Met Office

RISK and Resilience Day 13 March 2025

# Present-day risk from winter storms in the United Kingdom

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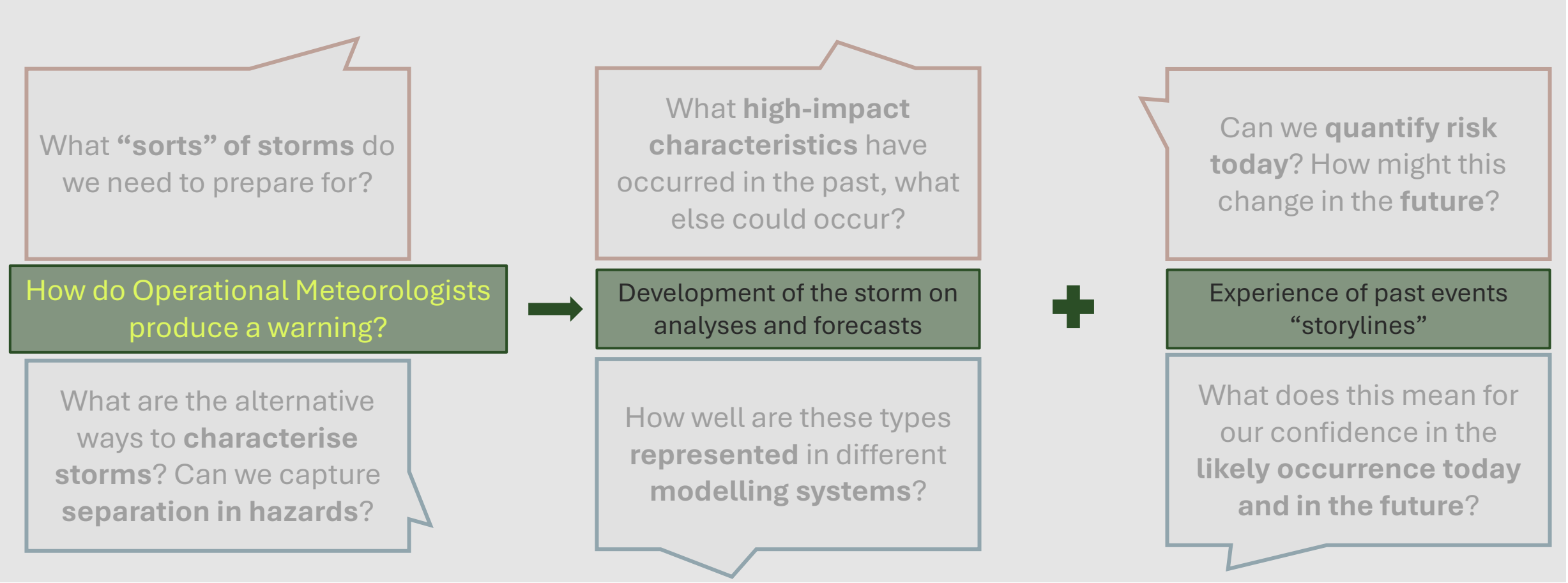
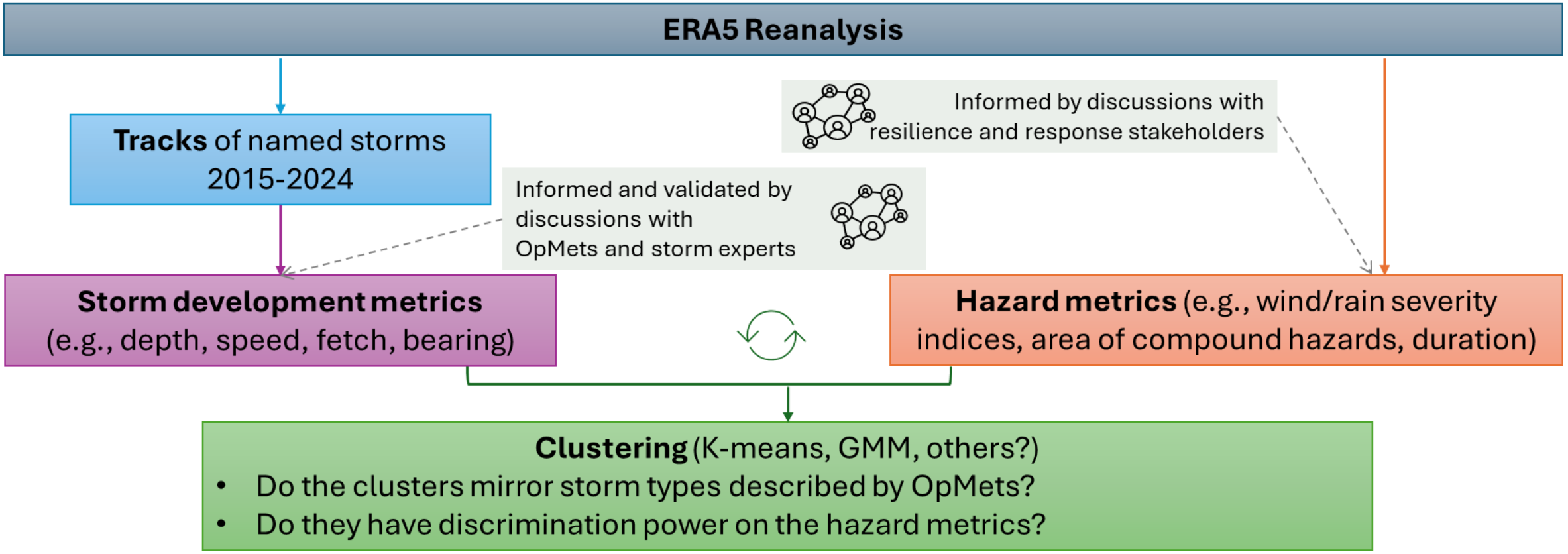
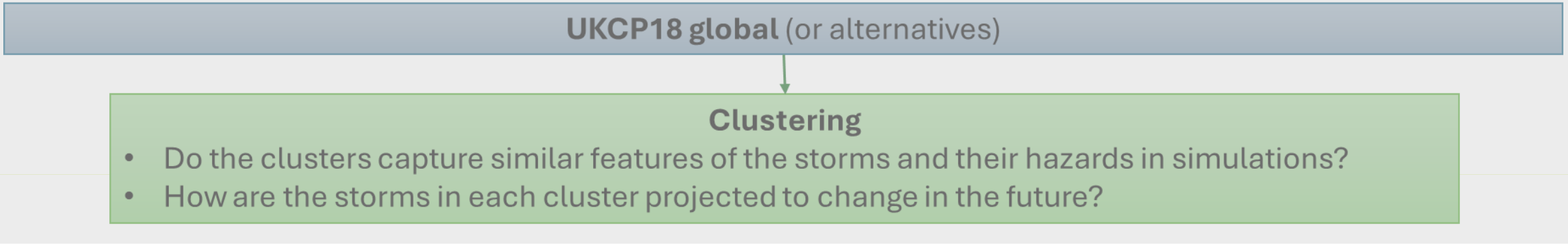
# Resilience community




