

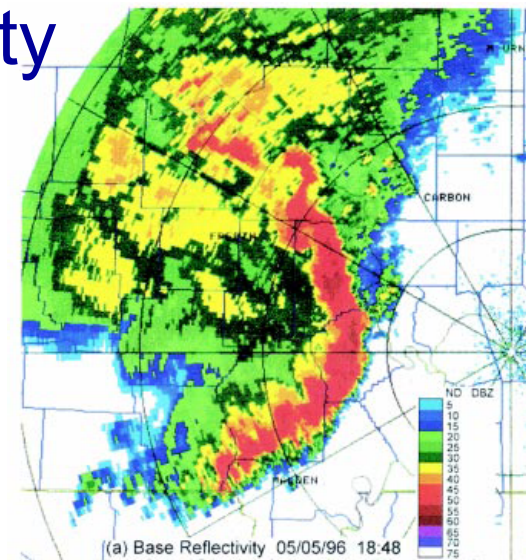
Severe Bow-Echoes in Germany

Christoph Gatzen¹

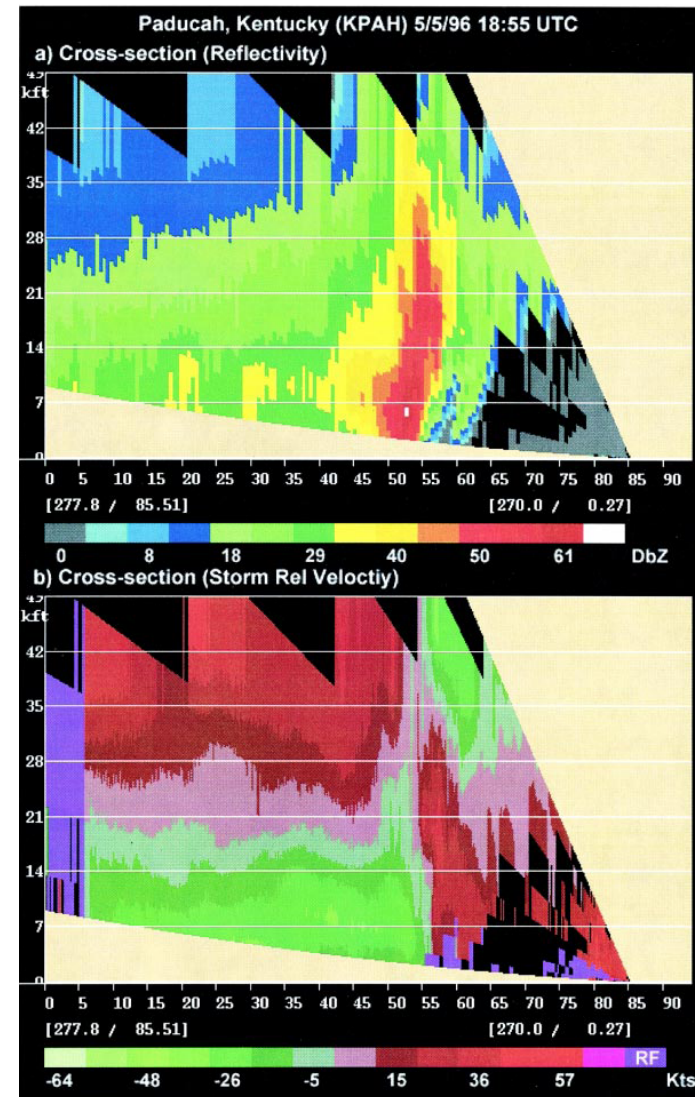
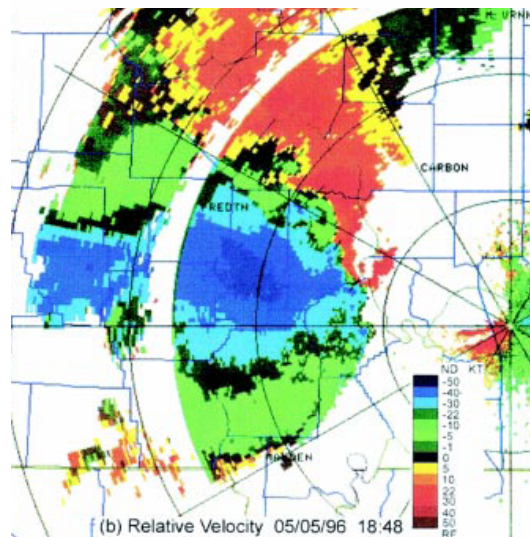
¹European Storm Forecast Experiment, gatzen@estofex.org

