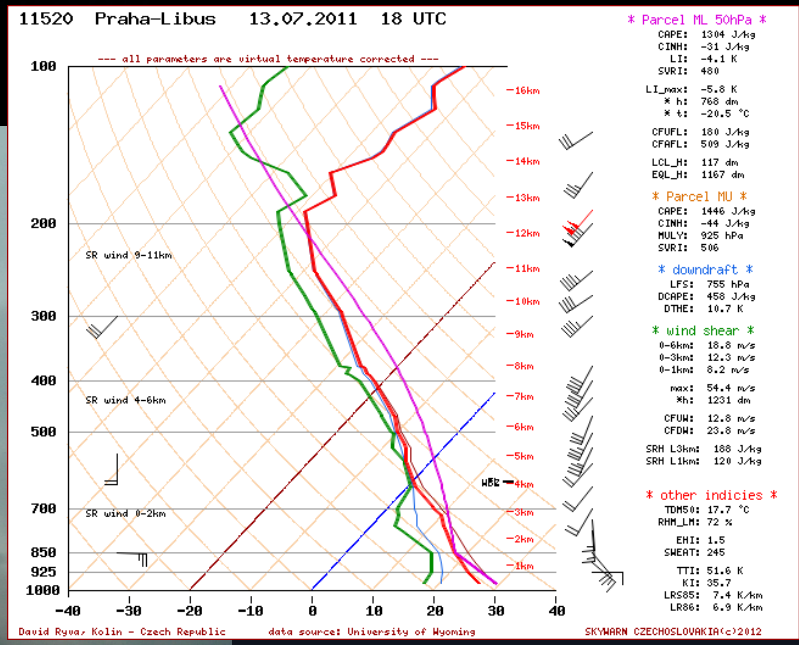
SOUNDING DERIVED PARAMETERS AND THEIR ABILITY TO FORECAST SEVERE WEATHER THREATS FOR THE REGION OF CENTRAL EUROPE



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MOTIVATION and GOALS

- Most of the forecasting studies using parameters deal with US – „Plains" area

- Concentration on tornadoes, less so on severe wind gusts and other phenomena

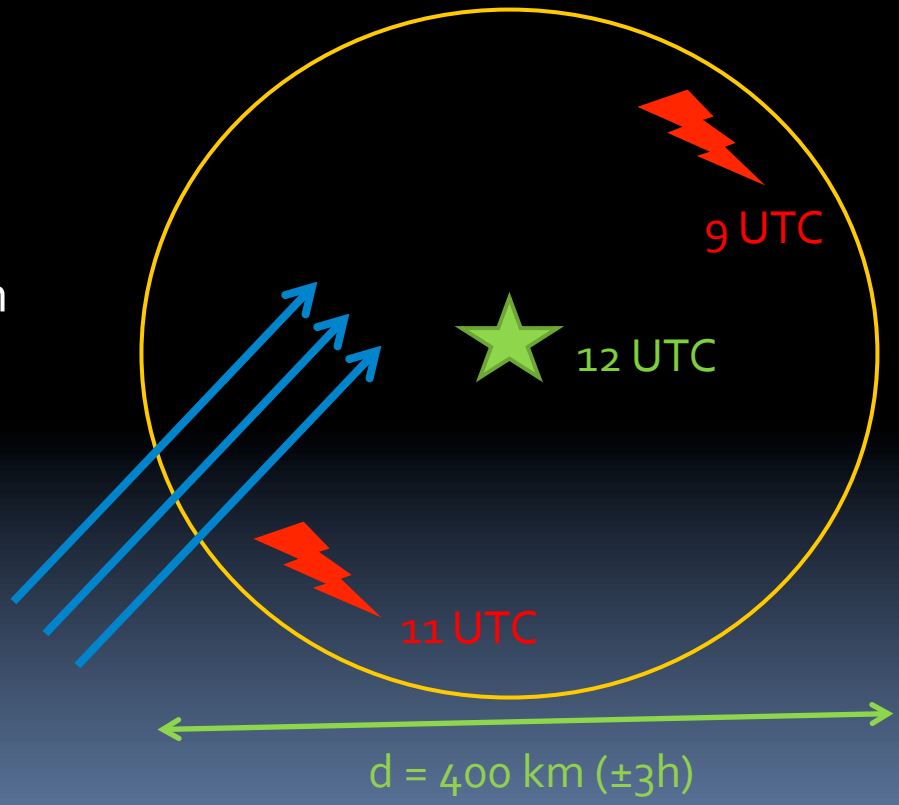
-> Create a database of proximity soundings for thunderstorms in the region of Central Europe

-> Determine which parameters / indices are relevant for individual severe tstm threat forecasting

