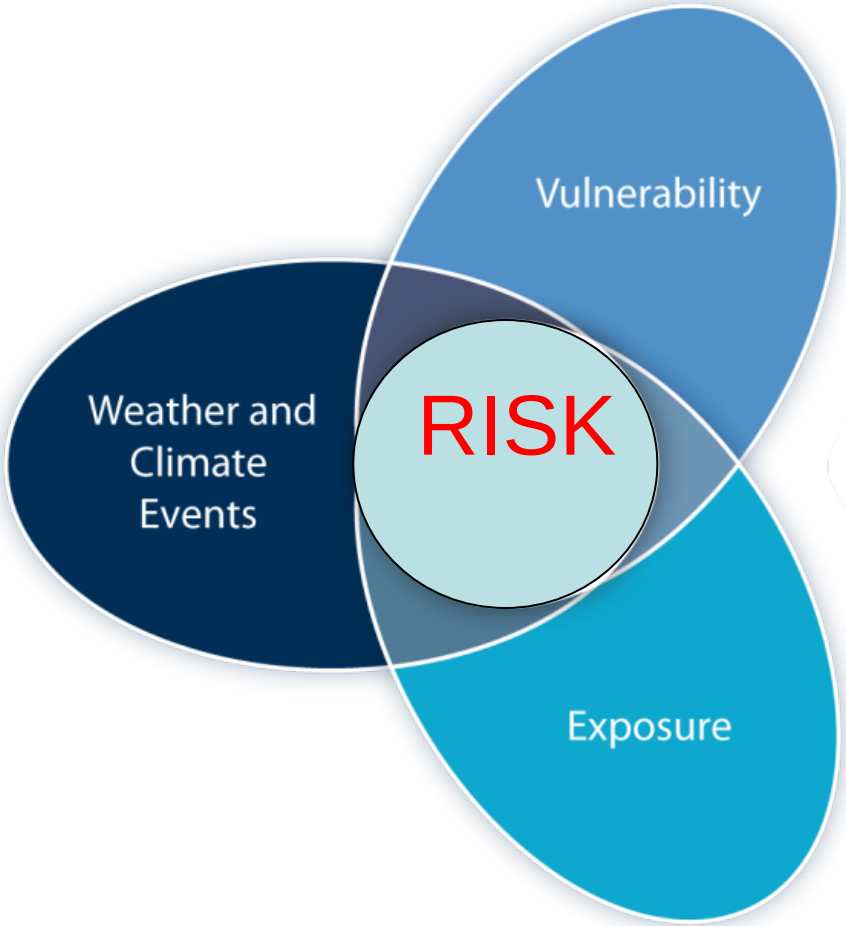
Sea Level Rise: We are NOT prepared

Michael Oppenheimer
Princeton University
at

AAAS - 50th Anniversary of the
First Official Climate-Change Warning to a U.S. President
29 October 2015

Vulnerability + Exposure interact with climate change to produce added Risk



Vulnerability:

The predisposition of a person or group to be adversely affected

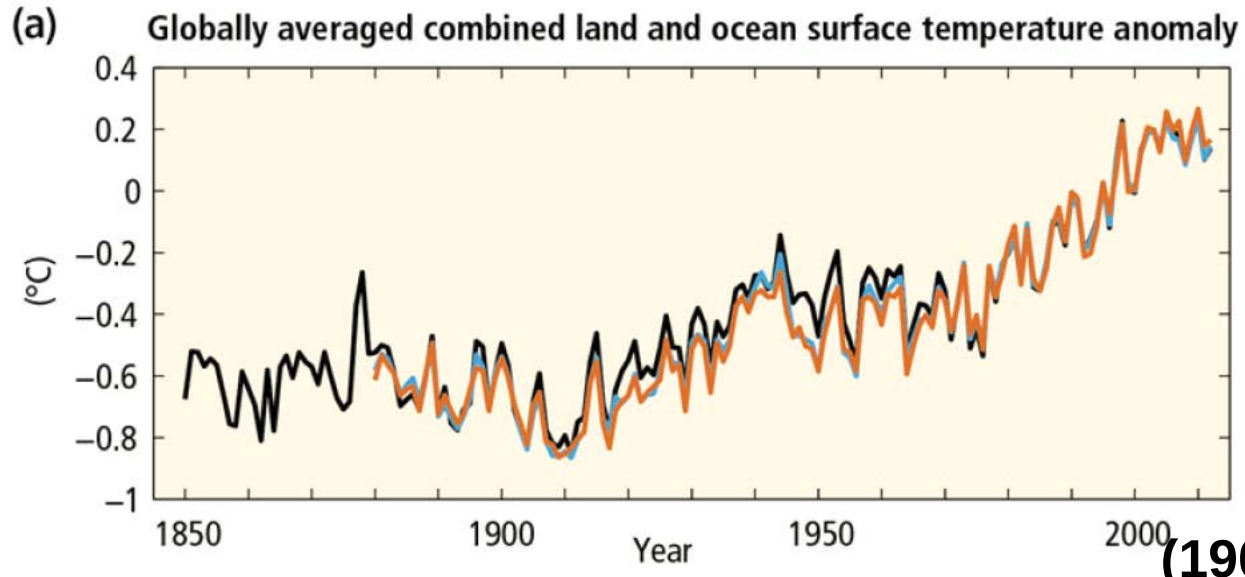
Exposure:

Being in the wrong place at the wrong time

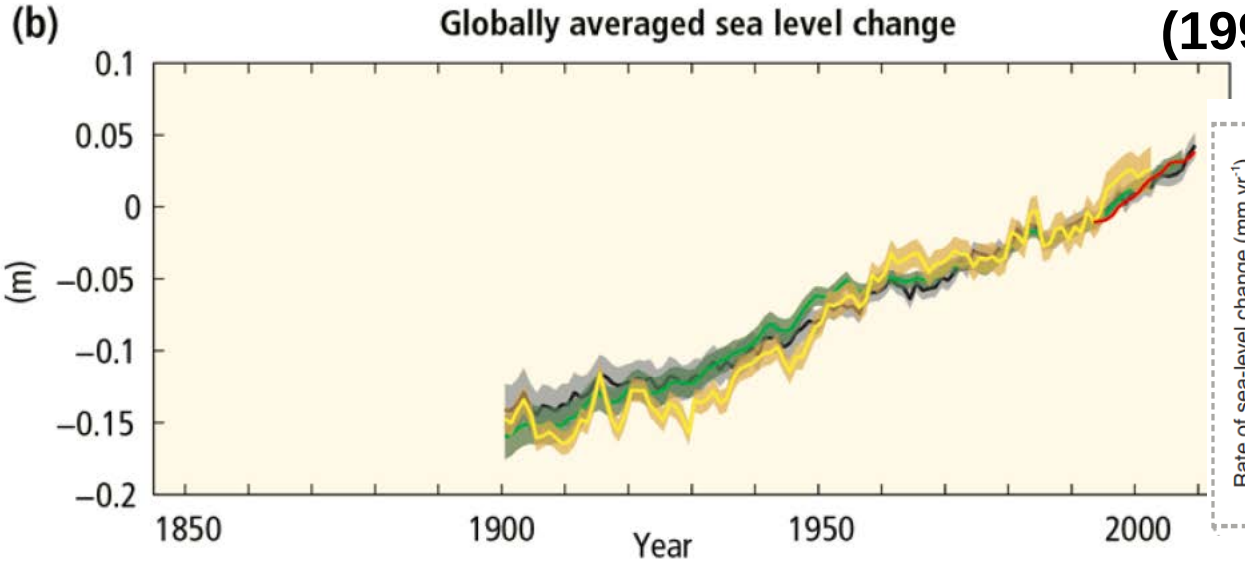
IPCC SREX 2012

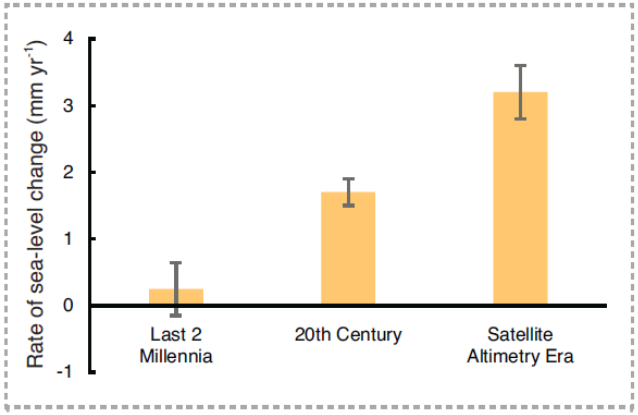
Global Mean Temperature, Sea Level Rising