Bow Echoes

Reflectivity



Relative Velocity



Bow Echoes

Klimowski et al. (2003): Severe convective wind reports in the Northern High Plains (May-September 1996-99)

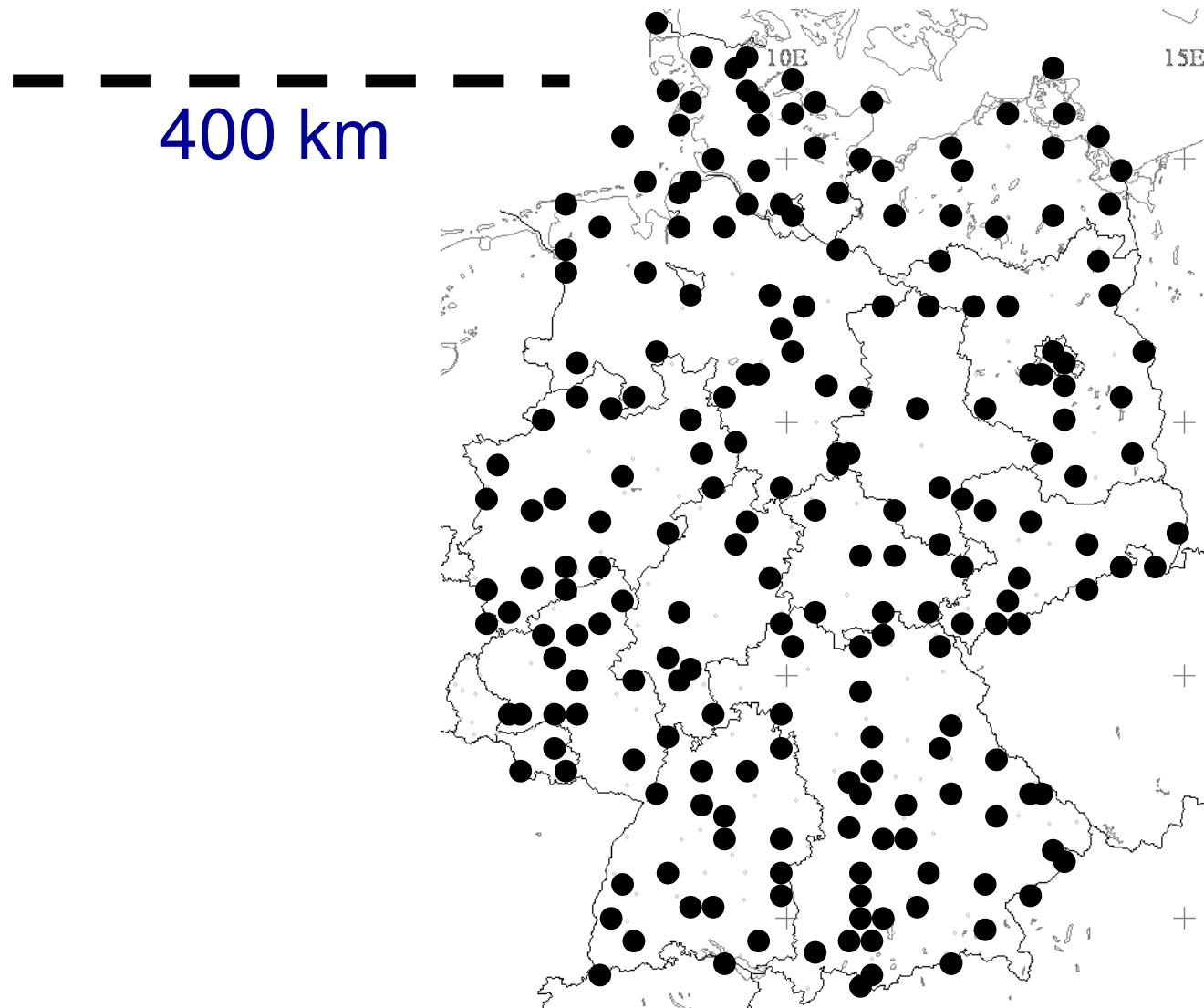
49 % of the wind reports associated with bow echoes or squall lines