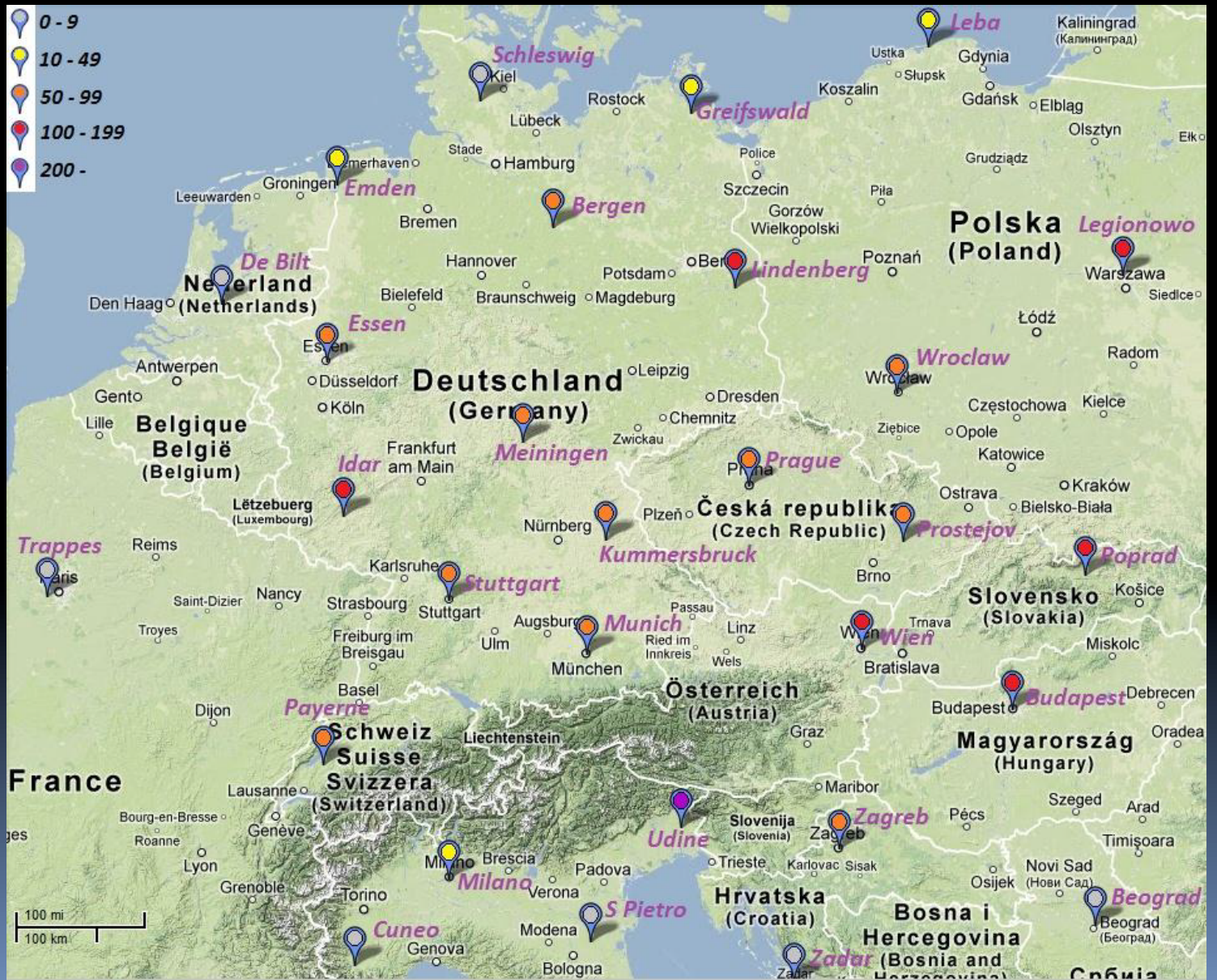
METHODOLOGY I

- 4 years of thunderstorm activity (2008-2011): **EUCLID data**
- **Severe weather: ESWD**
- **Proximity sounding**
  - 200 km radius, +/- 3 h restriction
  - advection consideration
  - other effects

Total: 1962 soundings



SOUNDING LOCATIONS



WHAT IS SEVERE WEATHER?

- 3 intensity categories: non-severe, severe, ex. Severe

- Severe weather criteria for 3 phenomena

- problematic especially concerning excessive precipitation

Type	Intensity		
	0 Non-severe	1 Severe	2 Ext. severe
Hail	D < 2 cm	2 ≤ D < 5 cm	D ≥ 5 cm
	No damage	Minor	Major
Gust	G < 25 m/s	25 ≤ G < 32 m/s	G ≥ 32 m/s
	No damage	F0, isolated F1	F1+
Rain	RR < 50mm/3h	RR ≥ 50 mm/3h	RR ≥ 100 mm/3h
	RR < 70mm/6h	RR ≥ 70 mm/6h	RR ≥ 150 mm/6h
	No flooding	Minor flooding	Major flooding