IPCC WGI AR5

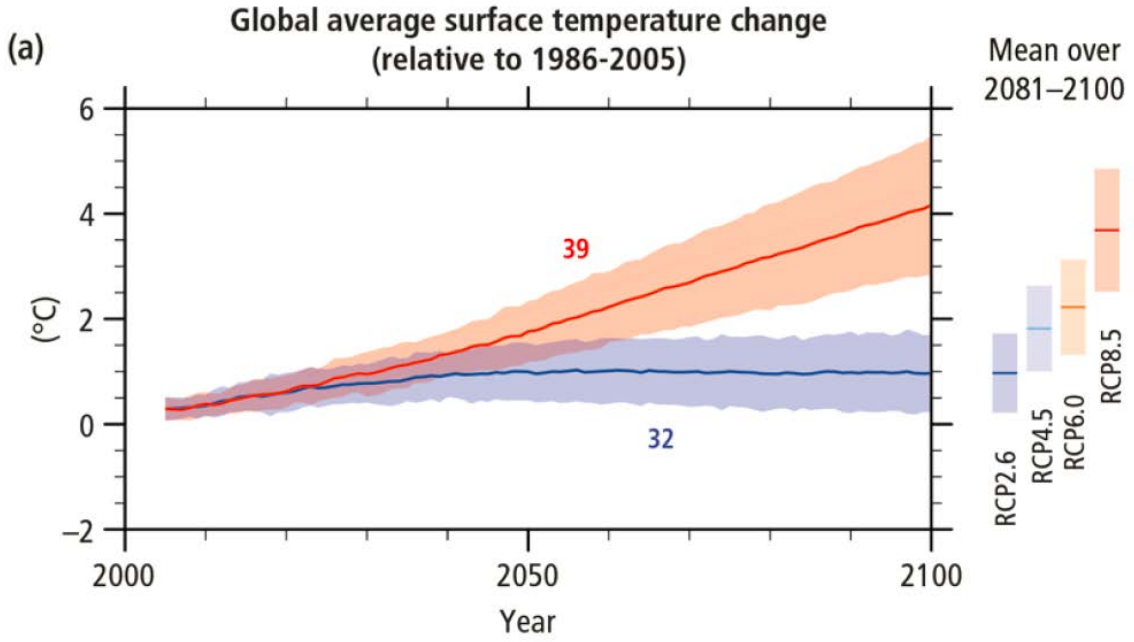


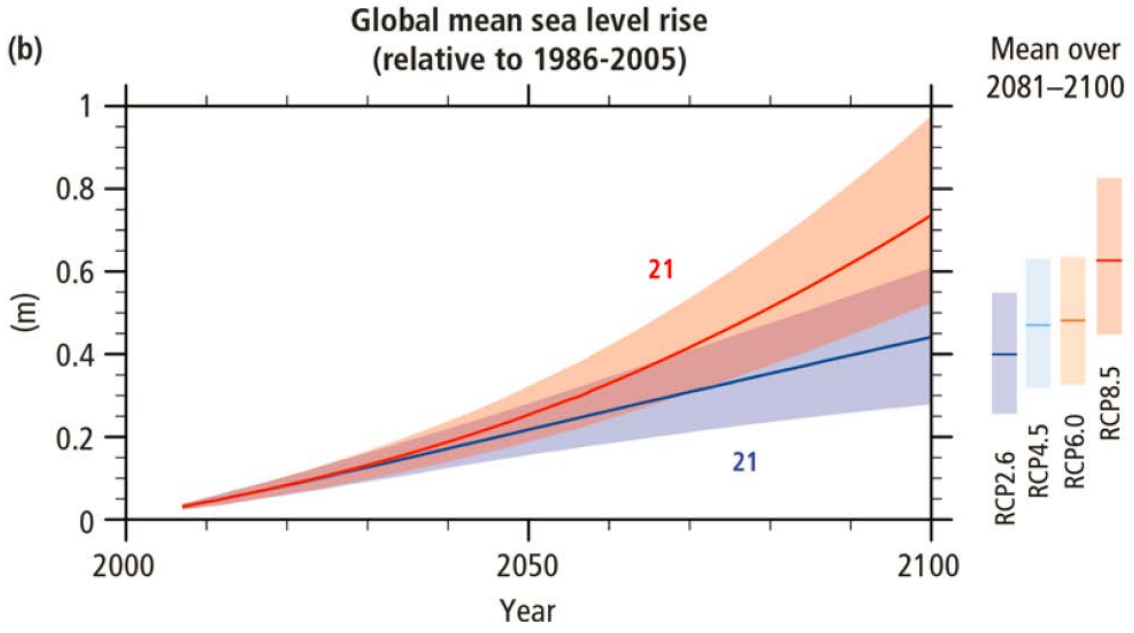
(1901-1990:1.2 ± 0.2 mm/yr)
(1993-2010: 3.0 ± 0.7 mm/yr)