# Science community

# Our project

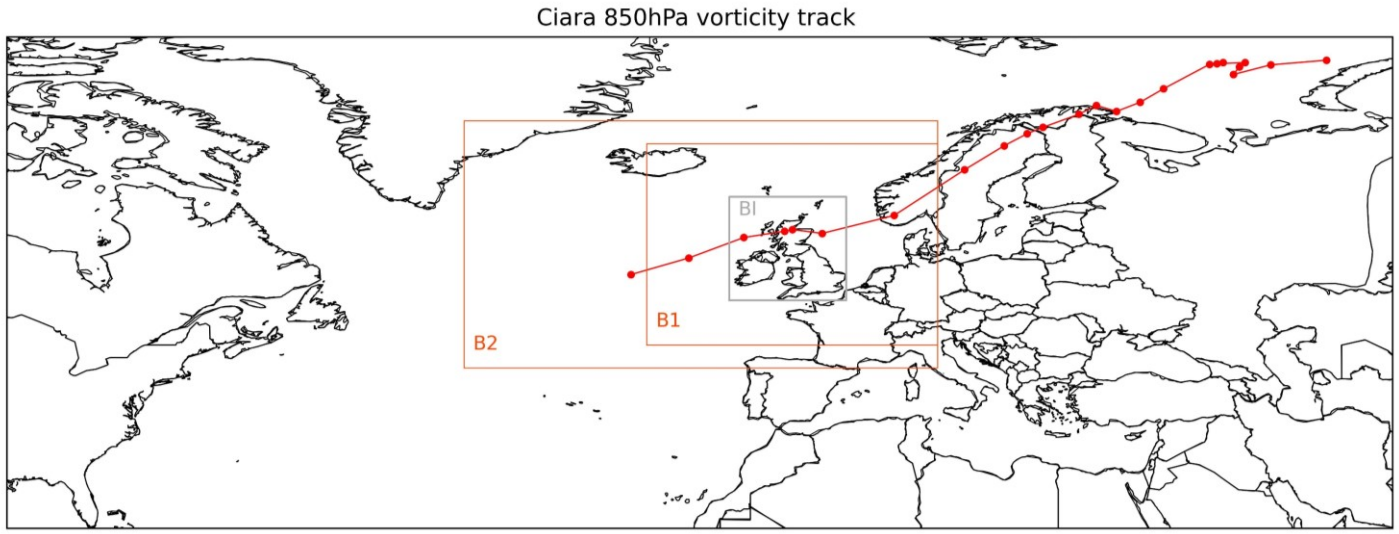

ERA5 Reanalysis
Tracks of named storms 2015-2024
Informed by discussions with resilience and response stakeholders
Informed and validated by discussions with OpMets and storm experts
Storm development metrics (e.g., depth, speed, fetch, bearing)
Hazard metrics (e.g., wind/rain severity indices, area of compound hazards, duration)
Clustering (K-means, GMM, others?)
• Do the clusters mirror storm types described by OpMets?
• Do they have discrimination power on the hazard metrics?

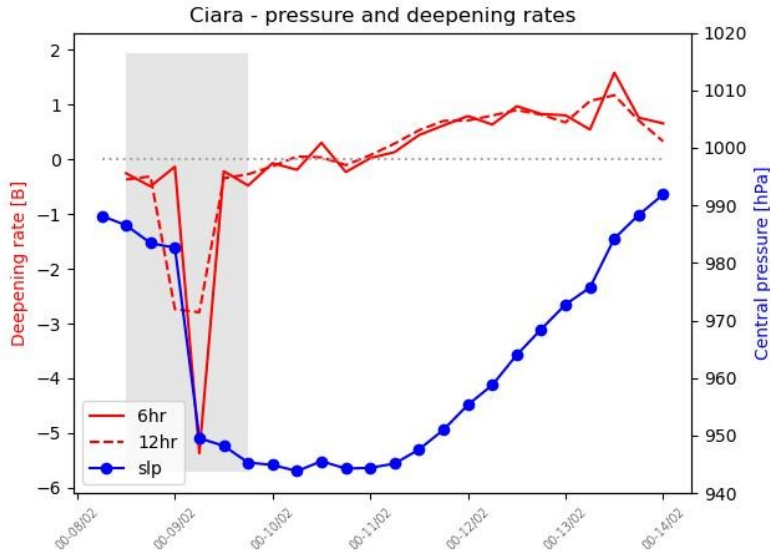

UKCP18 global (or alternatives)
Clustering
• Do the clusters capture similar features of the storms and their hazards in simulations?
• How are the storms in each cluster projected to change in the future?

