

Adaptation-Beiträge des ESSL im Bereich konvektiver Unwetter

4 HOCHWERTIGE
BILDUNG



3 GESUNDHEIT UND
WOHLERGEHEN



Alois M. Holzer



European Severe Storms Laboratory

ESSL

- 1. non-profit organization
- 2. association with members
NMHSs, EUMETSAT, ECMWF, research institutes, and individual scientists as full members
- 3. statutory purposes:



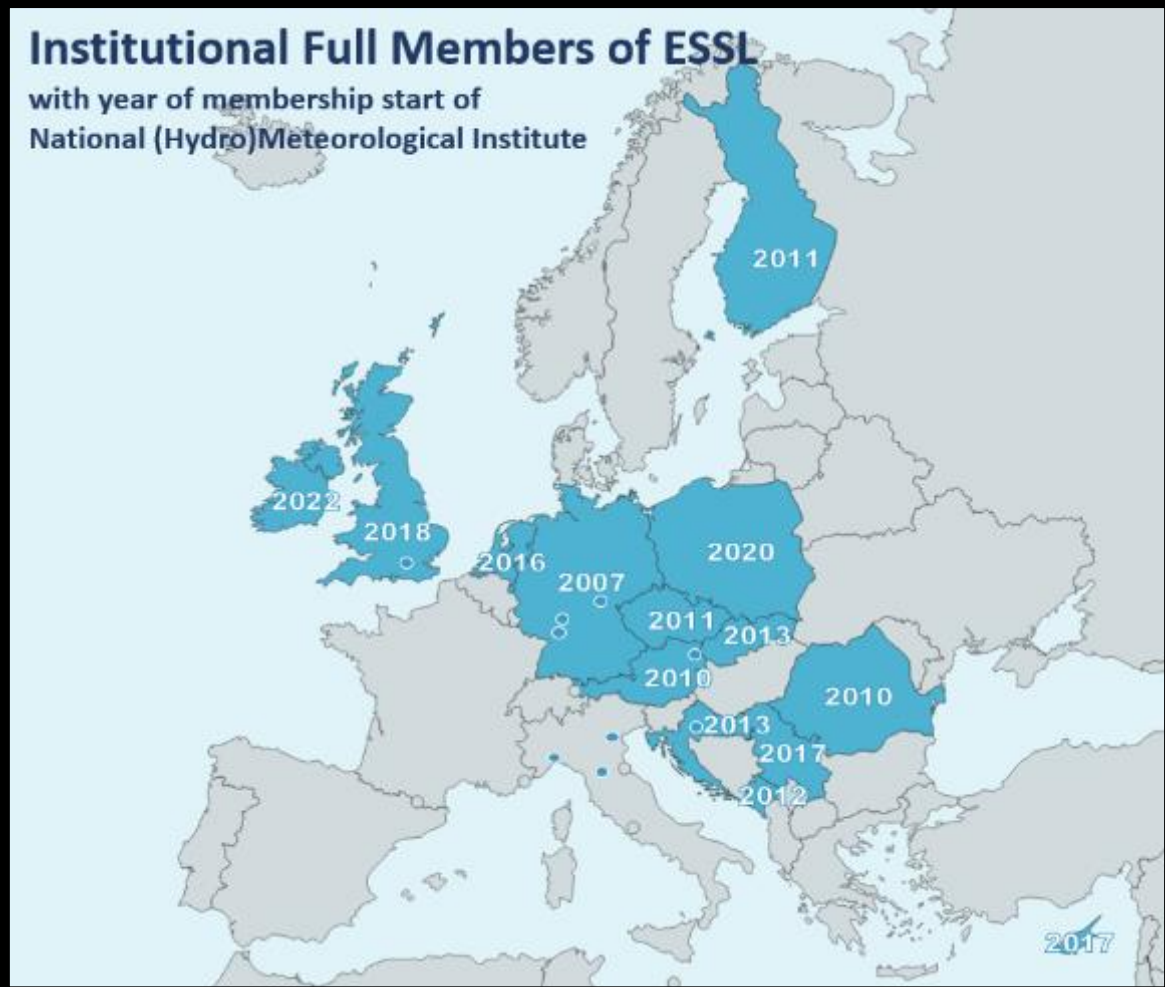
Perform and support **severe weather research** at a European level