AR5 FAQ 5.2 Fig.1



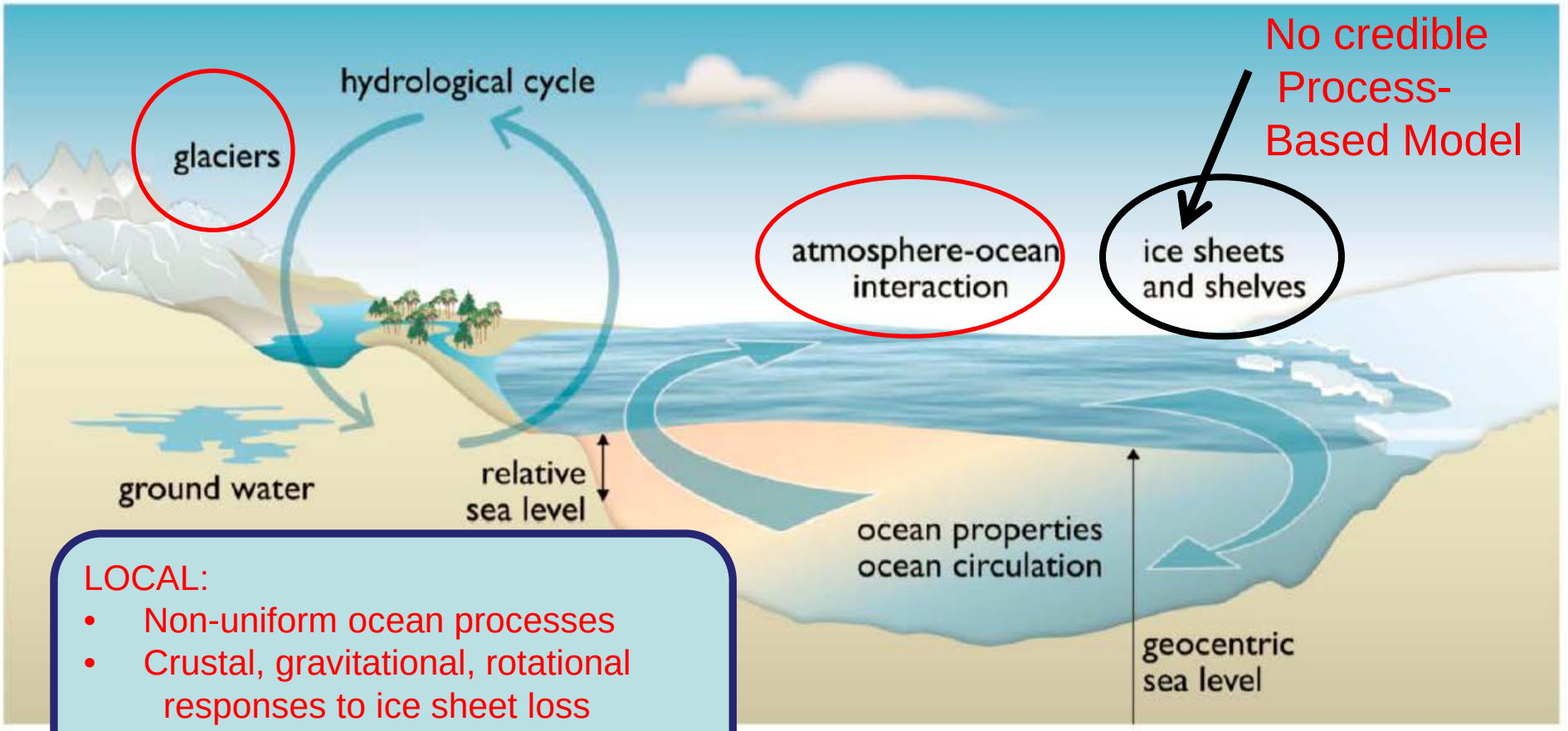


Uncertainty remains very large…

IPCC WGI AR5

Yet some decisions should be made now!

