How do we address catastrophic impacts and extreme events?

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What are catastrophic impacts?

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  - Catastrophic to whom/where?
    - Local versus global
    - Community versus society
  - Long-term versus short-term

- Do extreme events always/usually/sometimes cause catastrophic impacts?
  - Dependent on the type of extreme event
  - Dependent on the region, sector (resiliency)

- Can non-extreme events cause catastrophic impacts?

Modeling challenges

- How are extreme events represented in models?
  - temporal and spatial resolution
  - realistic representation of underlying processes (do we really understand the underlying processes?)
  - evaluation against observations (when available)

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  - temporal and spatial resolution
  - realistic representation of underlying processes (crop models are growth models, not death models)
  - evaluation against observations (when available)

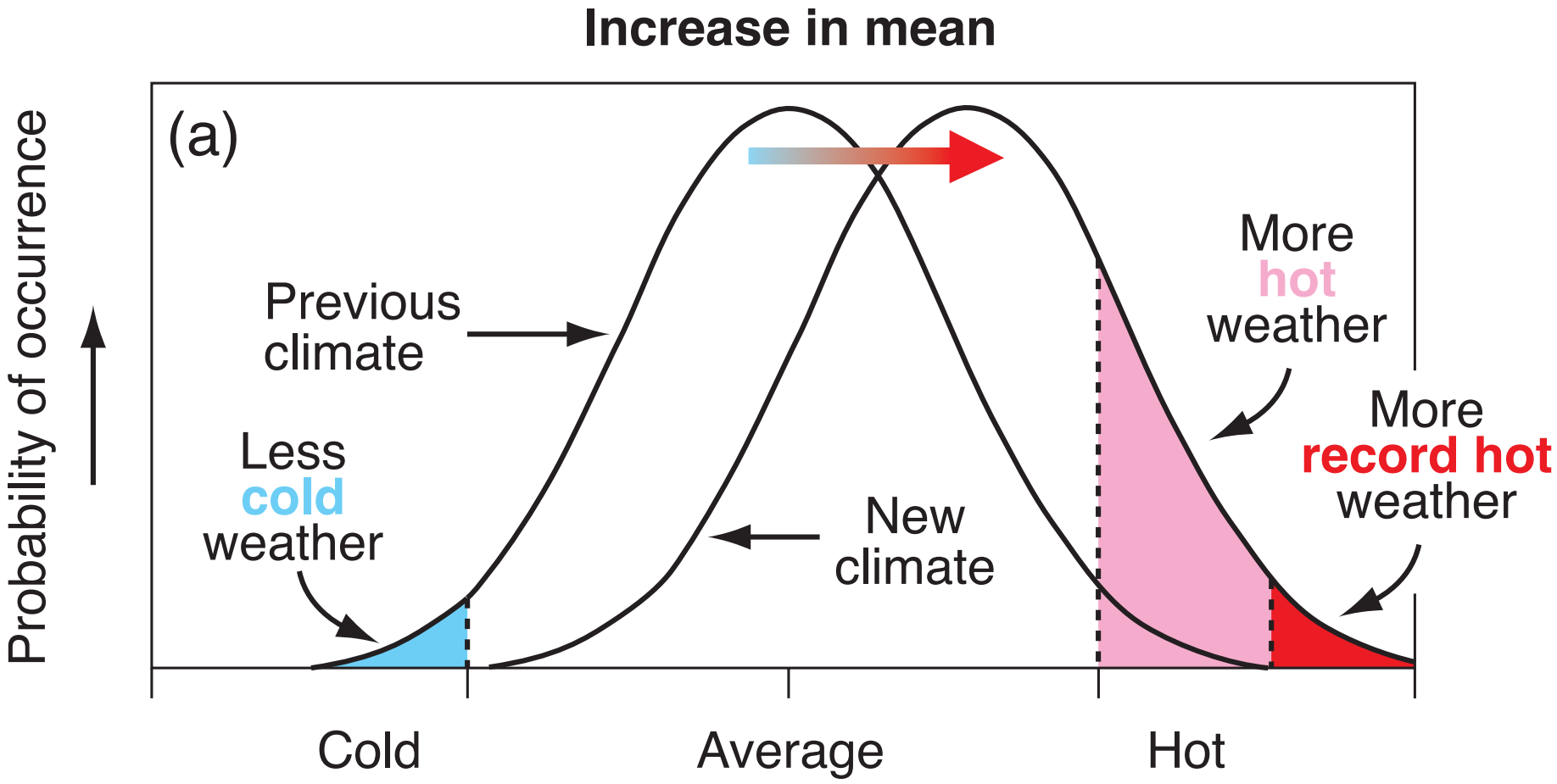
- How are hazard management represented in models?

