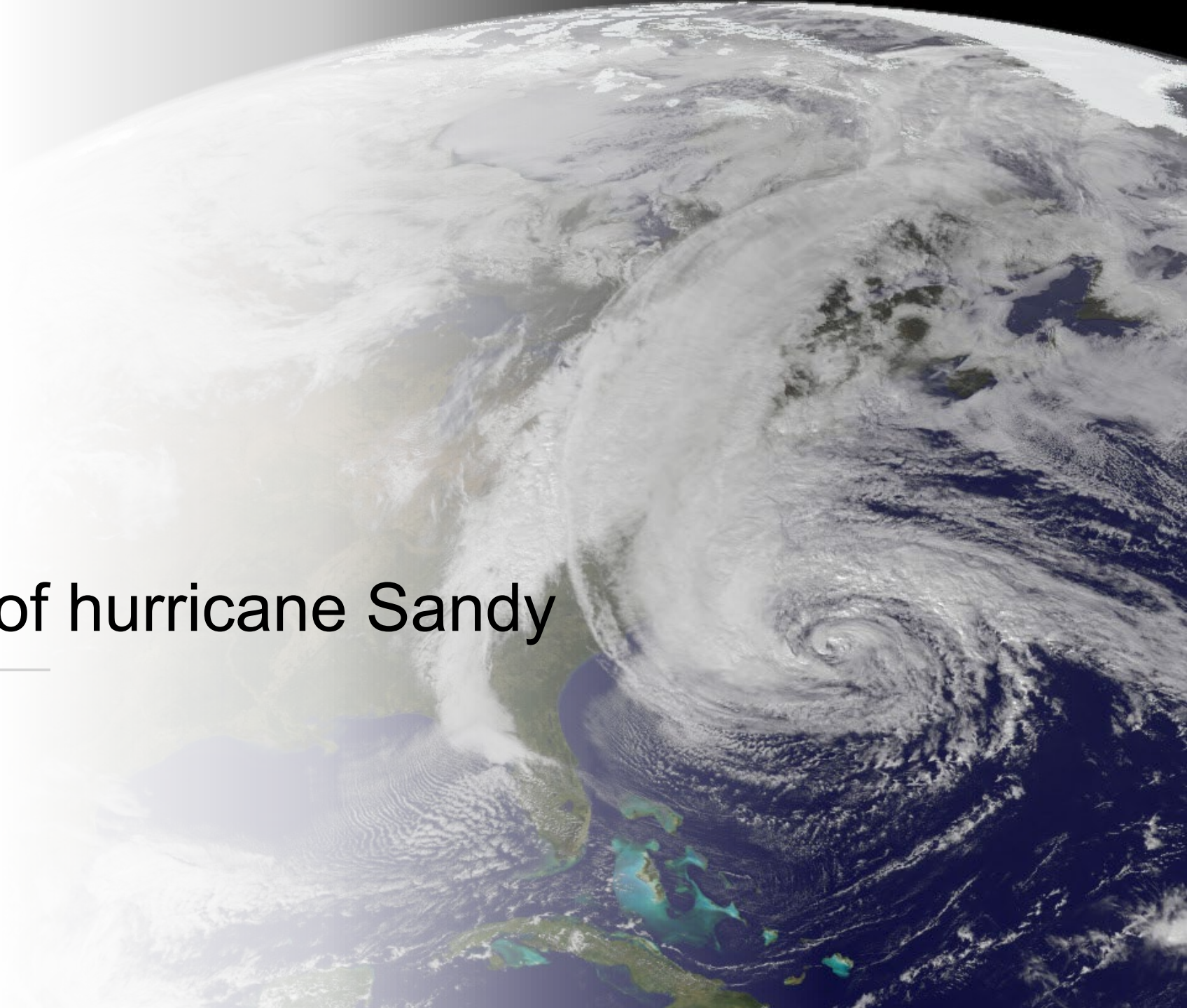


Creating storylines of hurricane Sandy

Henrique M. D. Goulart



Hurricane Sandy

- Second-costliest hurricane in U.S.
- Worst natural hazard to occur in NYC;
 - Not a lot of precipitation;
 - Extremely high storm surge.
- Conditioned adaptation plans for NYC.
- *How would Sandy affect NYC under different conditions (such as climate change)?*