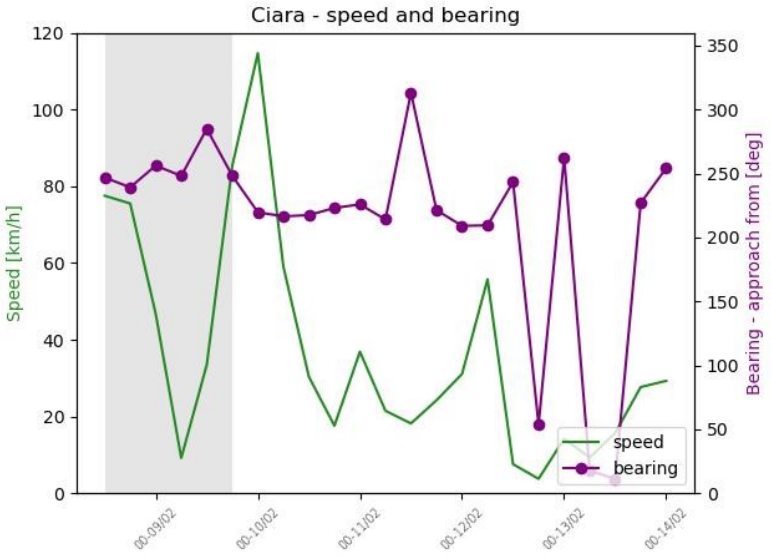
# Storm development metrics

- **Average speed [km/h]**
- **Minimum pressure [hPa]**
- **Maximum vorticity [1/s]**
- **Maximum deepening rate [B]**
- **Bearing**
- **Fetch (distance [km], duration [h])**
- **Warm seclusion [Y/N]**

- Refine spatial definitions
- Understand inter-dependencies
- Explore dimensionality reduction