- Scale consistency between climate and impact models

Methodology challenges

- How do we bridge the gap between different schools of thought?
  - High-resolution simulations versus uncertainty analysis
  - Empirical models versus process models
- Bias correction/downscaling
  - How do bias correction/downscaling methods treat extreme events?
- Representation of natural variability
  - Using individual climate simulations versus the ensemble mean simulations
  - Pattern scaling methods
  - Weather generation models
  - Idealized experiments
  - Assumption of shift in the distribution (delta method)

Methodology challenges



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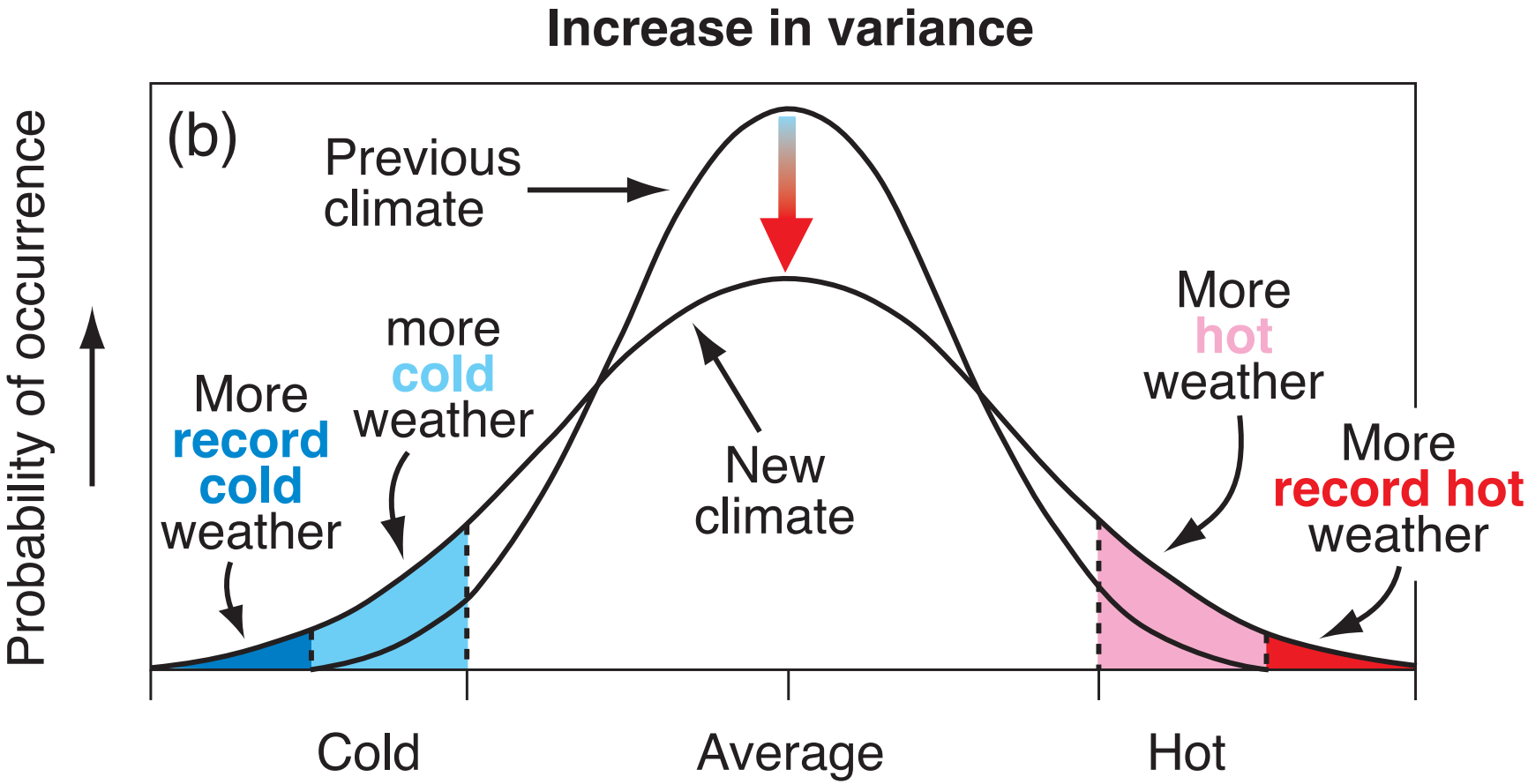