Creating storylines of Sandy

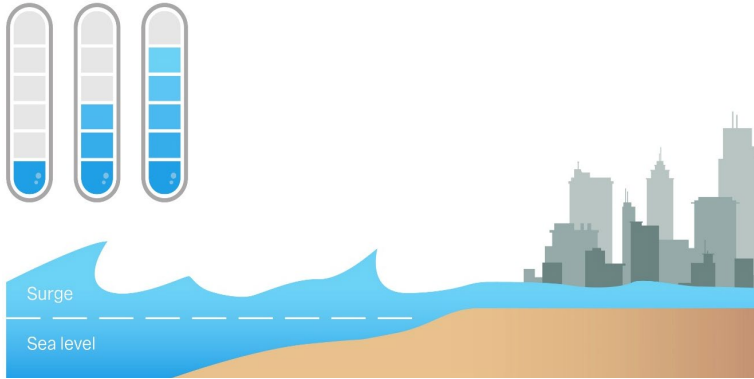
1. Set of scenarios;
2. Modelling framework.

Set of scenarios

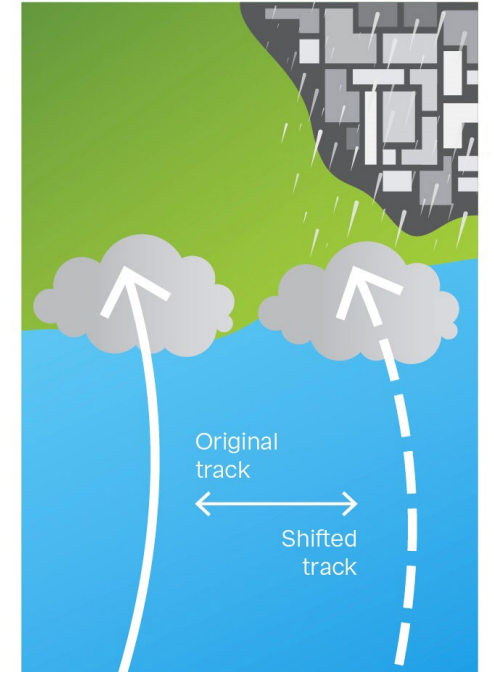
Climate scenarios



Sea level rise (SLR) scenarios



Maximised precipitation (MP) scenarios



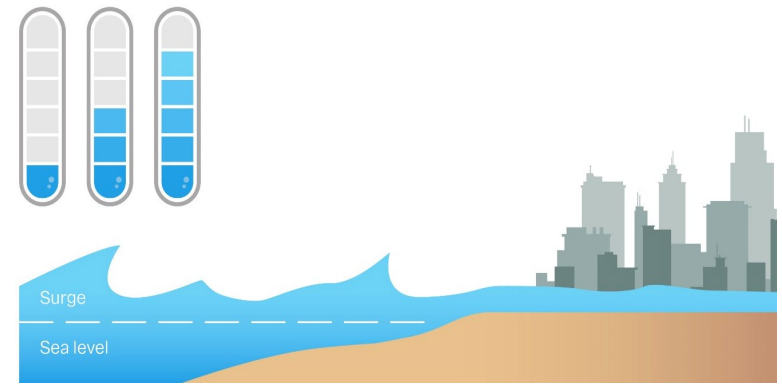
Climate scenarios



- Spectrally nudging technique:
 - Forces large scale atmosphere to reanalysis;
 - Changes boundary conditions to global warming levels;
 - 3 global warming levels: pre-industrial, present day and +2C;
 - 3 members in each global warming level for climate variability.

