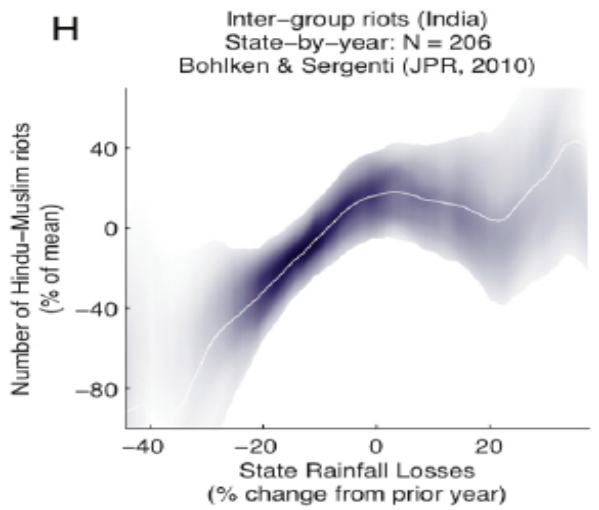
Kenya



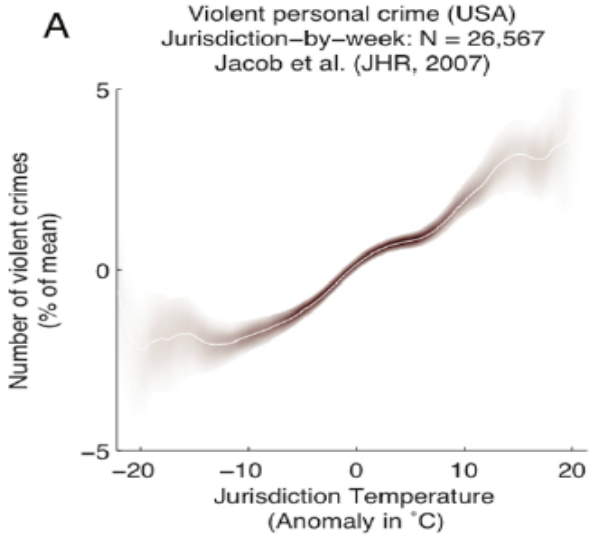
Brazil



India



USA



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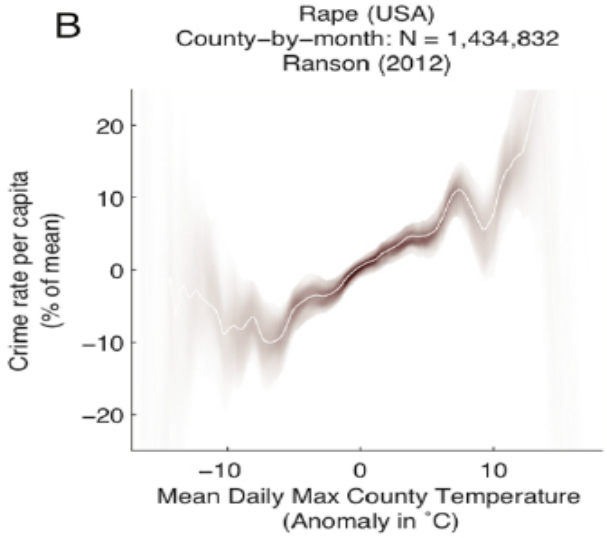

