Summary of breakout group discussion
"Will AI/ML techniques lead to vast improvements in modelling EU WS?"

1. General role in climate/NWP modeling

- Full scale (data driven) AI climate models:
  - replace full GCM
  - ECMWF / Google
  - Most data-driven AI climate models use ERA5 reanalysis as training data set
- Hybrid physics-AI models:
  - replacing parametrizations in GCMs/RCMs
- Selected AI-applications for post-processing:
  - downscaling of GCM/RCM for footprints
  - Bias-corrections of GCM/RCM output

2. Use cases in EU WS cat models:

→ generally, at experimental stage but with selected successes

- Improving the hazard (footprints, catalogues of storms)
- Improving vulnerabilities (linking claims to risk characteristics) → one example where ML approach explored to link claims with building characteristics
- Exposure: done for augmentation of data (e.g, primary modifiers of buildings)
- Replacing a full cat model (risk of loss)?

→ rather not at claims data are likely too messy (reliable and homogeneous data needed for training

→ question of regulation if ML-methods are allowed, e.g. Florida hurricane commission currently not allowing ML-techniques as each number/approach needs to be auditable

3. Expectations & Potential

- Enable to create longer datasets at finer resolution (will help us to better understand return periods of events like Daria, Lothar)
- Better forecasts for EU WS / weather warnings
- Hard to say where the limits are but current focus on AI climate models still on stability and reproducing targets as good as possible
- AI models/applications will likely become a tool and part of the model landscape

4. Limitations & challenges

- What about extremes if not in training data? AI models typically miss mesoscale details because of the training data (typically ERA) but also the metrics for optimization (Z500)
- So far the training methods (optimizations schemes) seem to rather lead to too smooth outputs which again is a problem for extreme events
- challenges: need large computational resources to train AI models; and deal with all the data
- practicality: many ML-models in-hands of big tech with licensing model for commercial applications – use of these models will come with a price tag and potentially more a shift to corporate

5. Evaluation & trust

- need evaluation of AI models for windstorms before they can be used
- explainability: are sensitivity tests possible with AI models? ongoing AI-MIP initiative (analogue to CMIP)
- AI often seen as black box but so are GCMs with millions of code lines, we probably should have the same standards for both and just validate the specific aspects which we are interested in