POTSDAM INSTITUTE FOR
CLIMATE IMPACT RESEARCH

Economic ripple resonance from consecutive weather extremes amplifies consumption losses

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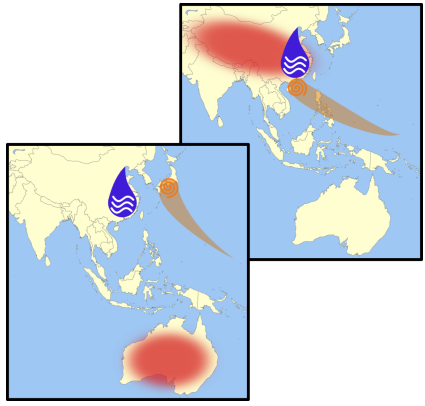
Single weather extreme events vs. consecutive disasters

- Projected independent regionally limited disasters for 2020–2039

⇒ Heat stress, floods, tropical cyclones

- Consecutive disasters: possible spatial and temporal overlapping
- Sum of three seperate direct production losses equally to direct production losses of consecutive extreme events



Single weather extreme events vs. consecutive disasters

Projected independent regionally limited disasters for 2020–2039

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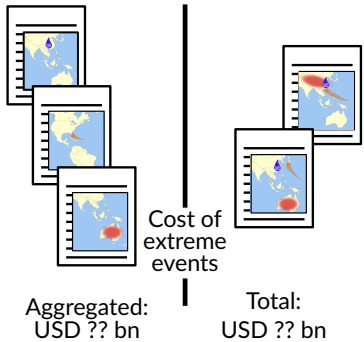
Consecutive disasters: possible spatial and temporal overlapping

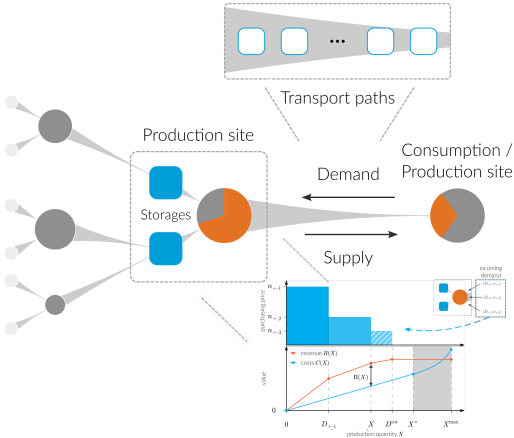
Sum of three seperate direct production losses equally to direct production losses of consecutive extreme events

- Including econonmic ripple effects:
  - Propagation of demand and supply fluctuation through trade network
  - Via overlay of economic repercussion: enhanced or weakened response



Economic ripple effects via loss propagation model Acclimate

- Economic agents:
  - 26 firms and 1 consumer for 268 regions
- Model keypoints:
  - Myopic, locally optimizing agents
  - Recursive dynamic modeling
  - Endogenous price dynamics
  - Demand driven economy
  - High temporal resolution
  - Explicit modeling of inventories
  - Transport delays



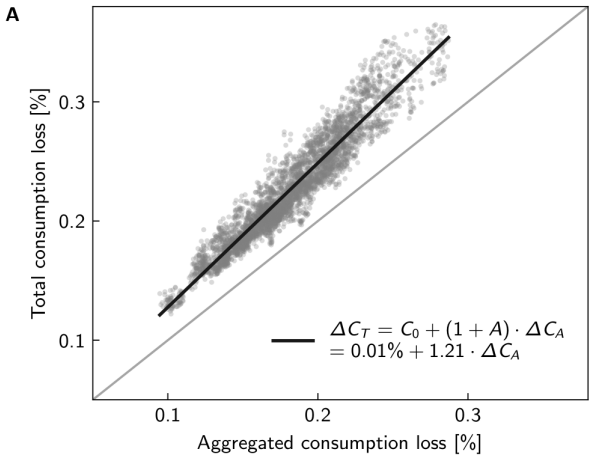
Otto et al. *J Econ Dyn Control* (2017).

Global consumption losses

- Annual total global consumption losses larger than annual aggregated global consumption losses
- Enhancement of losses via economic ripple resonance

⇒ Positive feedback between economic ripples

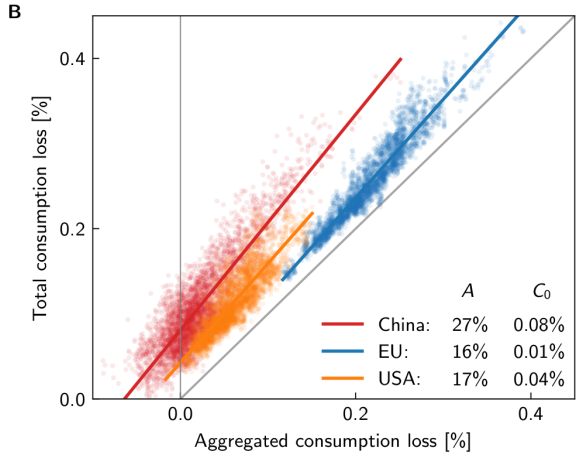
- Global consumption loss offset C_0
- Increasing aggregated losses: amplified total consumption losses ⇒ Loss amplification $A = 21\%$



Kuhla et al. *Sci Adv* (under review).

Regional consumption losses – I

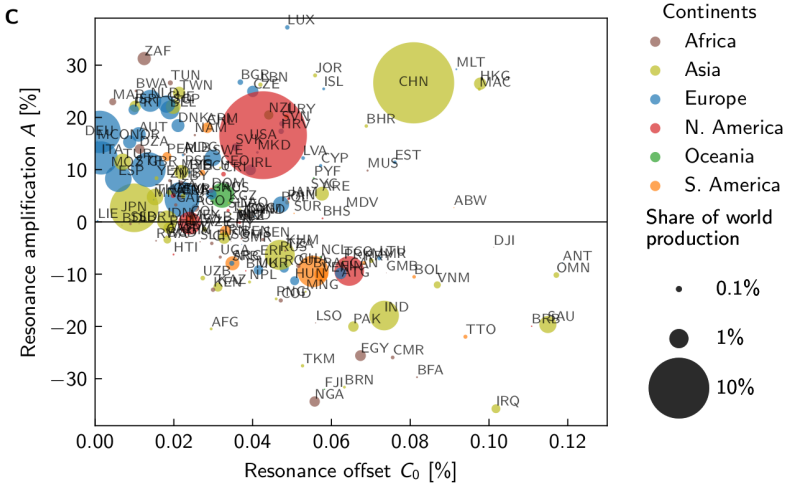
- Differences in regional enhancement by ripple resonance
- USA and EU28: similar amplification despite different direct production losses
- China: qualitative response shift



Kuhla et al. *Sci Adv* (under review).

Regional consumption losses – II

- Negative amplification (≙ Mitigation)
  - Biggest Economies: Brazil, Canada, Russia, Sweden, India, Mexico
- 82% of world production: positive amplification



Kuhla et al. *Sci Adv* (under review).

Take home messages

- Resonance of economic repercussions (ripples) of consecutive disasters:

⇒ Significant impact on welfare losses

⇒ Loss offset

⇒ Regional response shift possible

⇒ Loss amplification globally and regionally