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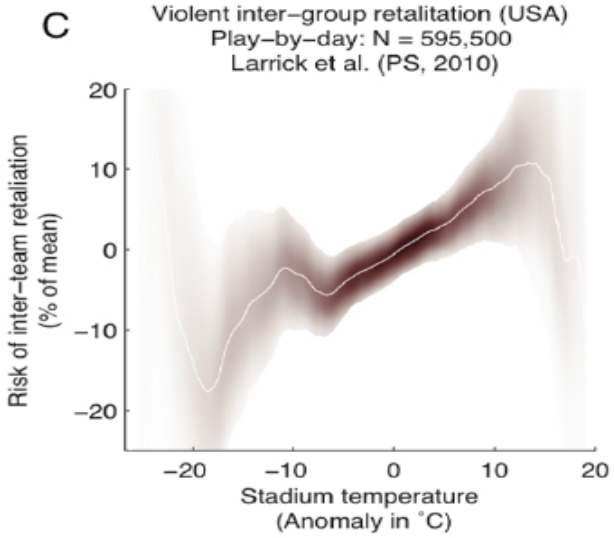
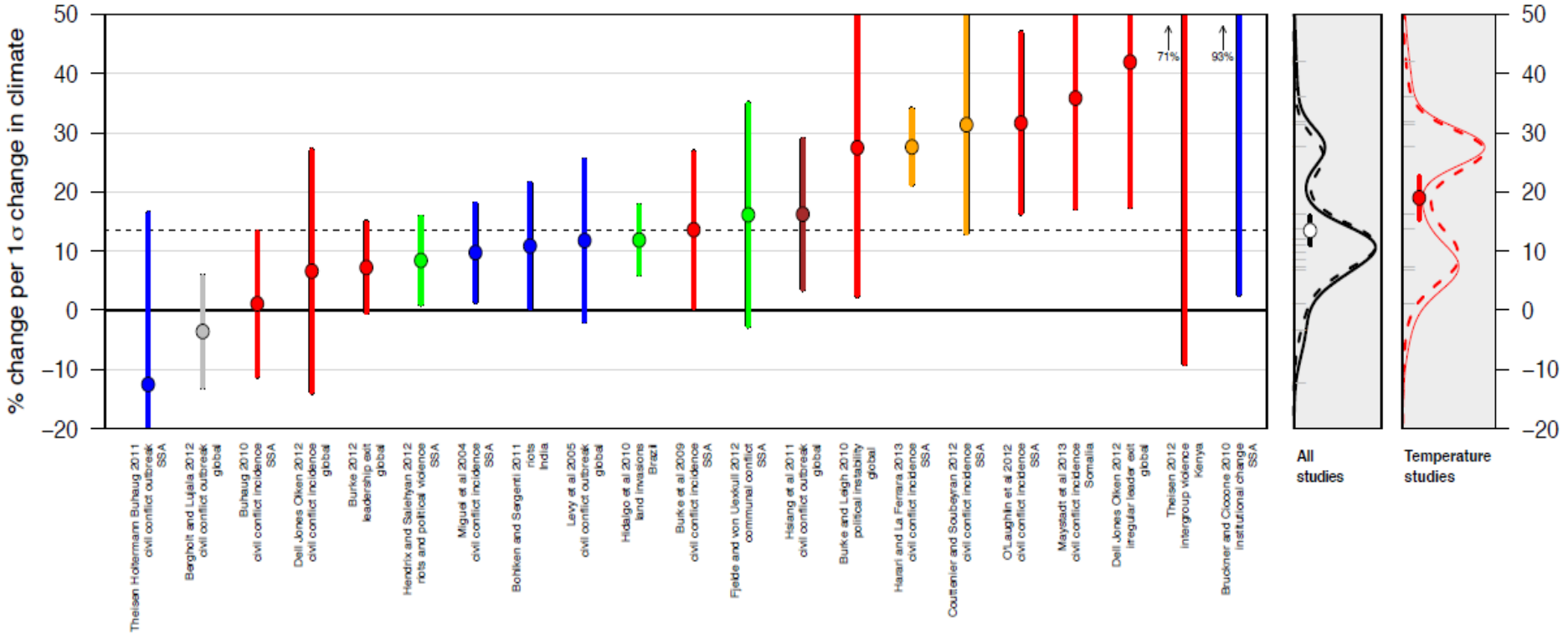