- Need for science relevant to decision-making: what do we advise; what will policy makers find useful?
- Extreme coastal events illustrate a general problem
- US National Assessment notes a “risk-based range” of 0.2 vs. 2m!
  - >>implies radically different investments now
  - >>may yield paralysis
- Need for a probabilistic, risk-based approach
- ***In the meantime, while risk is increasing, currently disaster preparedness is far below optimal***



LOCAL:

- Non-uniform ocean processes
- Crustal, gravitational, rotational responses to ice sheet loss
- GIA
- Tectonics, sediment, etc.

Processes determining global and local sea level change

(after AR5 Fig. 13-1)

Local sea level rise - selected NE US locations

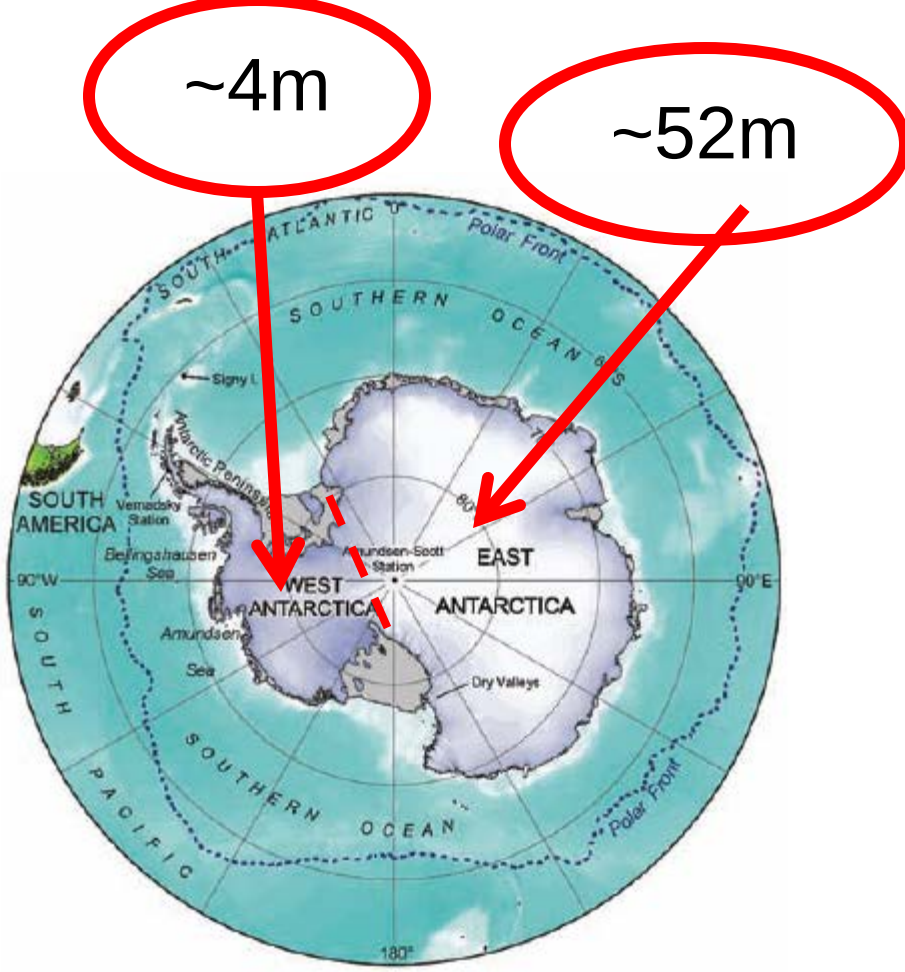
"BaU" emissions case (RCP8.5)

Percentile	Median	5	95
NYC	96	44	154
Newport	93	43	151
Atlantic City	104	53	163
Norfolk	105	59	158
Global Mean	79	52	121