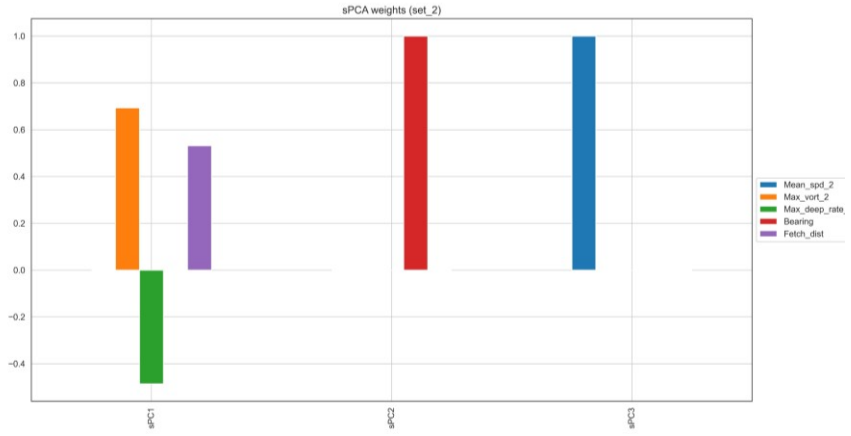


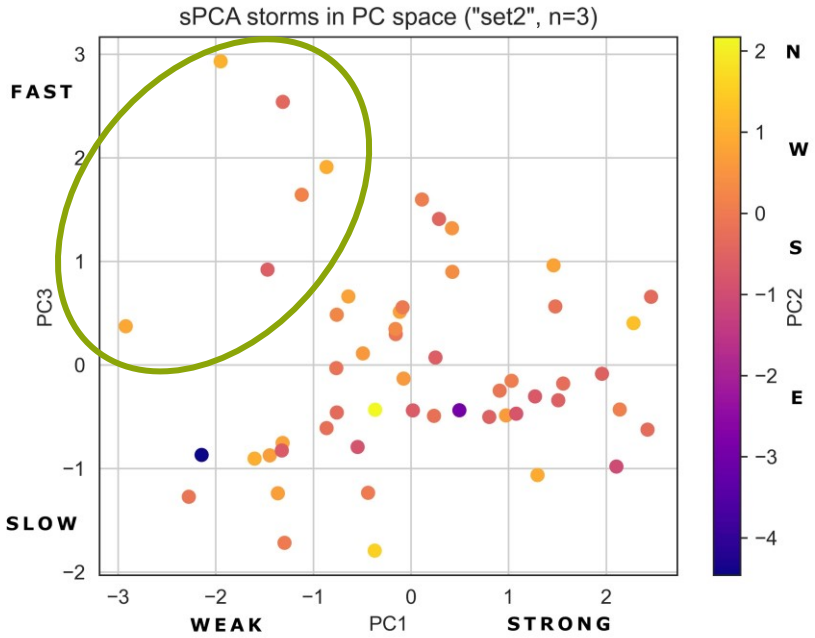



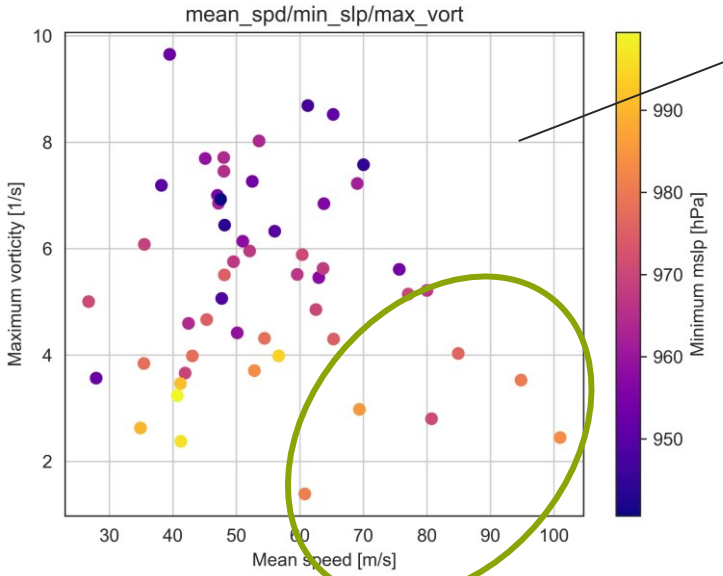



# Storm development metrics

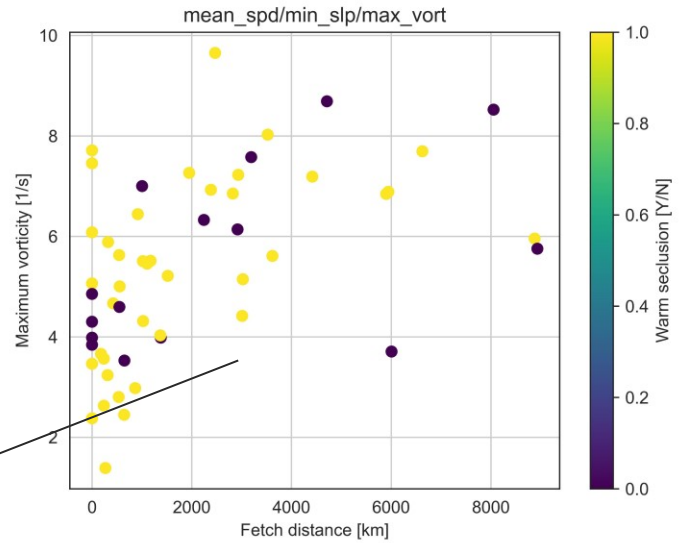
**Testing existing hypothesis** and narratives around storm types …



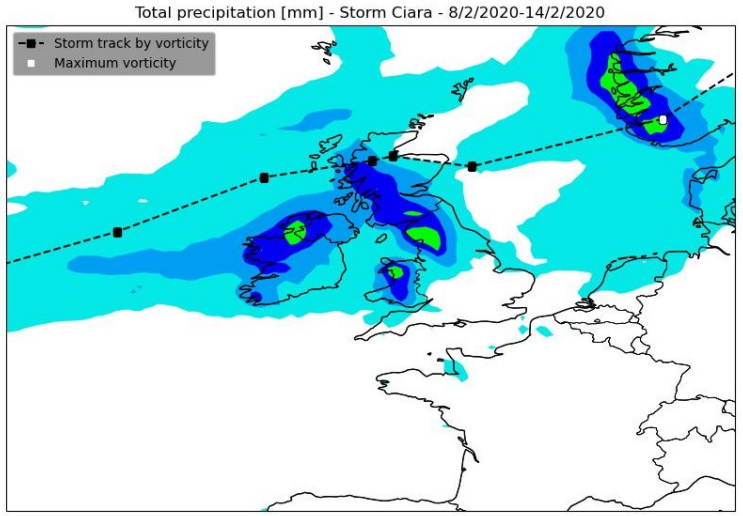

- High max vort ↔ low min mslp
- Slow weak storms **vs** fast strong storms **?** → maybe some exceptions