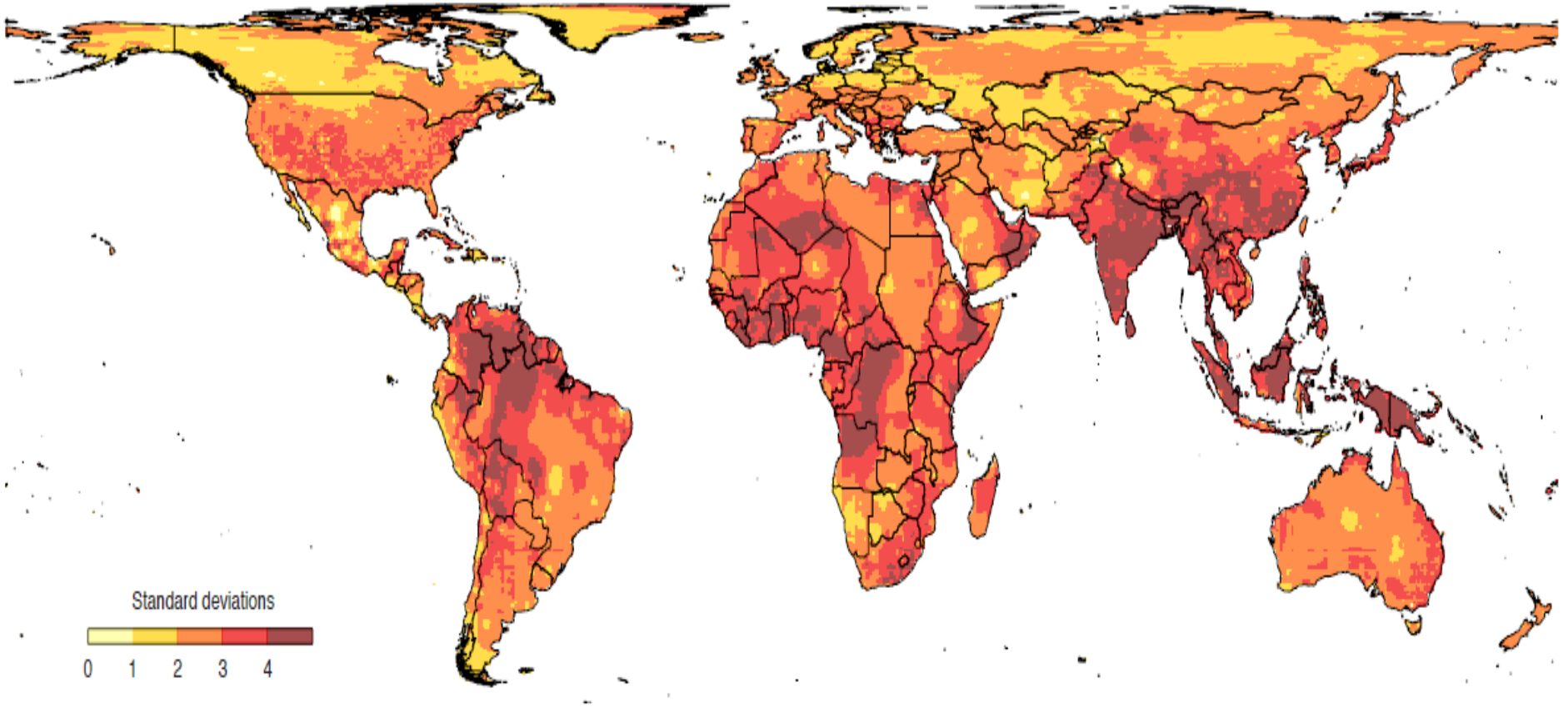
Estimated climatic impacts and CI's

- Are effects "large"?
- In a meta-analysis, the mean impact of a 1 s.d. change in temperature is a +**19% increase** in intergroup conflict



Projected temperature increase (s.d.), to 2050

- Most of Sub-Saharan Africa and South Asia is projected to experience average warming of **at least 3 s.d. (2 C)** by 2050, suggesting the risk of conflict could rise considerably



Climate and conflict: looking forward

- **The bottom line**: there is a remarkably consistent relationship between adverse weather and human violence across time and space.

  → Climate change could have serious implications for global political stability and economic development.

- Global **mitigation** (pollution control) efforts are critical but currently stalled politically
- An **adaptation** agenda is also desperately needed:

  → New crop varieties, insurance schemes, and other programs to reduce sensitivity to future climate change.

END