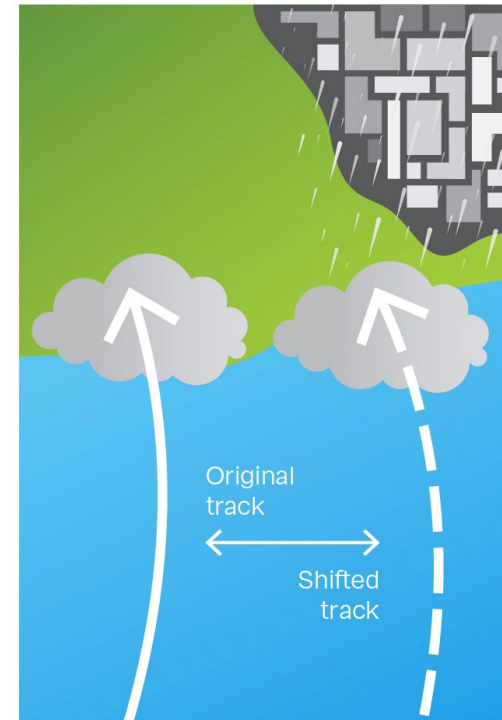
Sea level rise scenarios

- IPCC multi-model projections:
 - +2C warmer world;
 - Different time periods (uncertainty in core processes of ice mass loss):
 - 2100 – 0.71m;
 - 2150 – 1.01m.