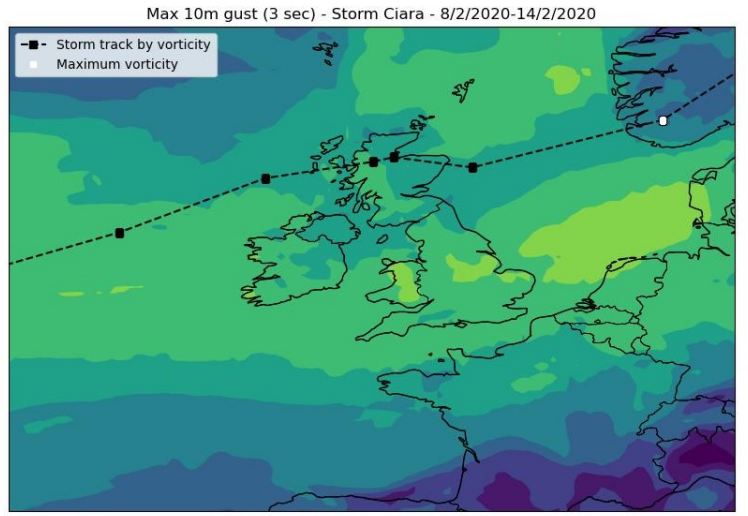


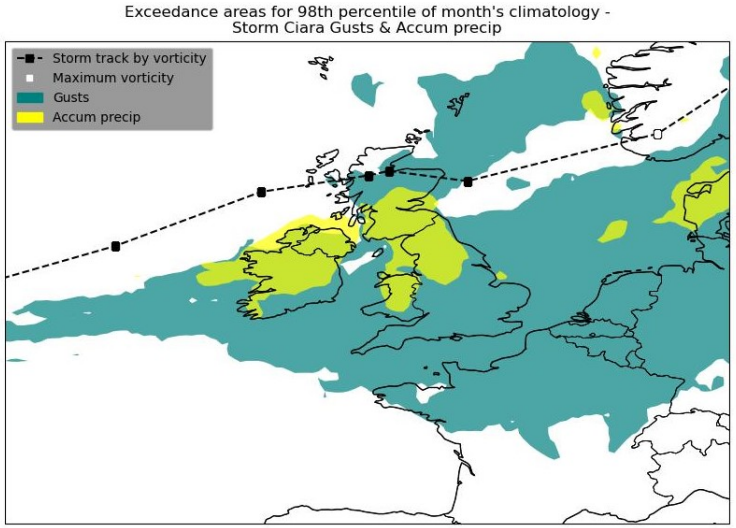

- Long fetch ↔ high max vort
- Long fetch ~~↔~~ warm seclusion

# Storm hazard metrics

- **Wind gust, total precip and rainfall rate footprints**
- **Areas and duration of 98th percentile exceedance**
- **Wind and rainfall severity indices**
- **Compound versions of all**

