

## STEPCLIM: Severe Thunderstorm Evaluation and Predictability in Climate Models

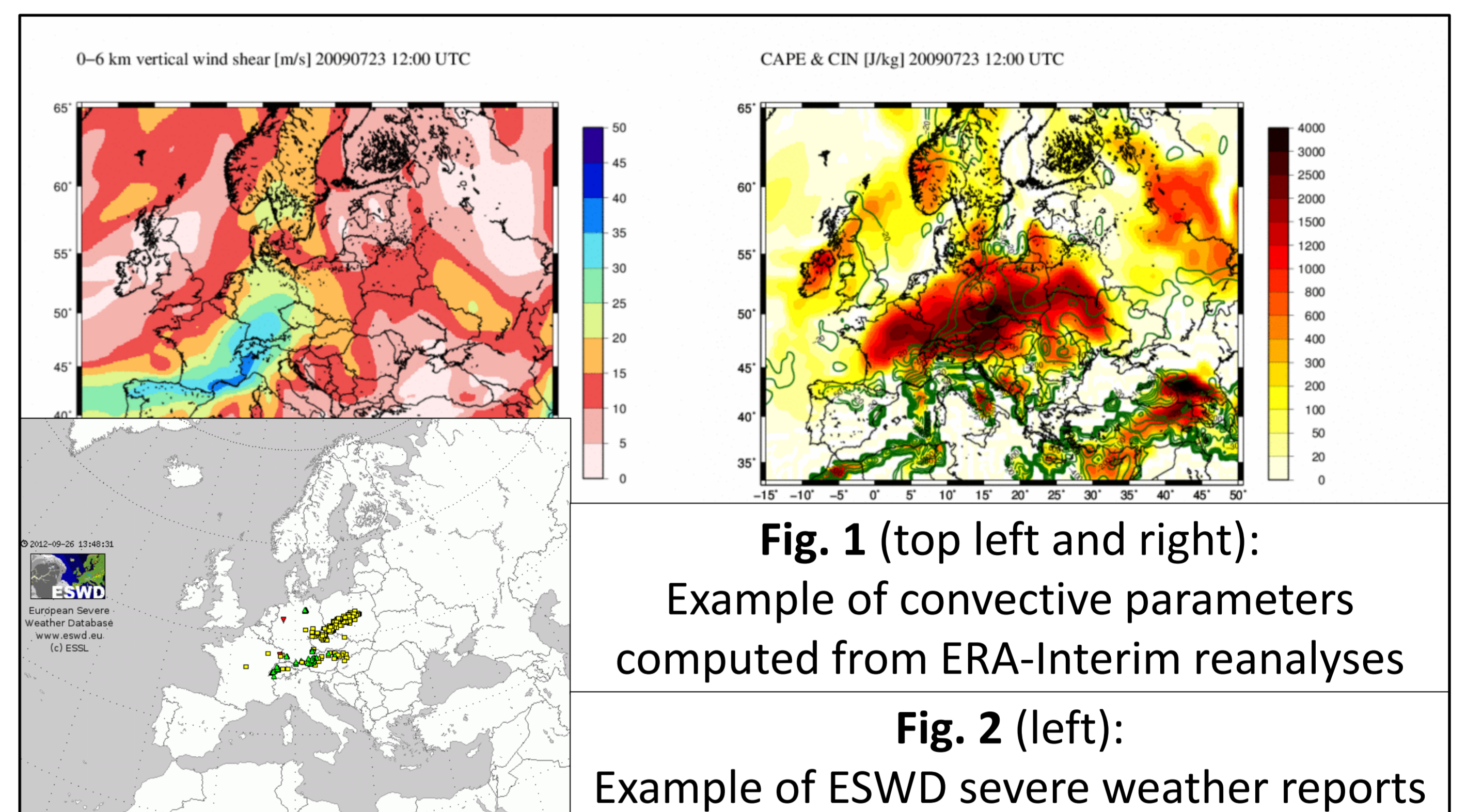
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### 1. Project goal

Decadal projections of severe thunderstorm risk in Europe

### 2. Data material

- ERA-Interim reanalyses 1979-2011 (Fig. 1)
  - ( $\Delta = 0.75^\circ$ )
- European Severe Weather Database (Fig. 2)
  - <http://www.eswd.eu>