TESTED PARAMETERS

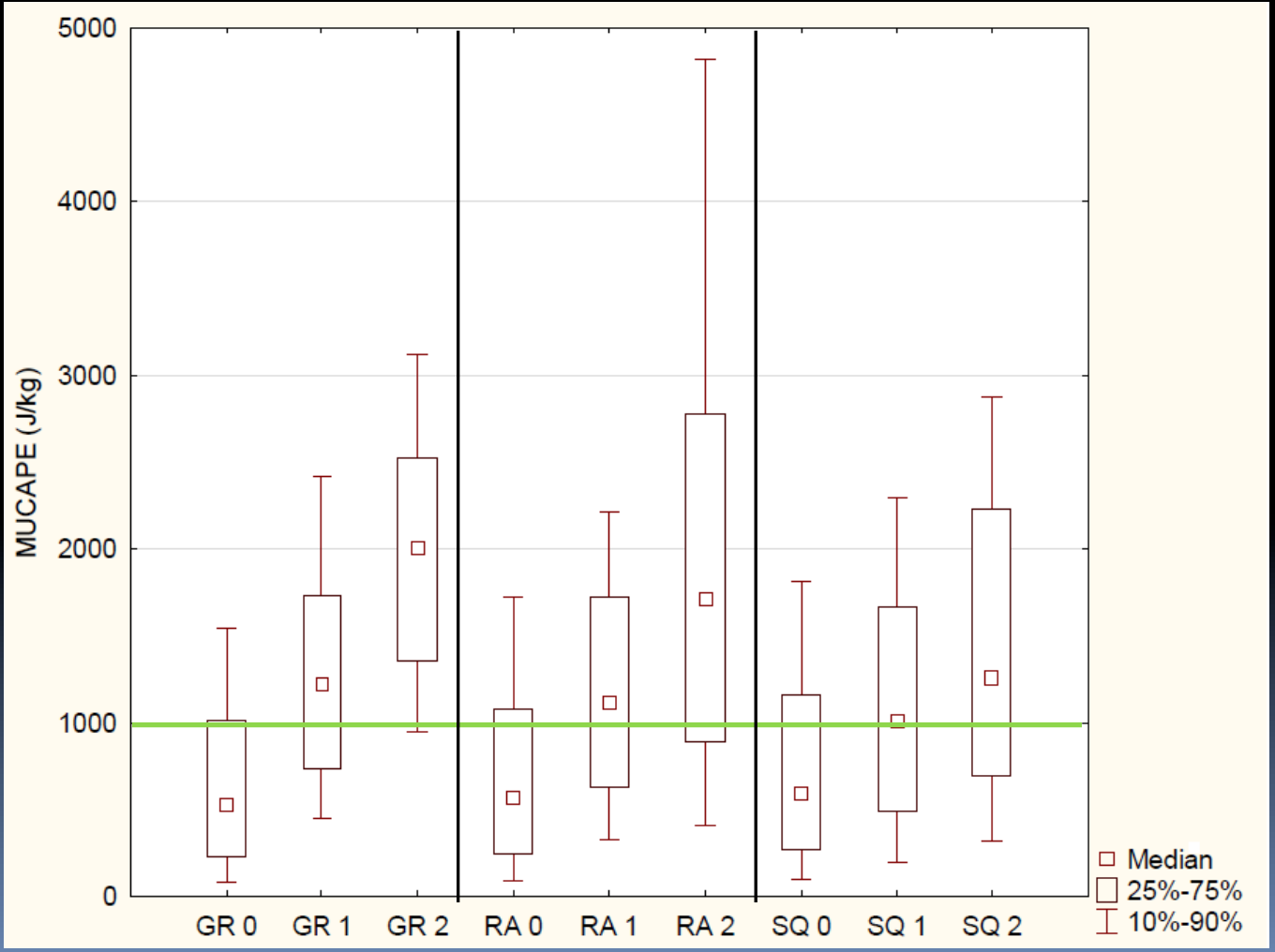
- Evaluation using non-parametric statistical tests (Kruskal-Wallis and Mann-Whitney U test)
- ***Instability – related indices***
- ***Wind shear – related indices***
- ***„Composite" indices***
- ***Miscellaneous***

RESULTS

- Some general points:

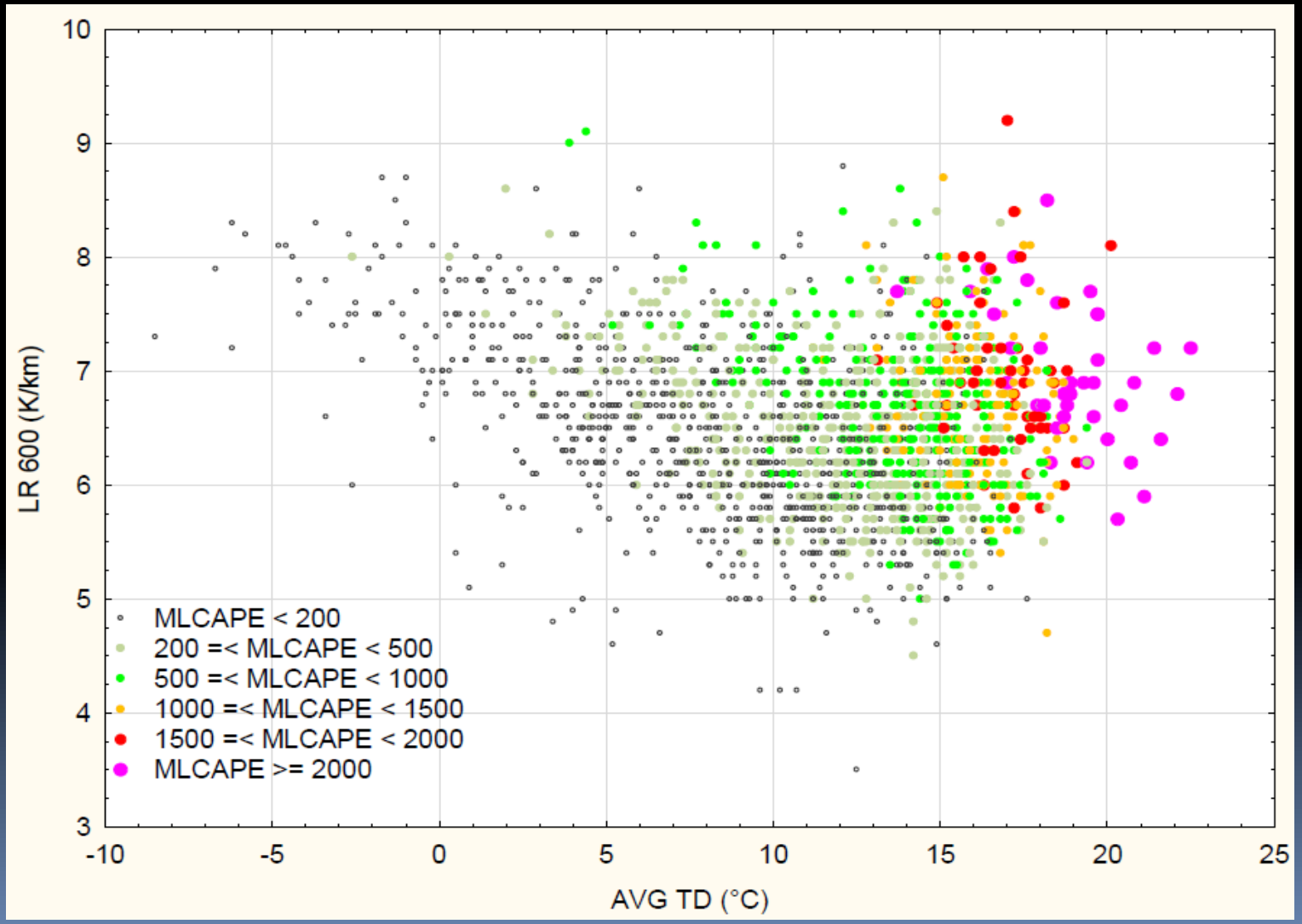
-> No parameter equally suitable for all phenomena