Sea level rise (cm) year 2100 compared with year 2000

Kopp et al 2014

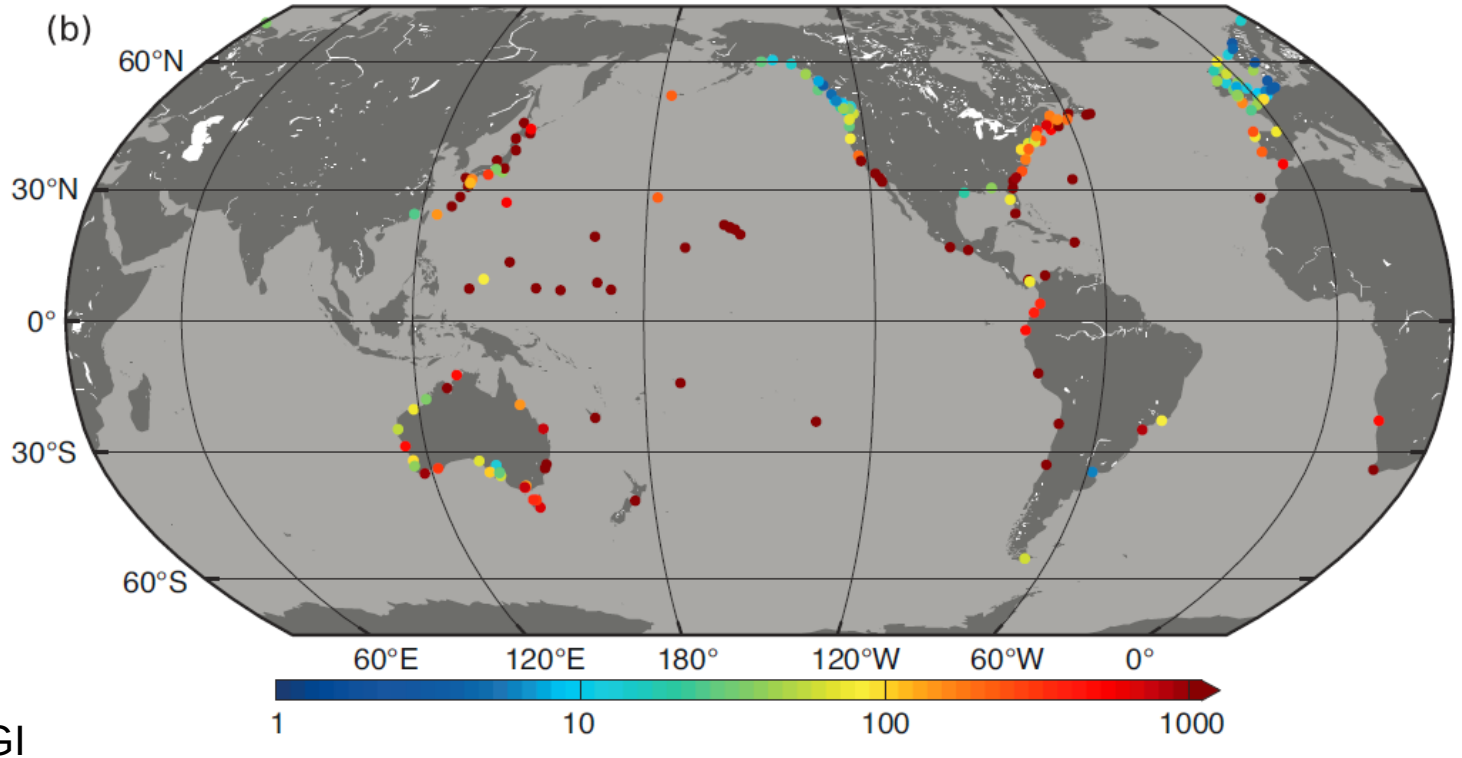
Long Term Hazard
– Trigger?
– How fast?



Last time Earth was about two-degrees Celsius warmer for sustained period, sea level was 5-10 meters higher!