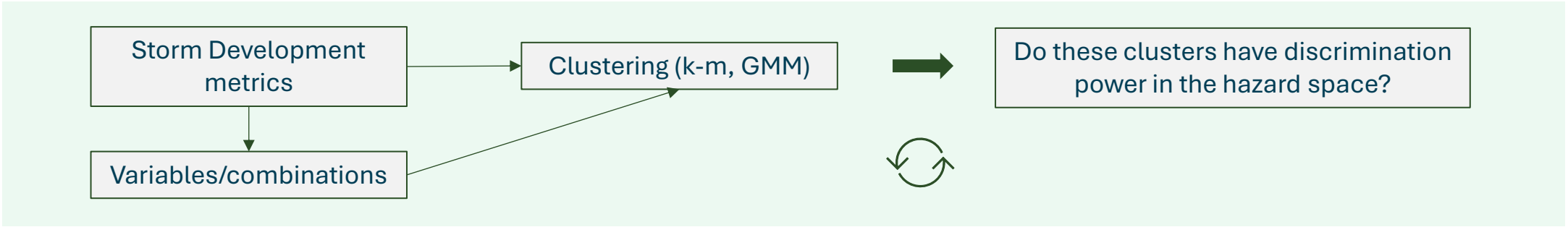


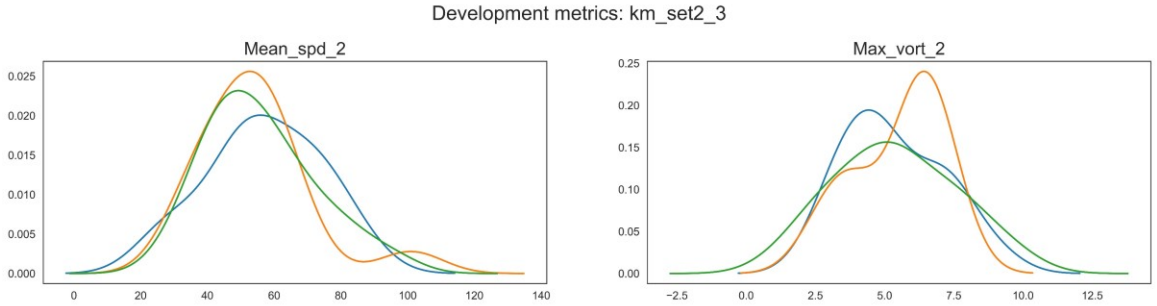



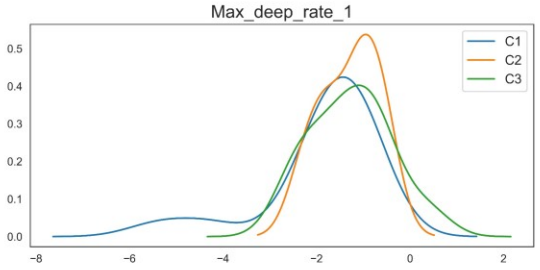

- Trying to capture impact-relevant metrics but constrained to "model world"

# Clustering

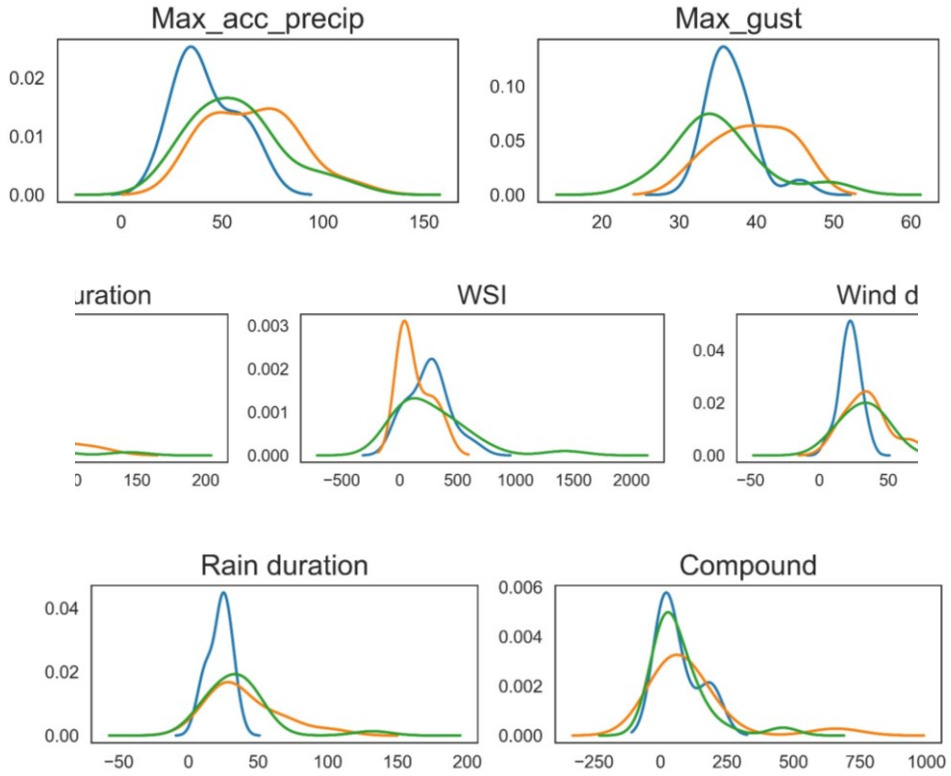



## SIMPLER CASE …




- C1: Fast - explosive storms
- C2/C3: slow – “weak” storms



# Future work

## Tracked storms in ERA5

- Are some storms **exceptions** to the OpMets storm typing? Why?
- What makes **named storms** “special”? → “named storm identifier”/”missing” named storms
- Are there **other categorisations** that better inform hazards?
- Can we incorporate **additional hazard metrics** linked to other impacts (e.g., storm surges)?