-> Value overlap for intensity categories always present



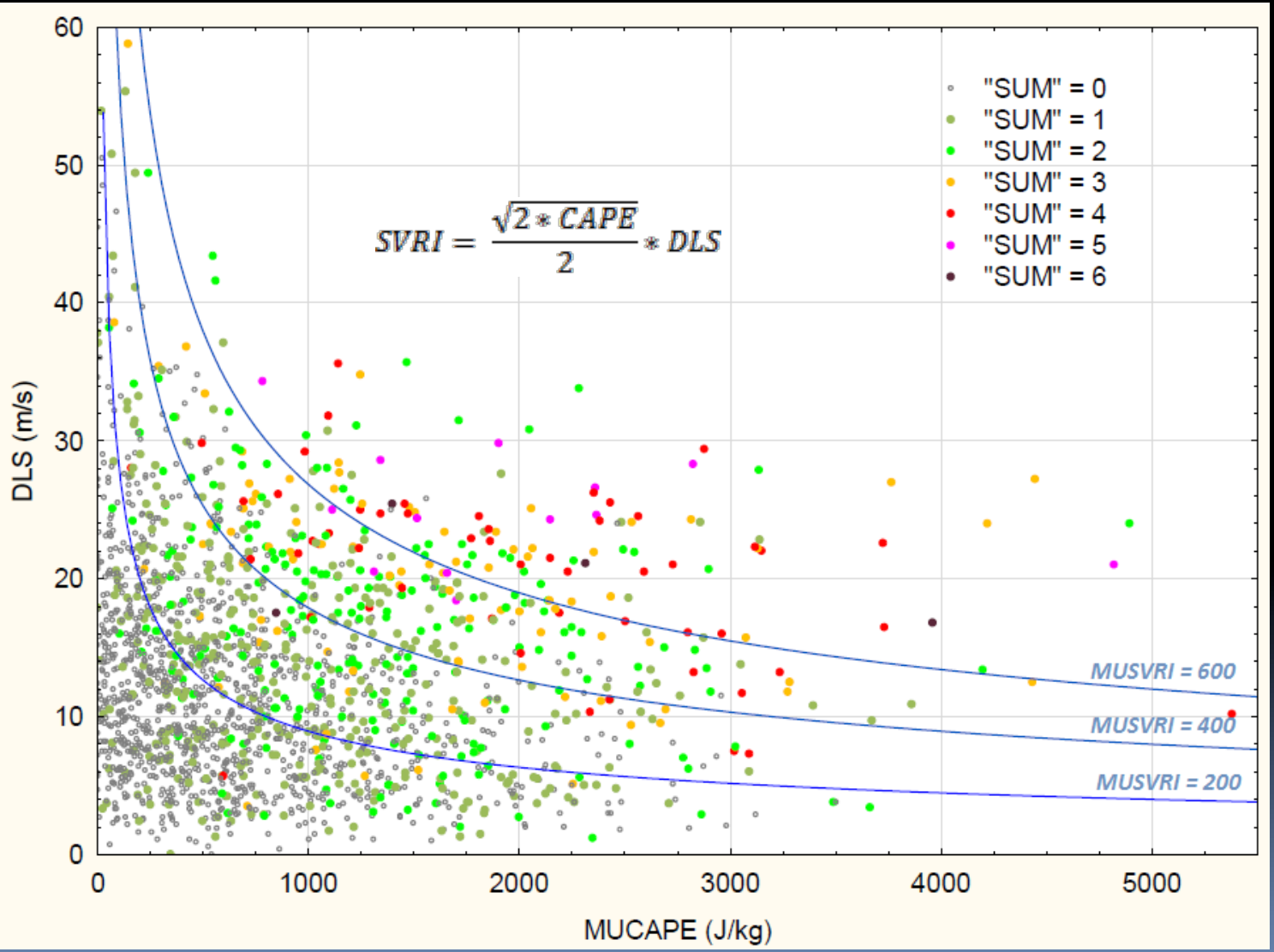
CAPE

- its relation to the lapse rates and low level moisture



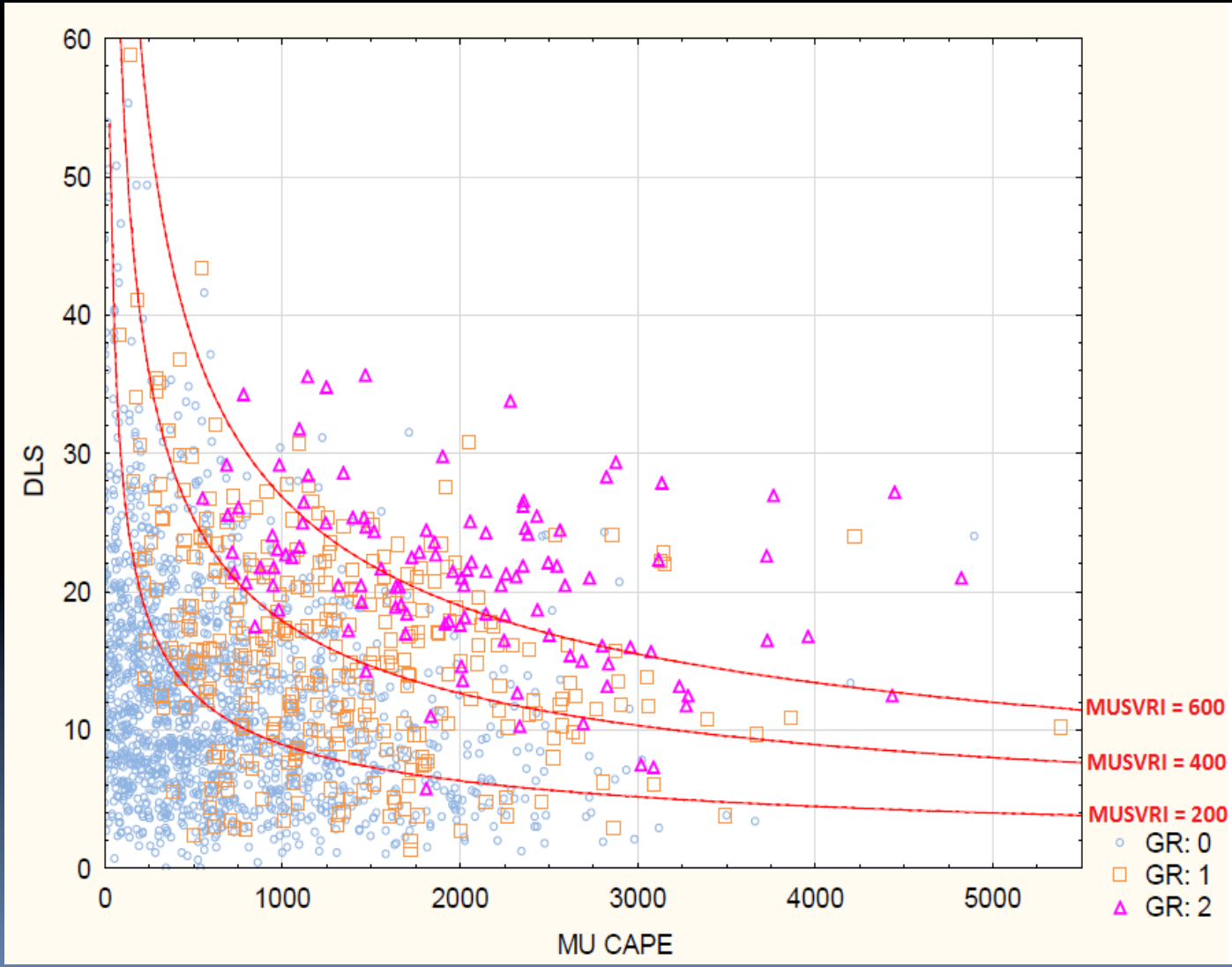
CAPE – SHEAR OVERLAP

- many severe situations also in inconspicuous conditions