29 % associated with isolated events

Severe wind gusts >25 m/s in Germany

- Connection to organized convection like bow echoes
- Concentration on the warm season (April-September)
- Data set: 6-hourly maximum wind gusts (1997-2000); 1-hourly (2000-2011)
- Plan view 0.25-hourly radar reflectivity (1997-2011)

Wind gust observation network



Radar data and classification

- Search for deep moist convection close (<20 km distance) to every severe wind gust report
- Distinction between Bow Echoes and non-Bow Echoes

Radar data and classification

- Criteria for Bow Echo Classification following Burke and Schultz (2004), Klimowski et al. (2000)
 - Bow or crescent shaped radar echo
 - Tight reflectivity gradient on the convex edge
 - Increasing radius with time (when detectable)
 - Vertical cross sections of storm-relative radial velocity not available.

Radar data and classification

- Bow Echo Classification after Klimowski et al.:
 - “Classic Bow Echo”
 - “Squall line Bow Echo”
 - “Bow Echo Complex”
 - “Cell Bow Echo”

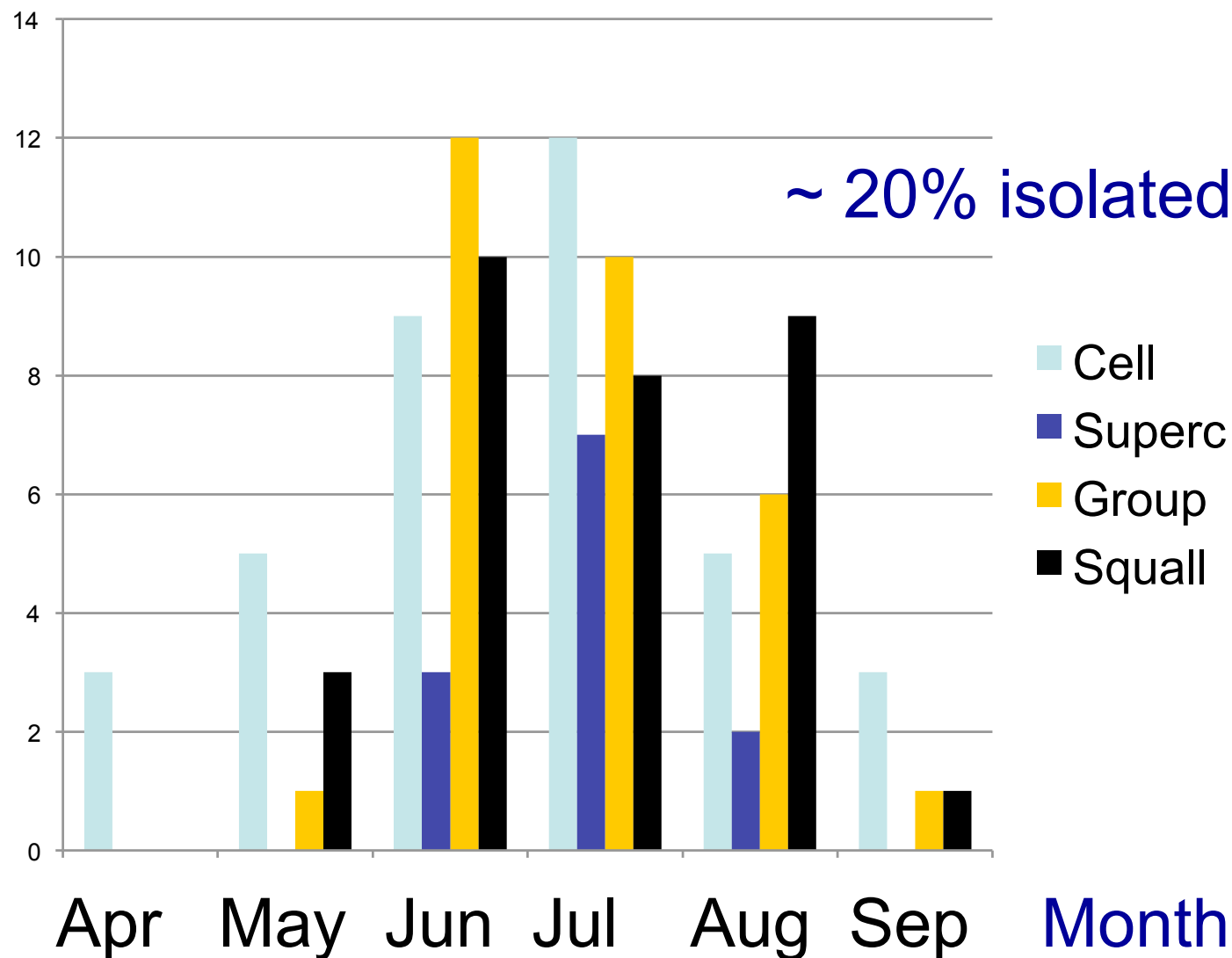
Radar data and classification

- Registration for every event
 - Start and end time (bow echo structure)
 - Size (largest secant)
 - Path length of severe wind gusts
 - No. of reports
 - Maximum wind gust
 - Origin (Cell, Squall line, Supercell, Group, Merger)
 - Weather pattern (strongly and weakly forced)