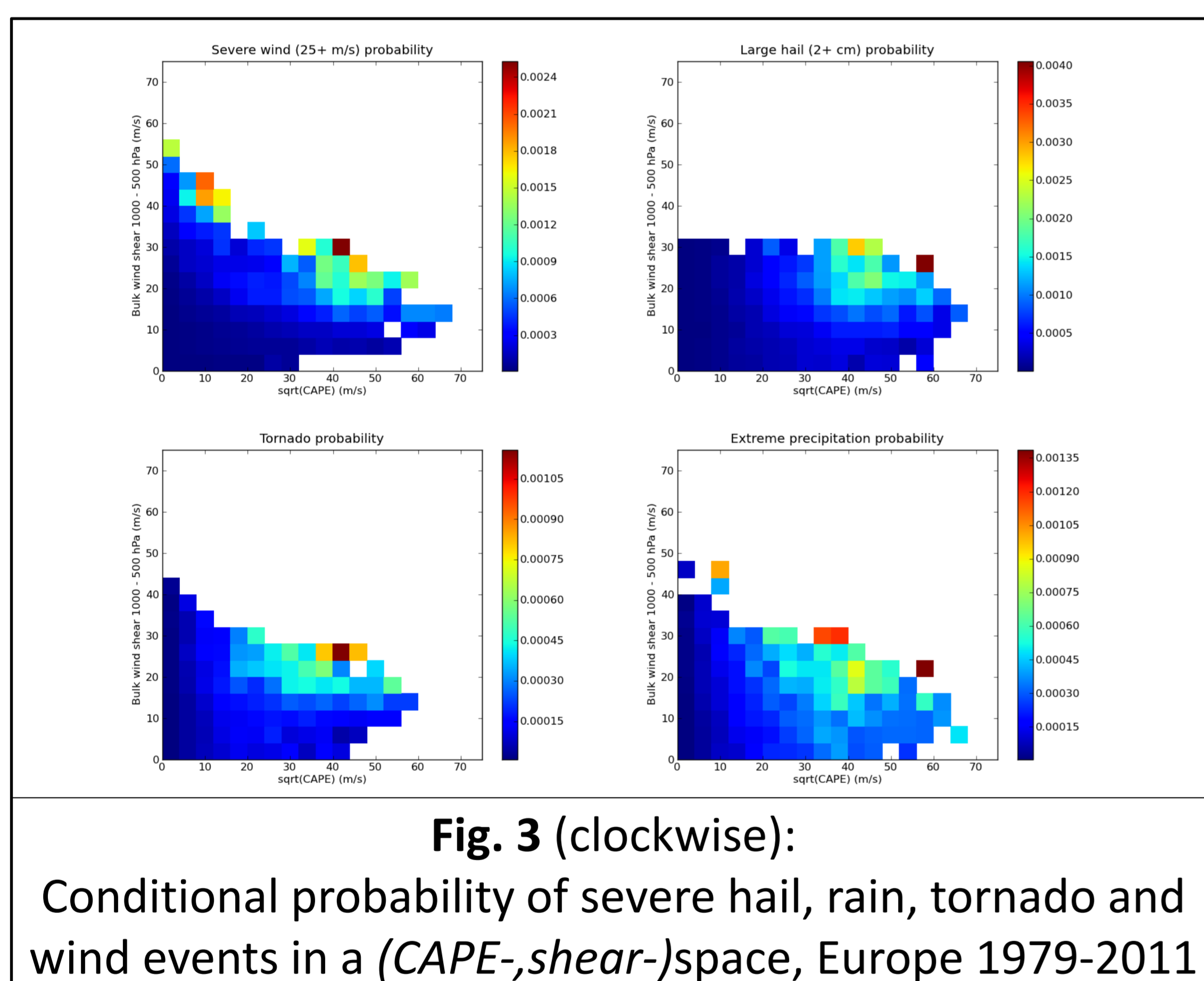


**Fig. 1** (top left and right):  
Example of convective parameters computed from ERA-Interim reanalyses

**Fig. 2** (left):  
Example of ESWD severe weather reports

### 3. Methodology and accomplished work

- Relate observed severe thunderstorm events to a set of parameters (“proxies”) derived from reanalysis data (Fig. 3)
  - So far:  $x_1 = \text{CAPE}$ ,  $x_2 = \text{0-6 km vertical wind shear}$
- Fit an analytical function to the occurrence frequency  $f(x_1, x_2)$  of certain proxies
- Fit an analytical function to the probability of severe weather  $P(x_1, x_2)$
- Model the expected number of severe weather events (Fig. 4)