LARGE HAIL PREDICTION I

- Best index: SVRI – CAPE/DLS combination

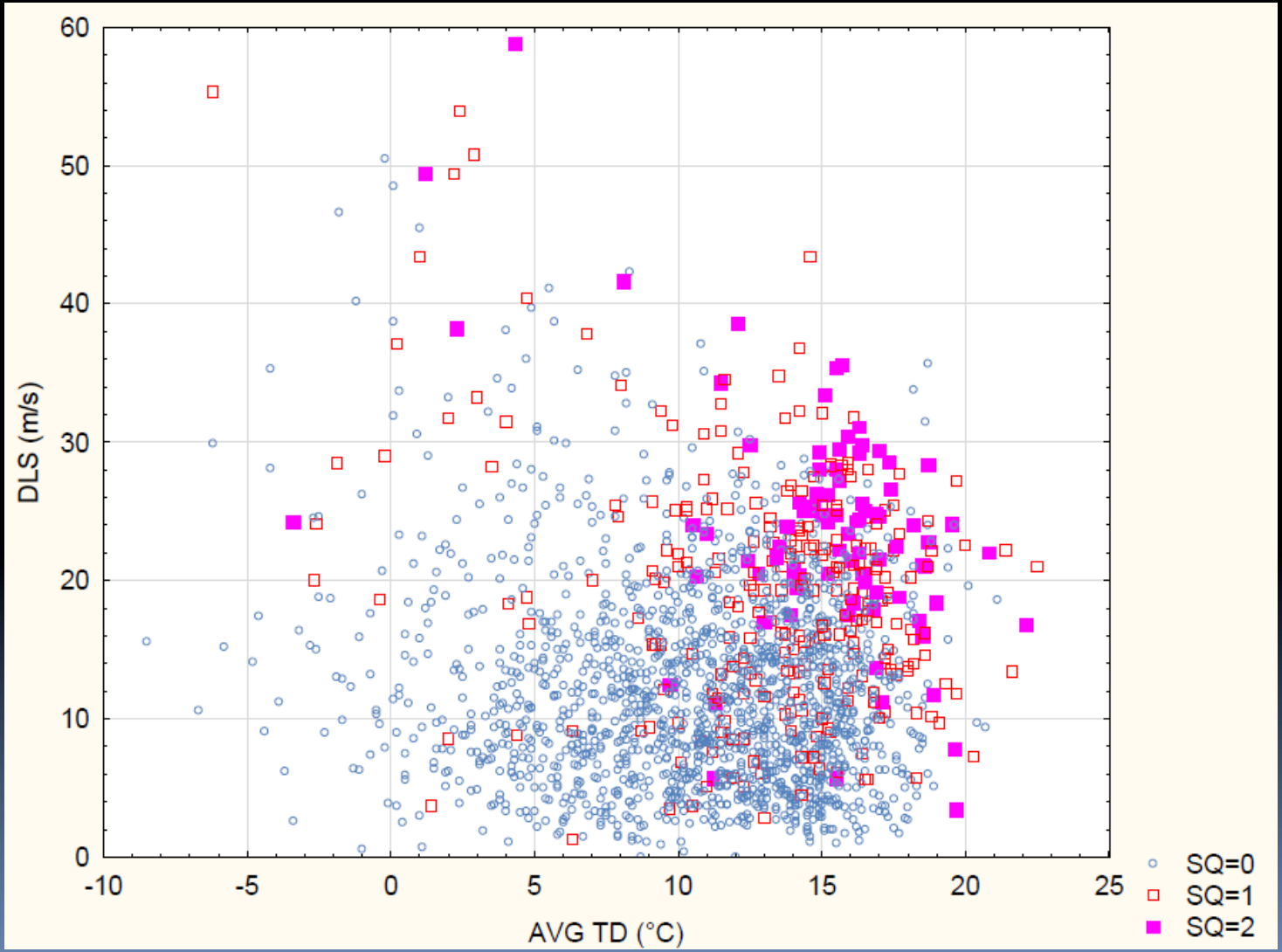


LARGE HAIL PREDICTION II

- **MUCAPE in the hail growth zone**
- Strong DLS especially for extremely severe
- Maximum buoyancy at higher heights
- Steeper lapse rates
- Higher LCLs