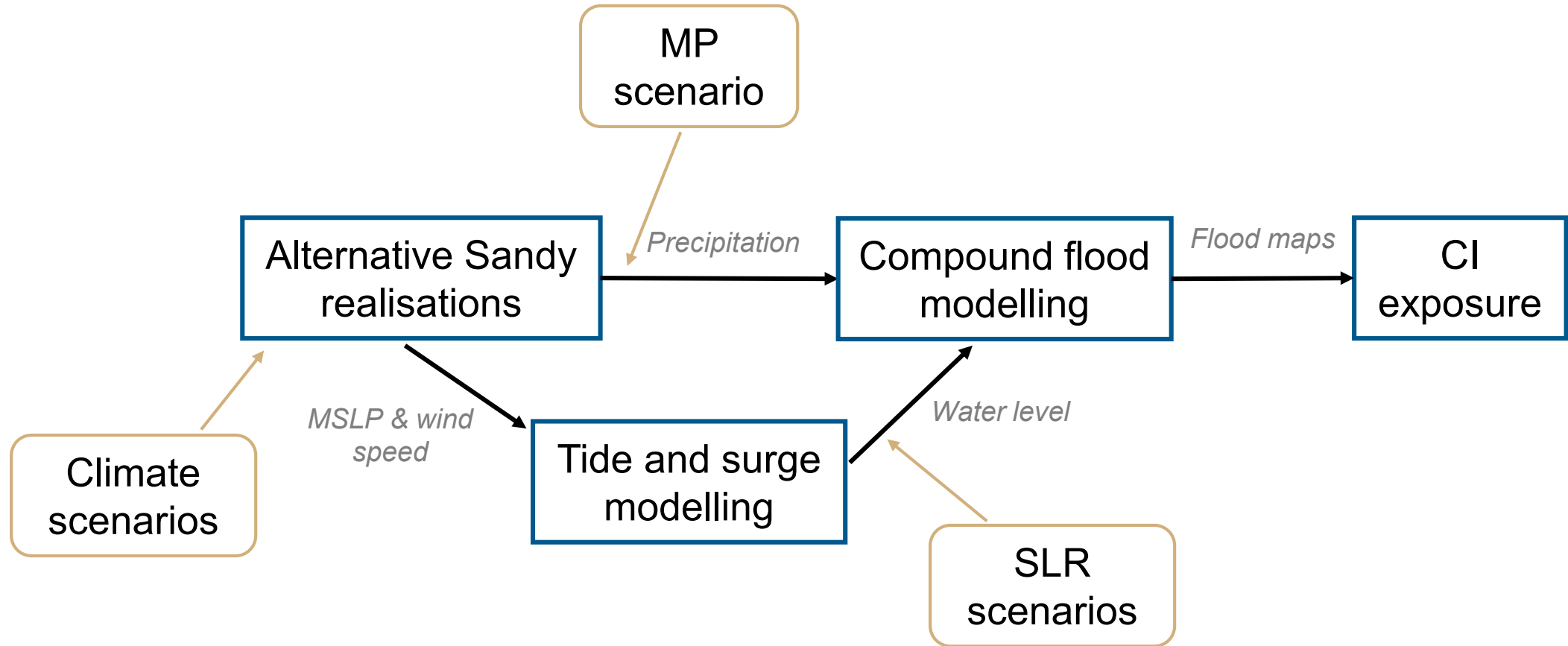


Maximised precipitation (MP) scenario

- TCs have spatial variability due to stochastic processes;
- Plausability: The landfall location could be slightly different;
- Move the highest precipitation part of the storm during landfall to NYC;
- Exploration of internal variability.