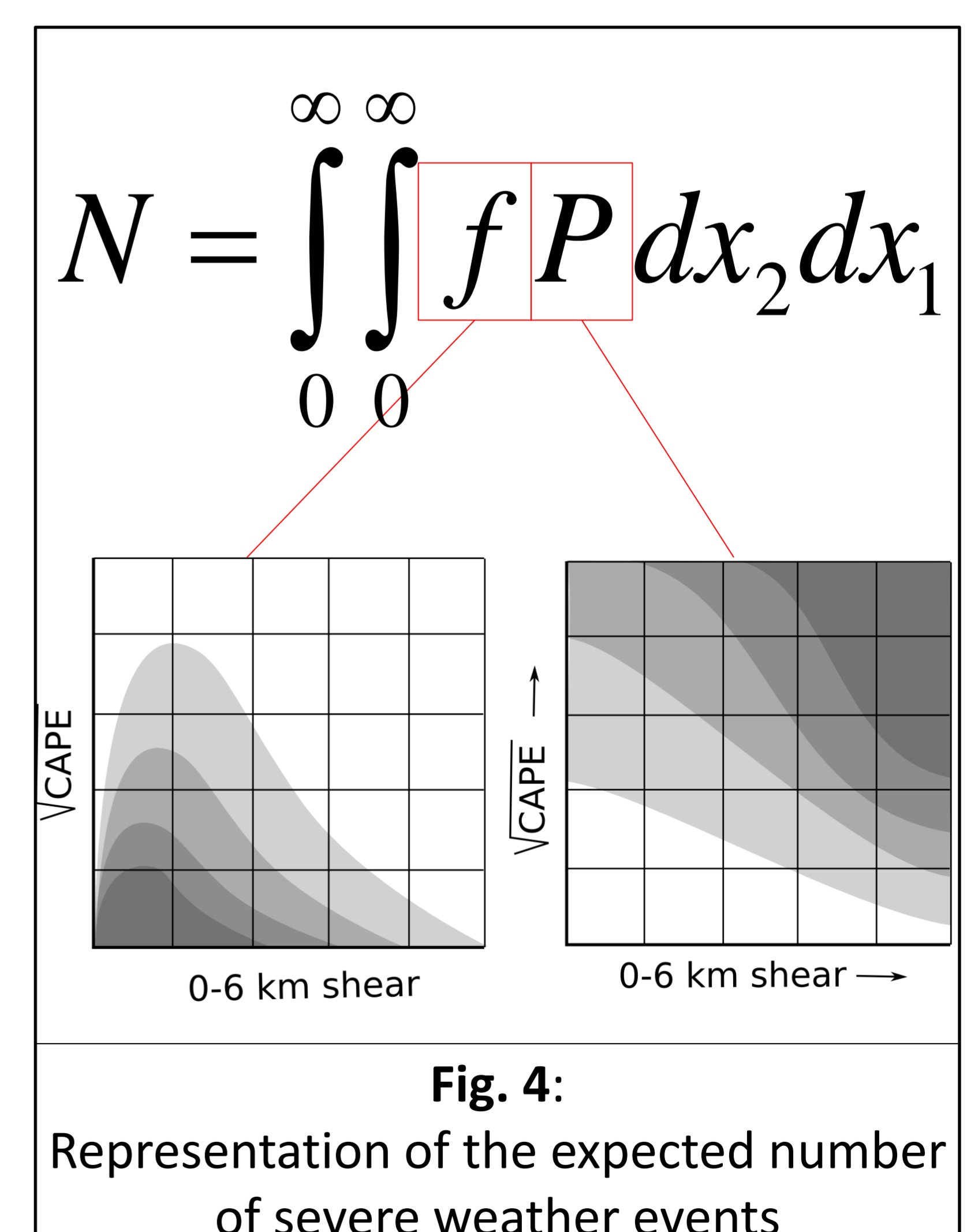


**Fig. 3** (clockwise):

Conditional probability of severe hail, rain, tornado and wind events in a (CAPE-, shear-)space, Europe 1979-2011

### 4. Next steps

- Account for underreporting of severe weather events
  - Tentative: derive analytical functions only from subdomain with reliably high reporting rate, e.g. Germany & Austria since 2004
- Expand parameter space to  $(x_1, x_2, \dots, x_n)$  and test predictive skills of further proxies
  - In particular: find a proxy for likelihood of convective initiation
- Repeat examination for MiKlip reanalysis fields to address benefit of a finer model resolution
  - MiKlip: “medium-range climate forecasts” ( $\Delta = 0.22^\circ$ )
- Apply to MiKlip forecast data for assessment of future severe storm hazards



**Fig. 4:**  
Representation of the expected number of severe weather events