SEVERE WIND GUST PREDICTION I

- 3 groups of occurrence
- Best index: SVRI – CAPE/DLS combination



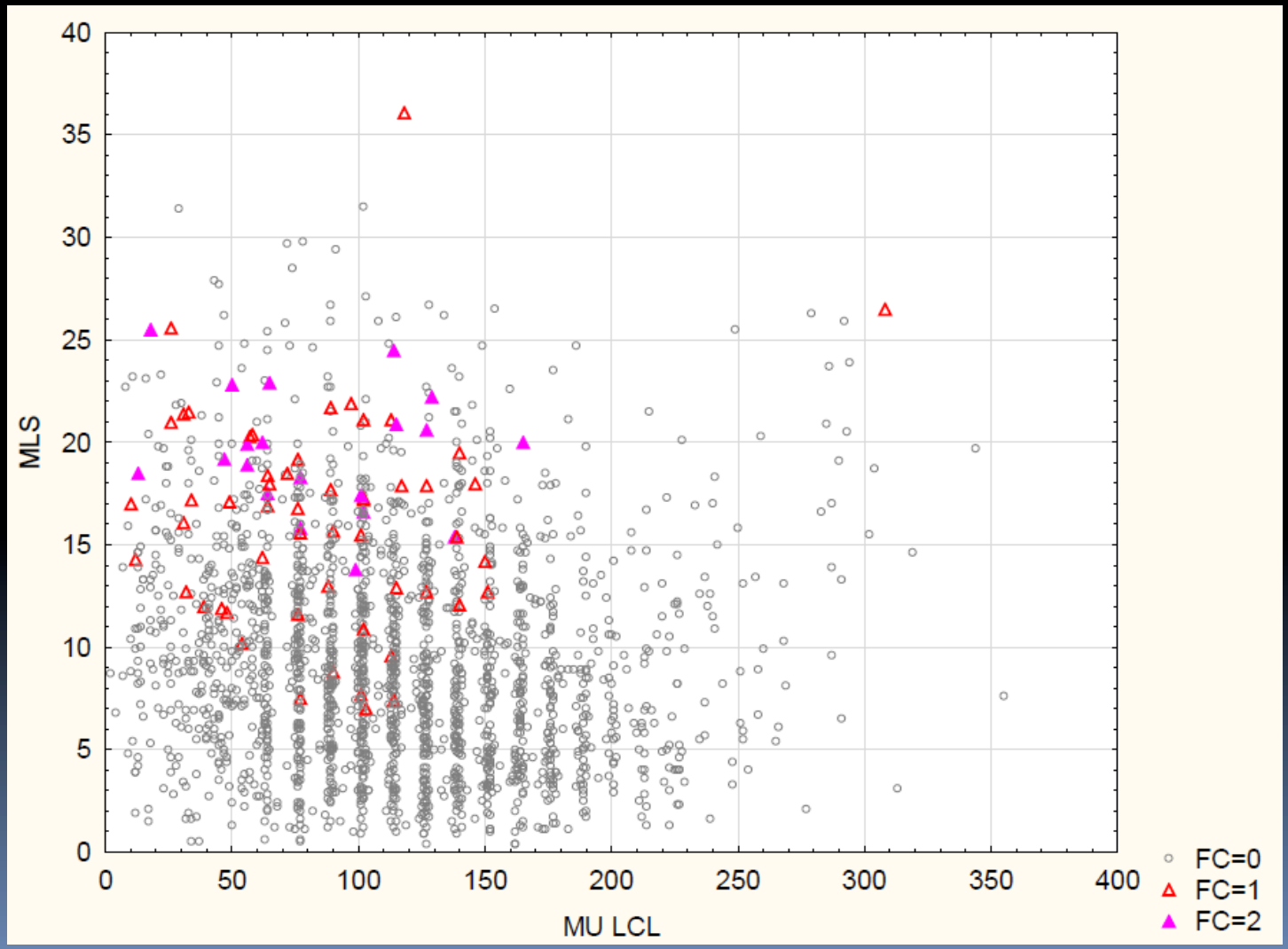
SEVERE WIND GUST PREDICTION II

- **Deep layer wind shear**
- Average dew point (50 hPa) better predictor than CAPE!
- DCAPE / Delta Theta-E worse than CAPE / shear-related indices
- Major problem:

- What are the possible ways of getting severe wind gusts in DMC?