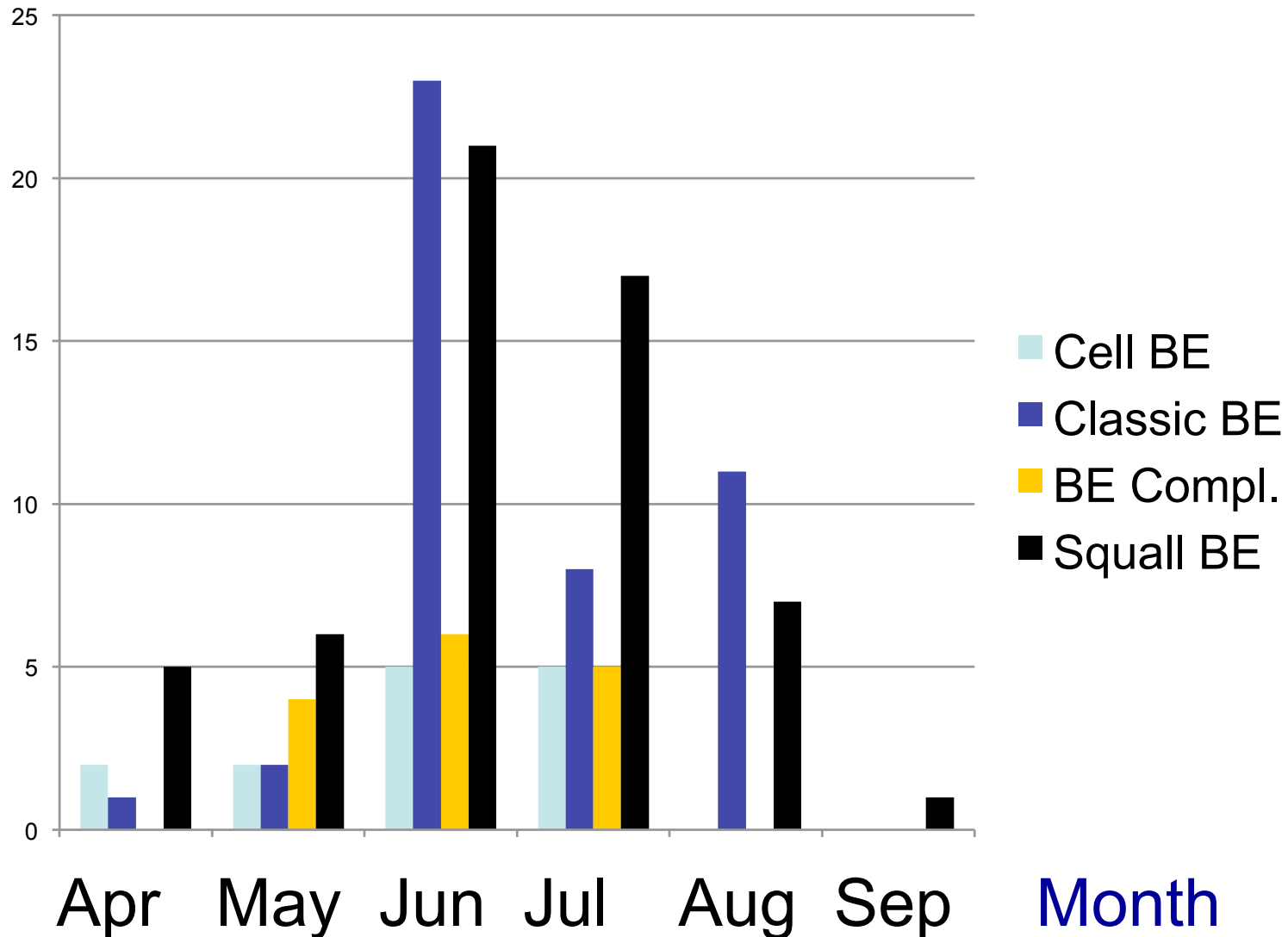
Results

- Almost every severe wind gust occurred close to convection except for mountain stations and at the coasts
- 265 wind events with 862 storm reports > 25 m/s close to convection
- Nearly 50 % of the events were classified to be non-bow echoes.