## Storms in models (hindcasts/UKCP18)

- Do the same **storm types** arise?
- Do the **relationships with hazard** metrics hold true?
- What can we say about **unprecedented/future “named storms”**?

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# Questions or comments?

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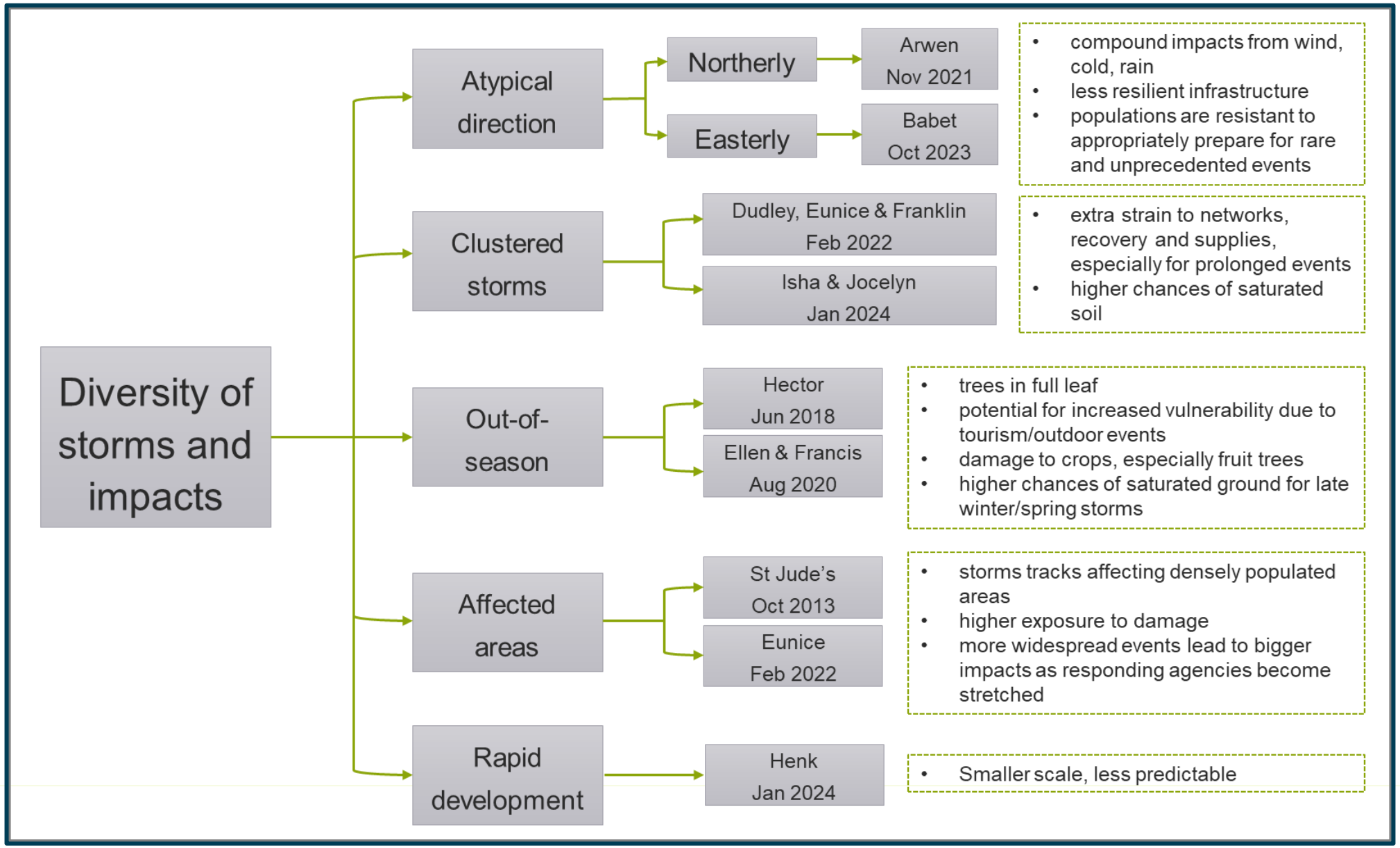
# What makes a storm impactful?