TORNADOES

- 0-3 km shear (SRH) better than 0-1 km
- nontornadic cases dominate even in favourable conditions



EXCESSIVE PRECIPITATION

- **High moisture content (dewpoints) + deep warm cloud layer**
- Buoyancy in the coalascence zone?
- Lower LCLs and higher RH
- No obvious wind shear dependence

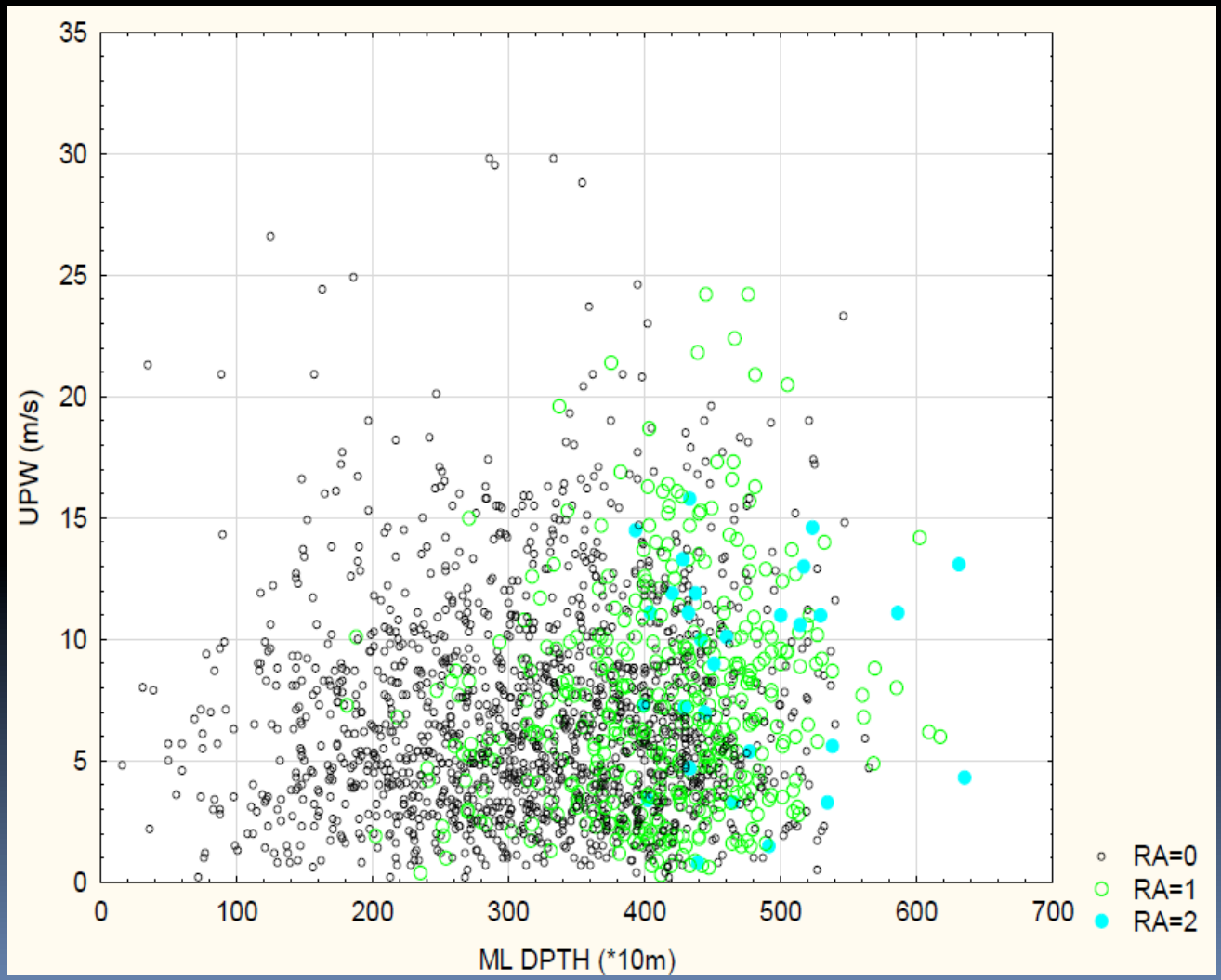
… Related to the precipitation intensity / efficiency