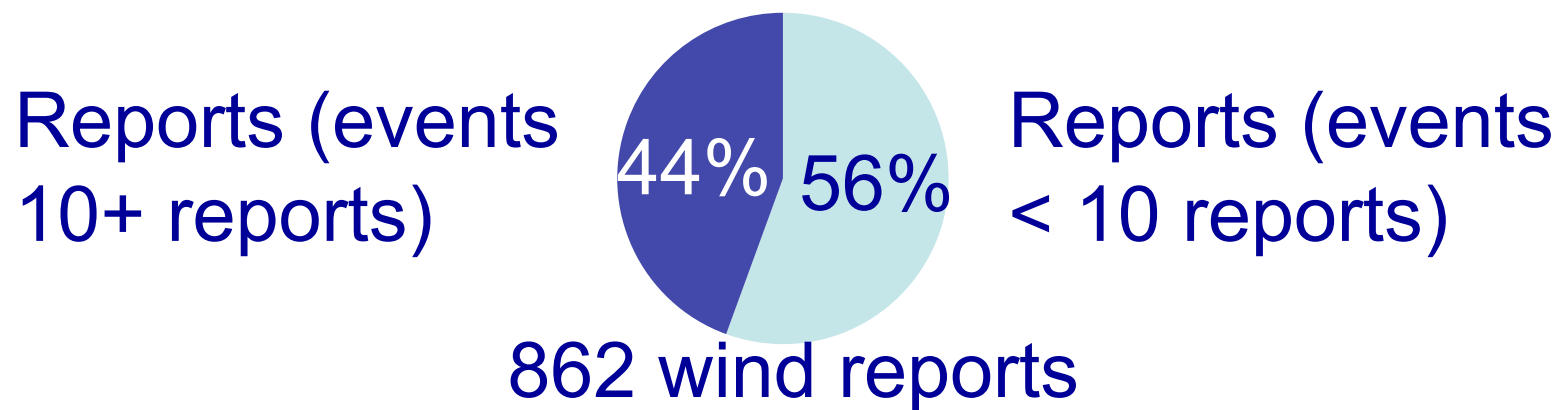
No. of events Non-Bow Echoes



No. of events Bow Echoes



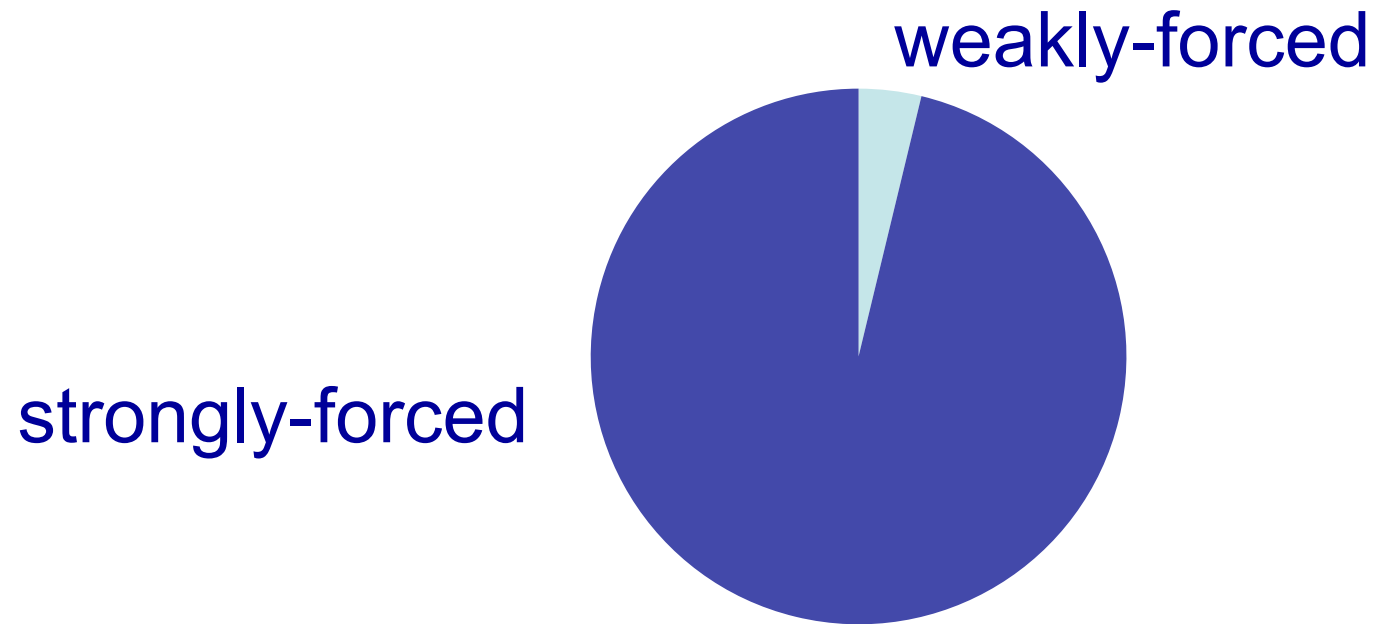
Severity



20 events with more than 10 reports:

- 19 reports/event on average (2 reports for other events)
- 15 events had a path length of 400 km or more