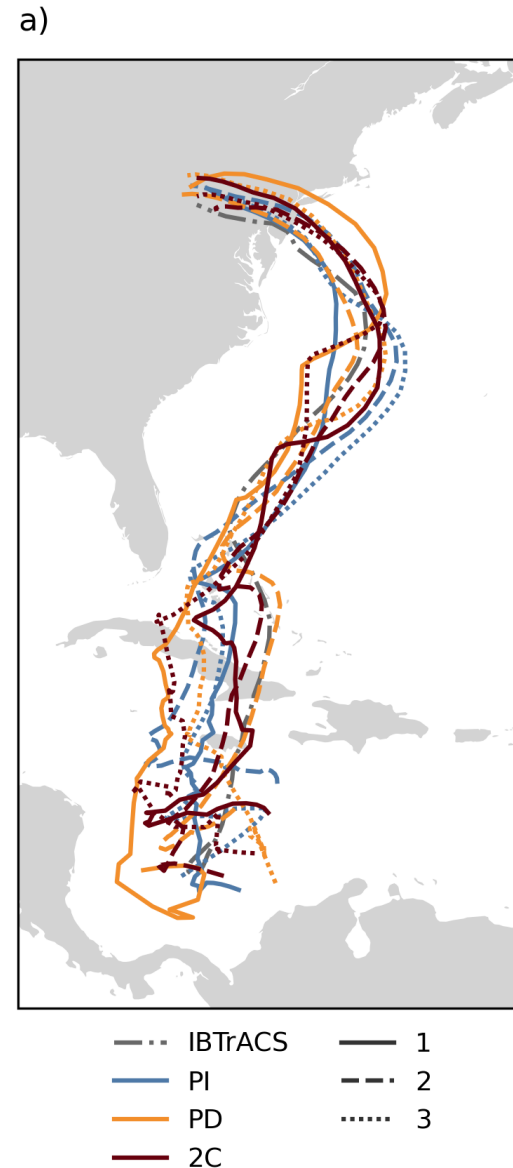
Modelling framework



Results

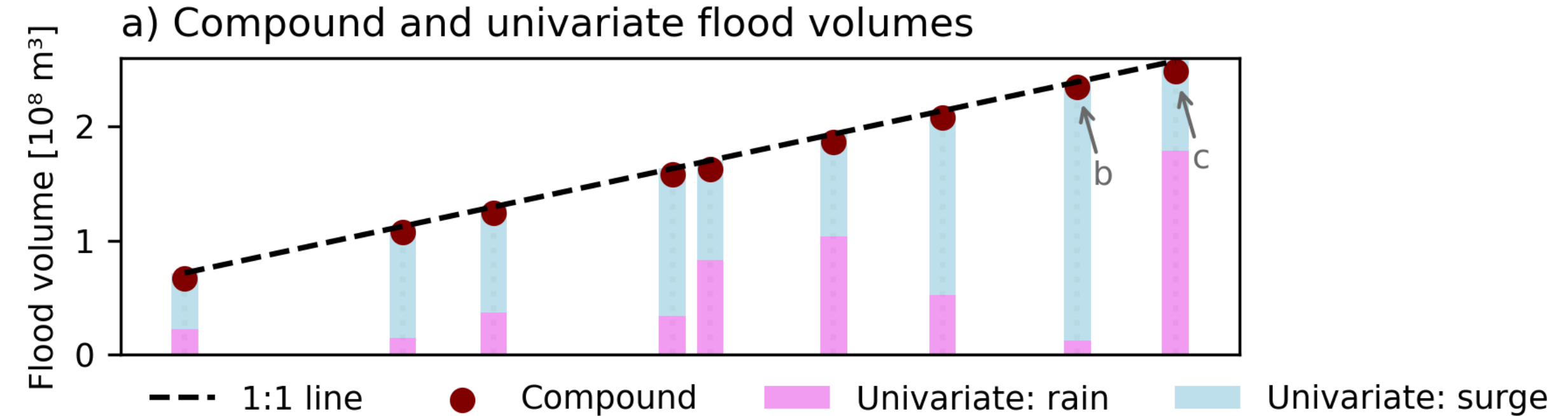
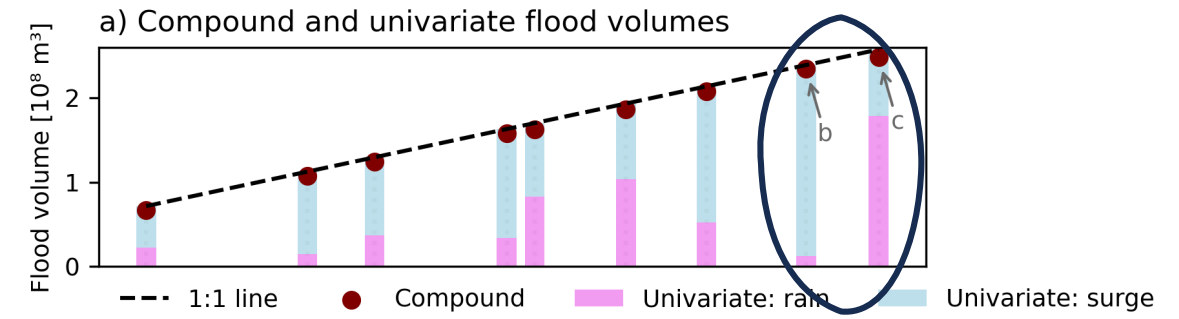
Spectrally nudged storms

- Synthetic runs show **spatial variability**;
- GW **increases** precipitation at peak values;
- **No changes in NYC** between GW levels.