… What aboud duration?

-> Corfidi upwind propagation vector

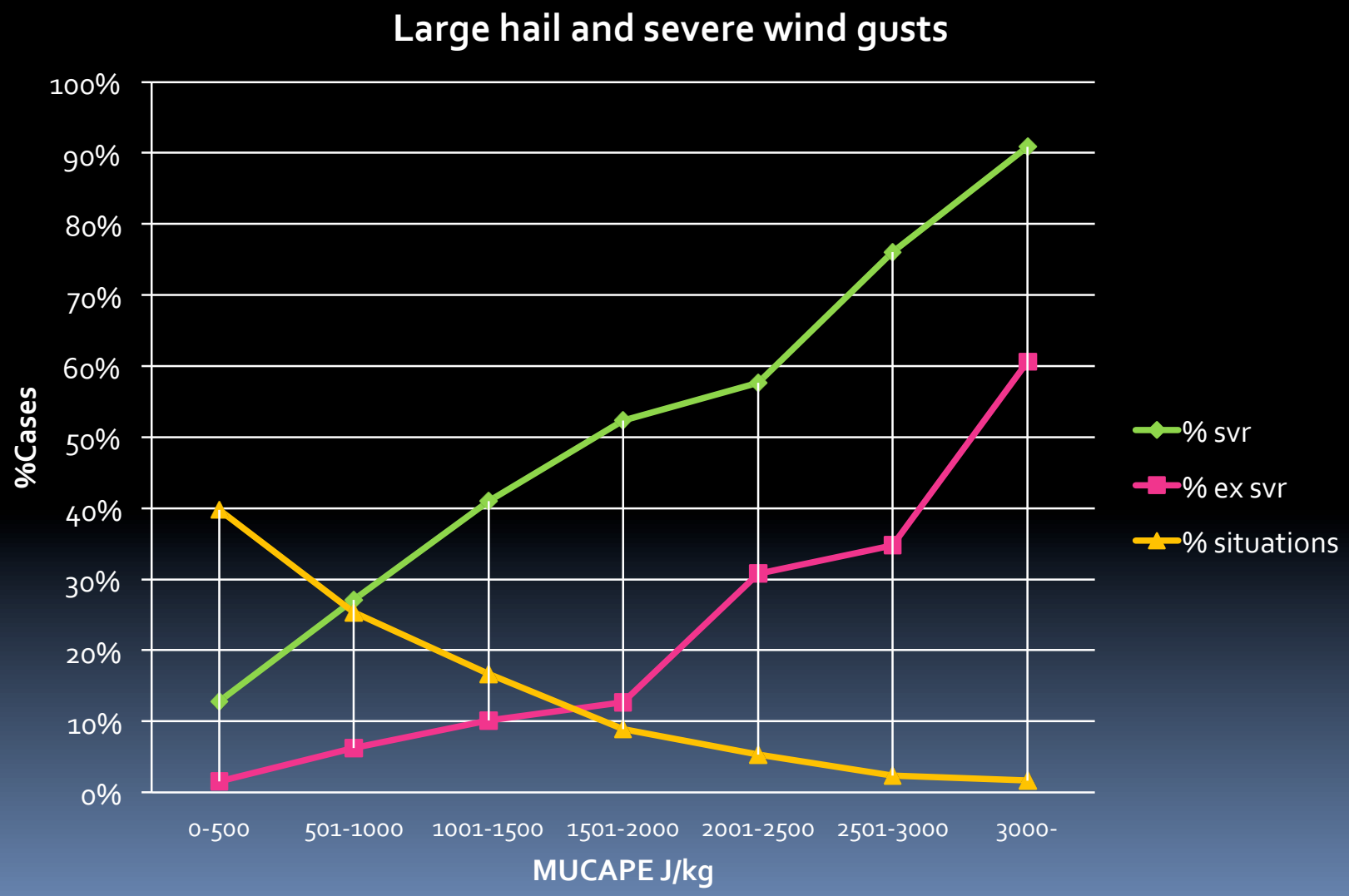
Corfidi upwind vector

- no obvious relationship
- how to recognize slow MCS motion situations?



THRESHOLD VALUES

- how does a probability of severe weather change?



CONCLUSION

- Parameters are useful in severe weather forecasting

-> not equally for all severe weather types

-> should not be used with „threshold" values

-> Doswell – Schultz (2006)

- Important to consider local modifications , interaction of the flow with the DMC or with „triggering" factor

THANK YOU FOR YOUR ATTENTION!