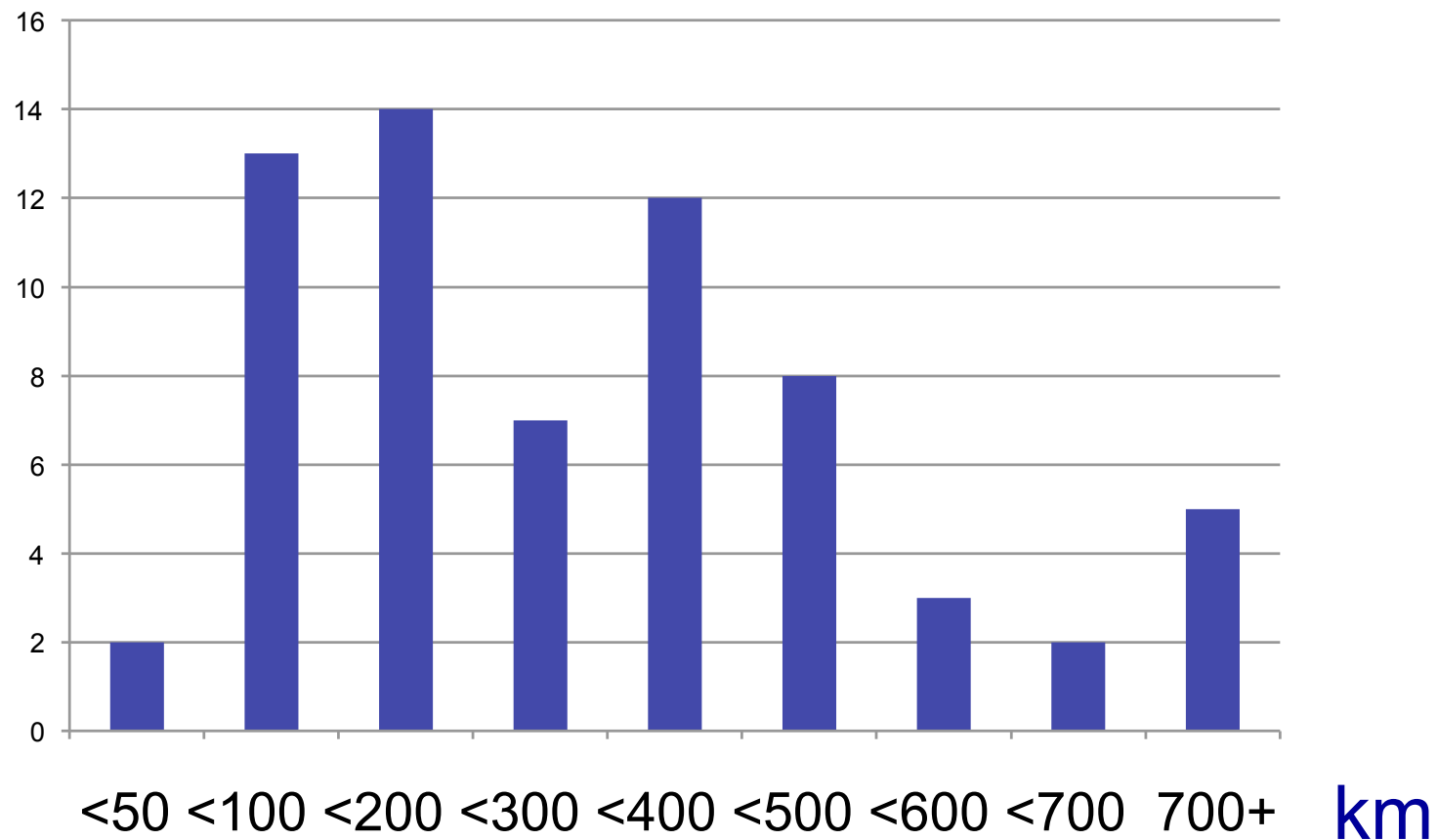
Weather pattern



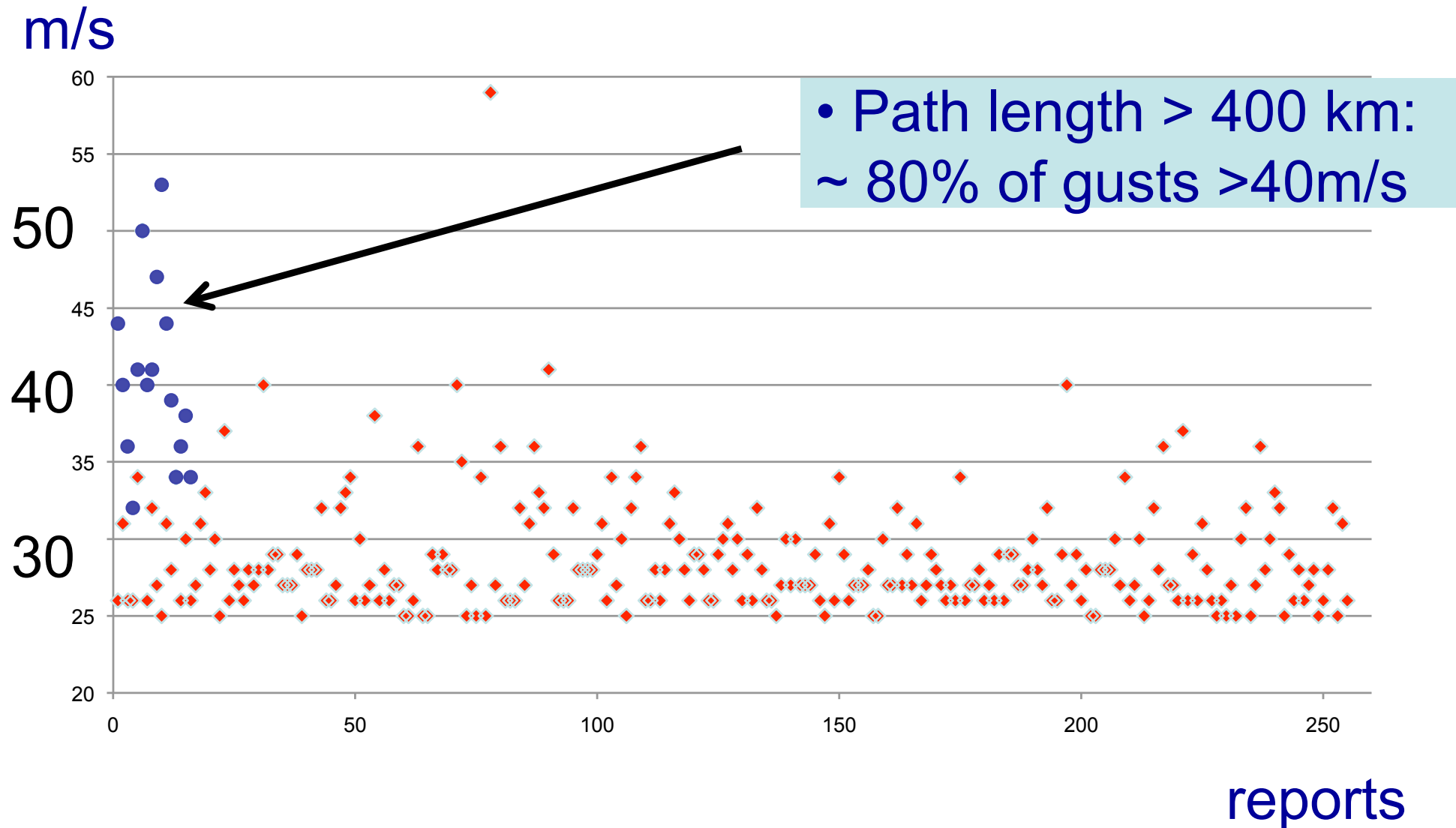
Most events were strongly-forced,
only 10 events (3 %) were identified
with weakly-forced situations

Path length

events



Maximum wind gusts



Summary

Severe convective wind gusts in Germany in the warm season

- occurrence in strongly-forced situations
- importance of big events
- importance of bow echoes
- bow echo maximum from June-August
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