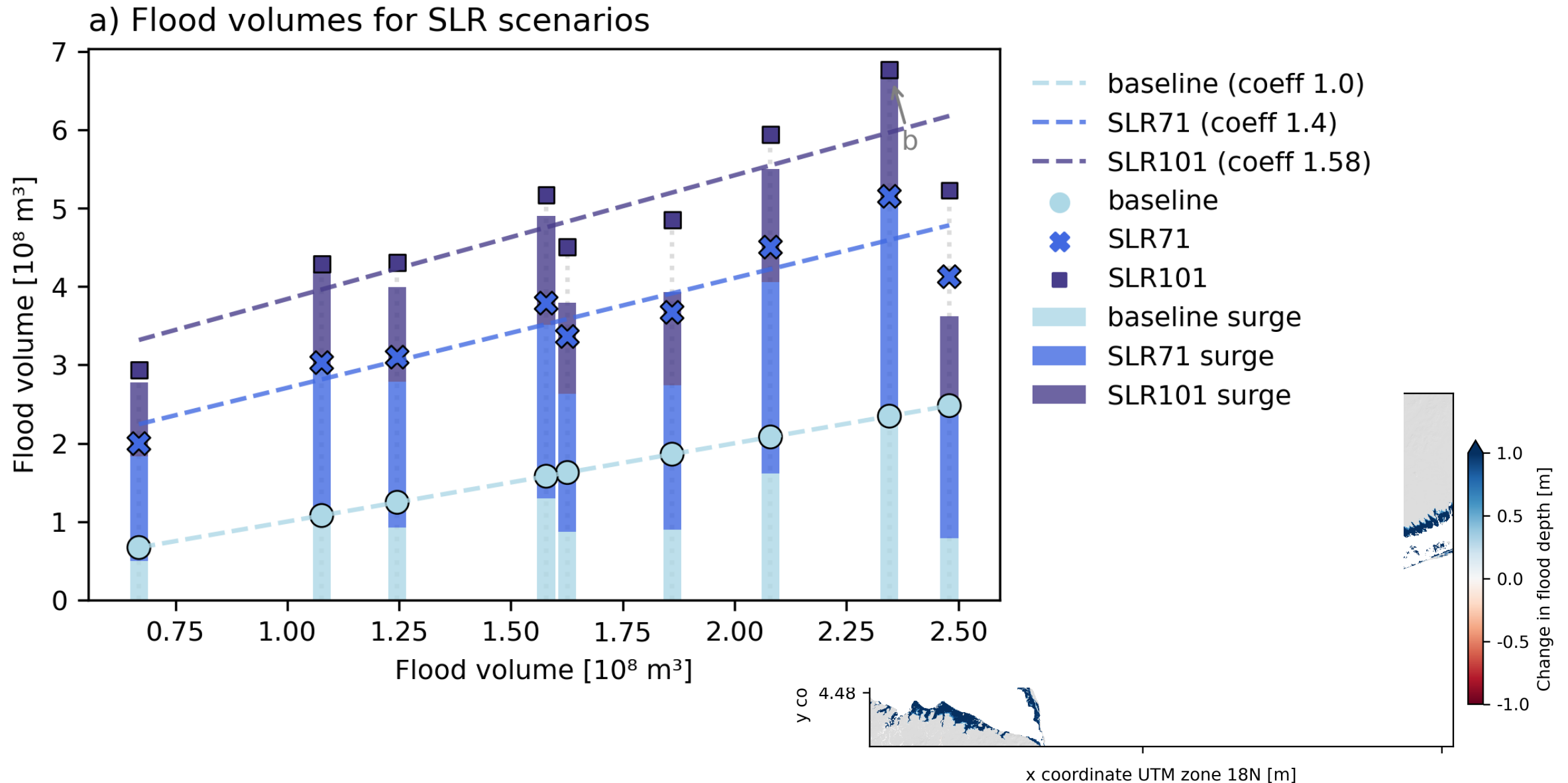


Coastal flooding

- Coastal flood is **compound**

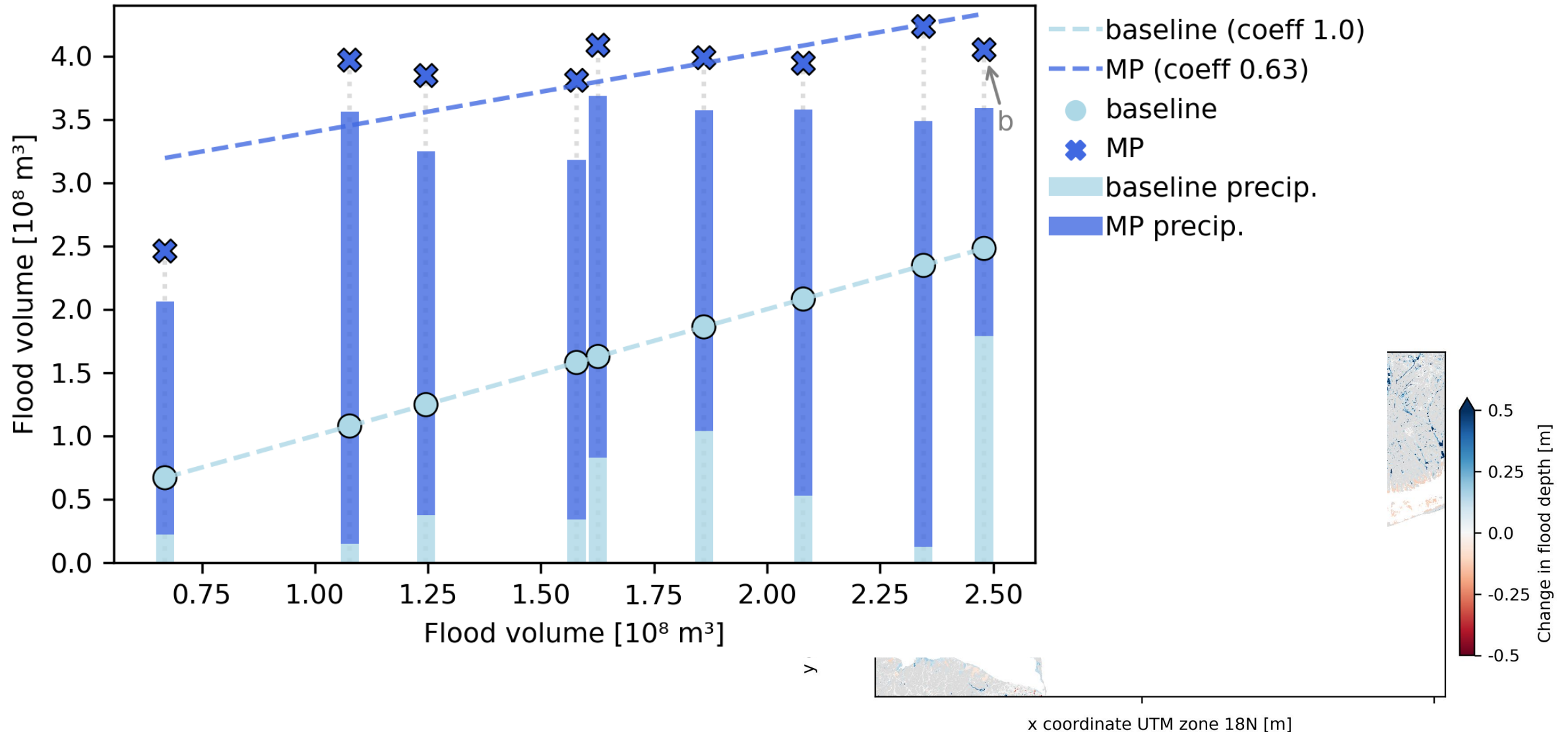


Sea level rise scenarios

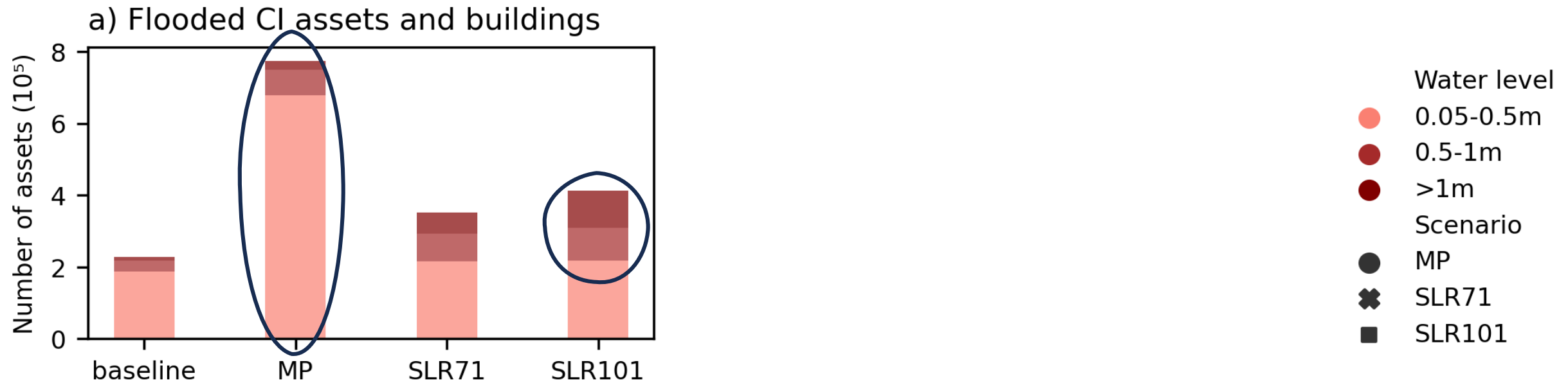


Maximum precipitation scenarios

a) Flood volumes for MP scenario

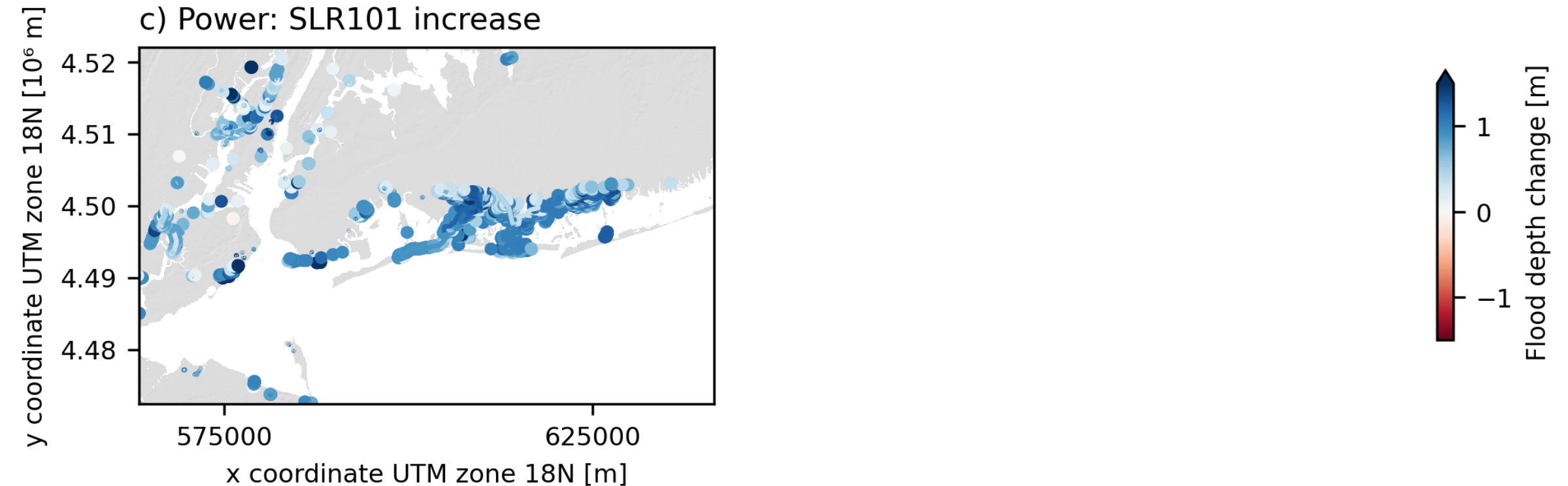


Critical infrastructure exposure



- MP leads to the highest increase in exposed assets;
- SLR leads to highest increase in assets exposed to high water levels;
- CI systems differ greatly, and decision making should account for that.

Critical infrastructure exposure



- CI systems differ greatly, and decision making should account for that.

Take home messages

- **Societal-relevant scenarios:** set of alternative (and plausible) scenarios offering insights into **alternative impacts** of historical events;
- **Modelling framework:** providing **direct** and **accessible** information for **decision makers**.

Storylines can be a valuable tool for future risk assessment and decision making.