Flood frequency multiplier for 0.5m global mean sea level rise:

Shortens window for recovery from large and intermediate storms

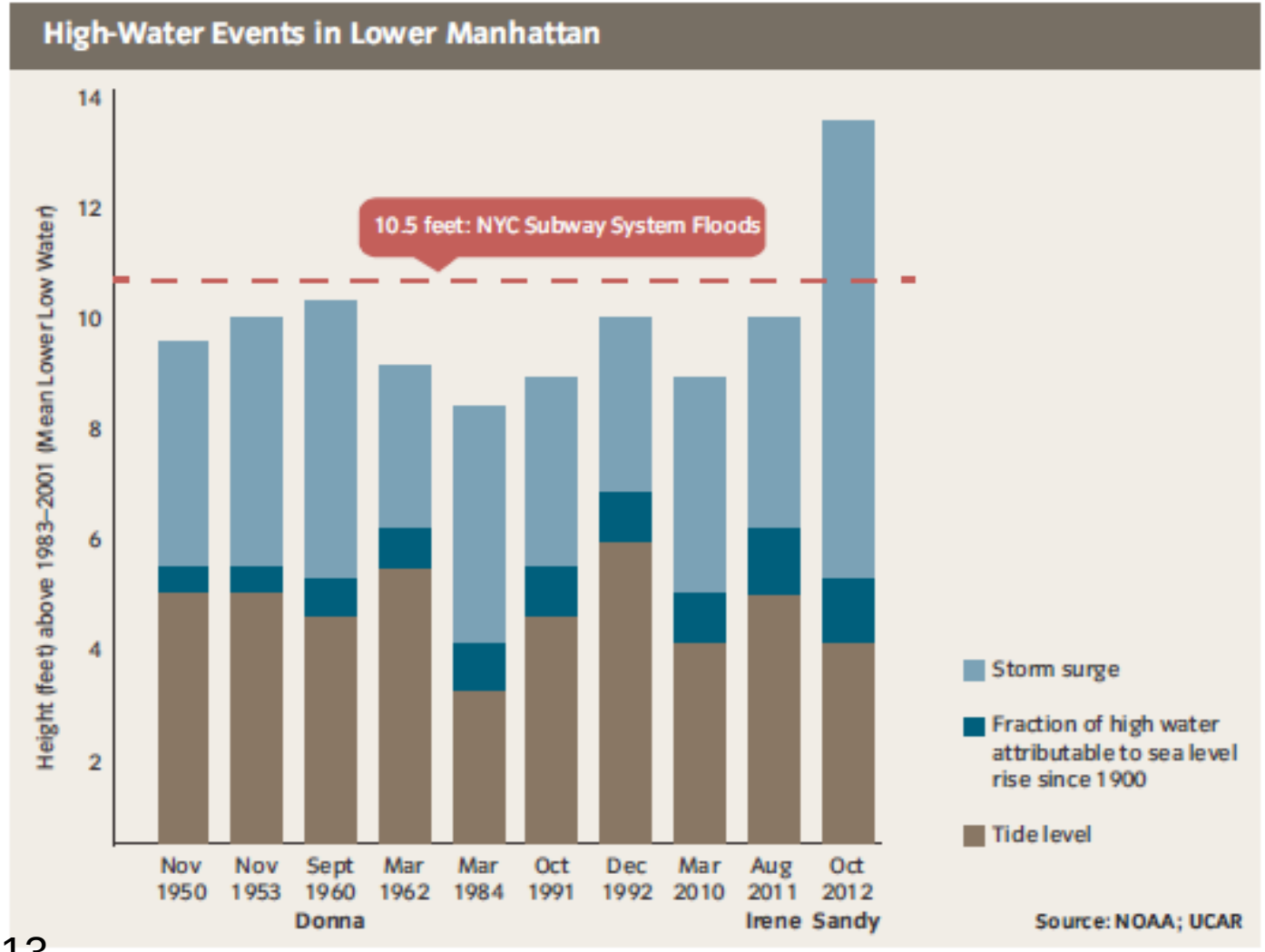


AR5 WGI

Storms fixed

NYC: uncertainty of +/-O.5m can triple the multiplier

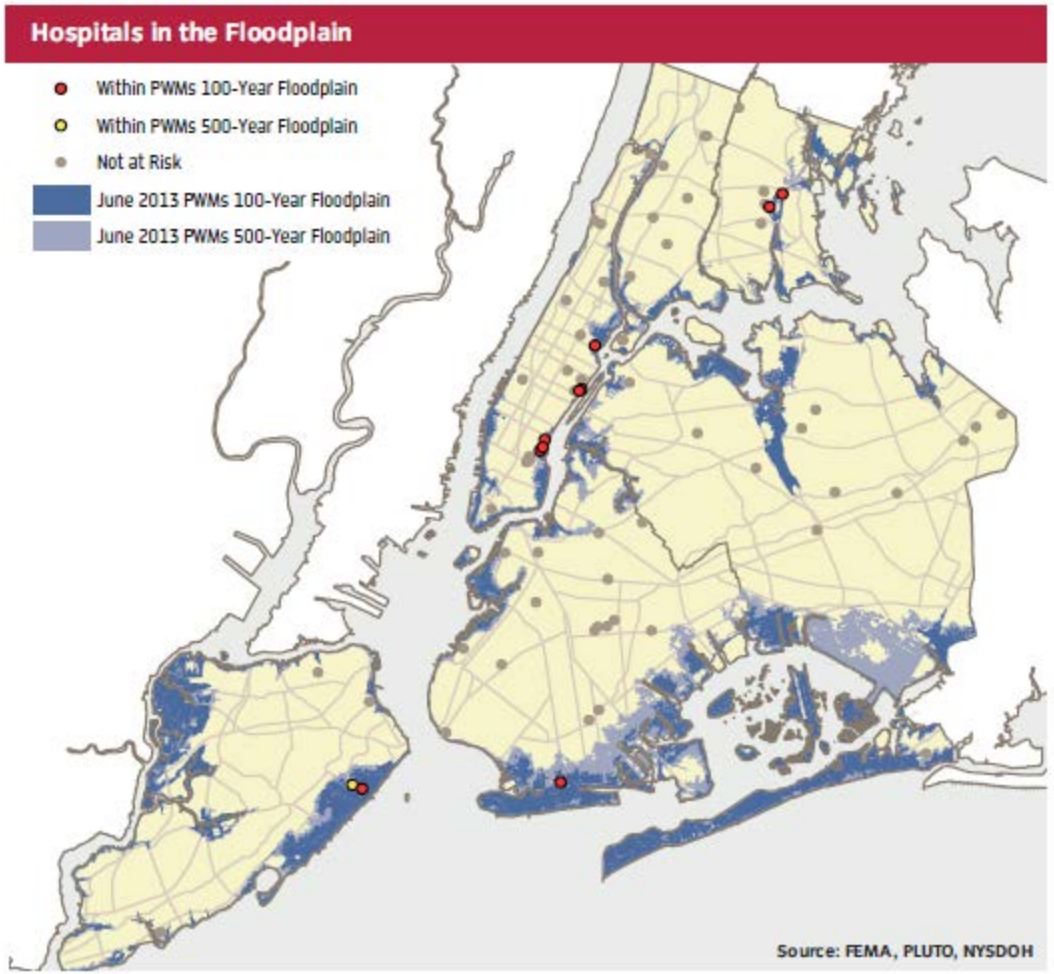
Modest amount of rise can make a big difference



SIRR 2013

Which scale of investment needed?

The easy part – critical facilities within floodplain: hospitals, for example



SIRR

Retrofit existing ones, direct new ones outside flood zone

Political, psychological obstacles to the ideal are large

Extreme episodes have a large impact on public but…

- Extreme episodes are infrequent (as of now)
- Memories short
- Planning times are long
- Risk increases continuously
- Political incentives perverse compared to requirements of risk management

Federal resilience “incentive” system

1. Requirement: if rebuild, rebuild to flood zone code
   >>>enforcement?
   >>> FEMA maps have errors, no SLR

2. HUD grants from reprogrammed Sandy funding

3. Co-funding for USACE projects (not applicable in other climate arenas)
   >>>virtual guarantee of hard (gray) solutions
   >>>depends on congressional appropriation

4. Otherwise, few $$$ dedicated to resilience-building ex ante

Some ideas on insurance reform

(in consultation with Howard Kunreuther, Wharton School)

- Premiums should reflect risk

  >>>Don't subsidize premiums – undermines anticipatory reduction of vulnerability and exposure (some progress here)

- Think through ***choice architecture***: coordinate risk-based rating with incentives to build resilience in advance.

- Need public ***and*** private enforcement

- Exploit public–private partnerships (terrorism insurance model)

  >>>new model for risks that are uninsurable by private sector alone

  >>>assist those who cannot afford protective measures

- Switch to multi-year insurance to provide premium and coverage stability while discouraging policy holders' cancelling after years of no losses.

Or, will we keep doing what we've been doing?

- Maintain perverse incentives
- Pour more concrete, avoid retreat
- Pay little for ex-ante resilience, plenty for ex-post clean-up