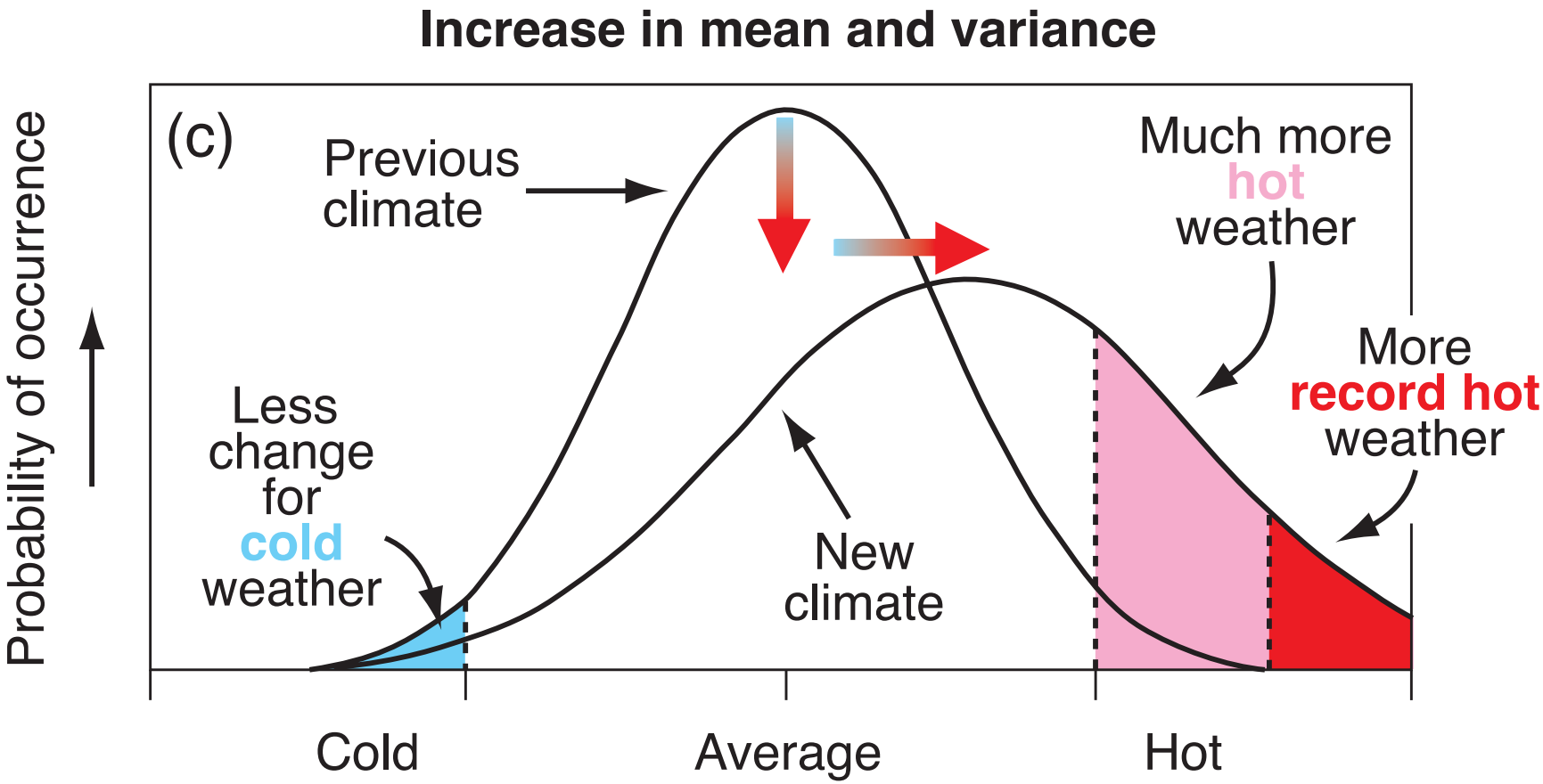


Methodology challenges



Some research questions

- What is the confidence in the representation of different types of extreme events, their future changes and impacts?
- Which sectors/regions are the most vulnerable to extreme events?
- Which extreme events are more likely to lead to catastrophic impacts?
- Quantifying the contributions of different drivers of climate impacts
  - Change in the mean versus change in the variance
  - Change in the frequency versus magnitude of extremes
- Regional versus global assessment
  - Co-occurring extreme events
  - Impacts on multiple sectors and their interactions
- Risk management in the face of extreme events