Management and development of the **European Severe Weather Database ESWD**



Organization or support of the **European Conference on Severe Storms**



Forecaster training, seminars, workshops and ESSL Testbed



ESSL

**European
Severe Storms
Laboratory**

ESSL

- Statutory seats in Austria and Germany

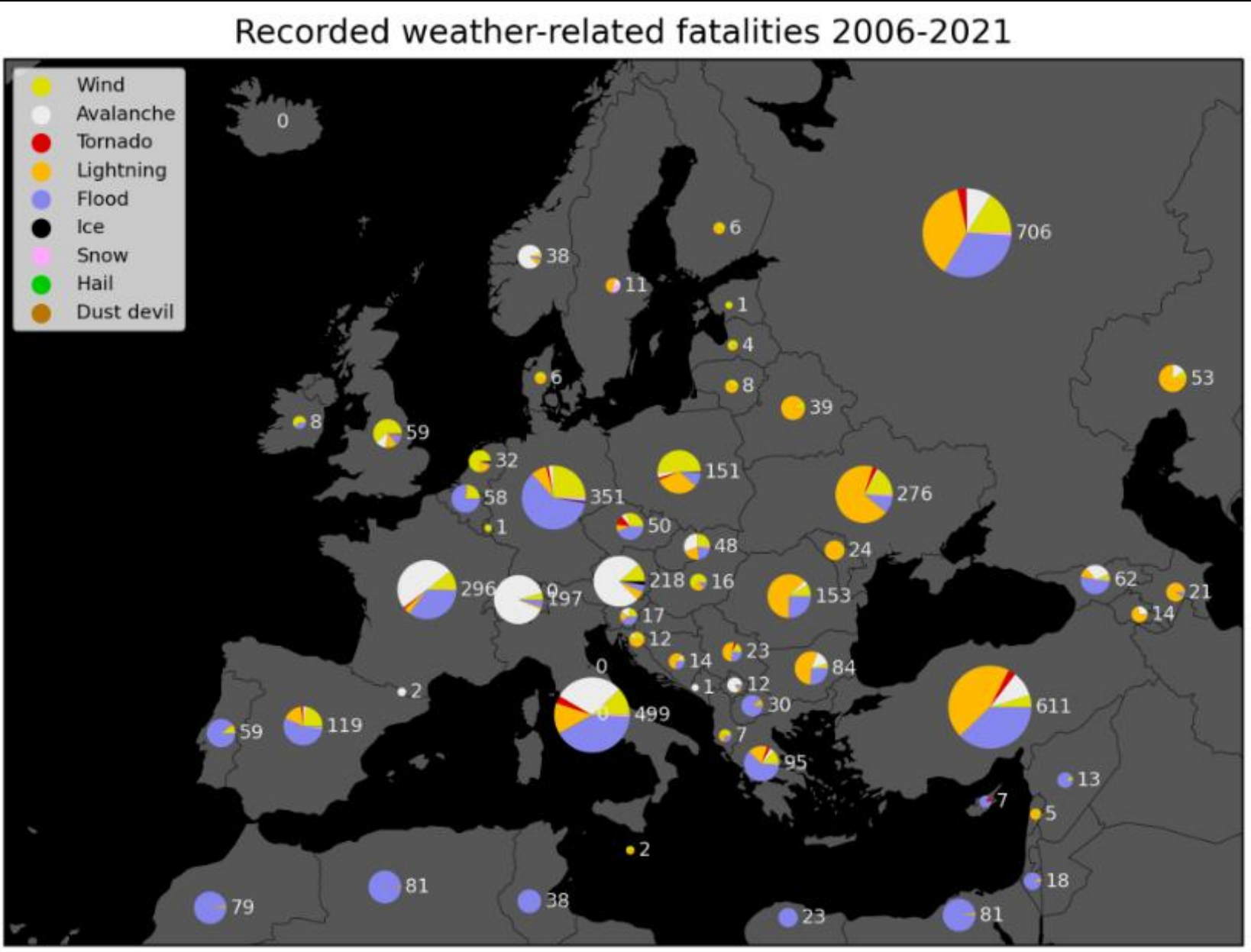
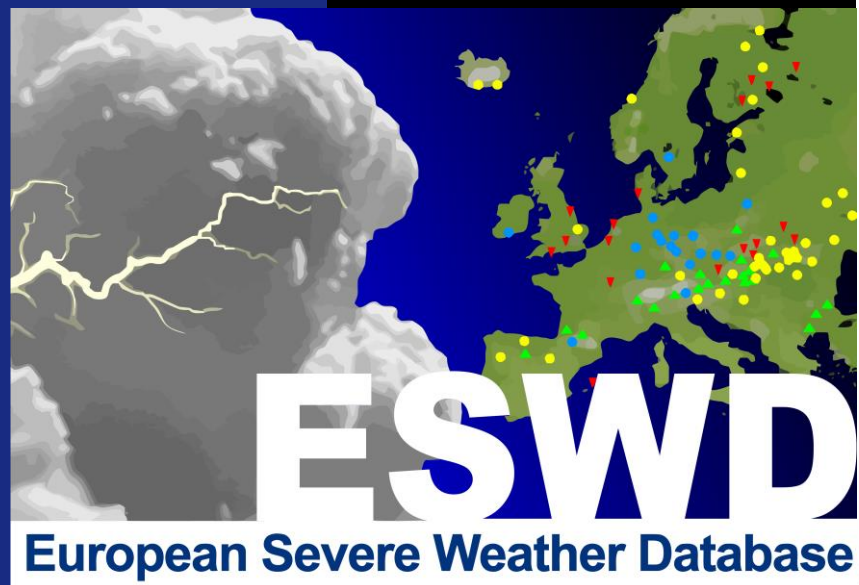


- ESSL Research and Training Centre in Wiener Neustadt



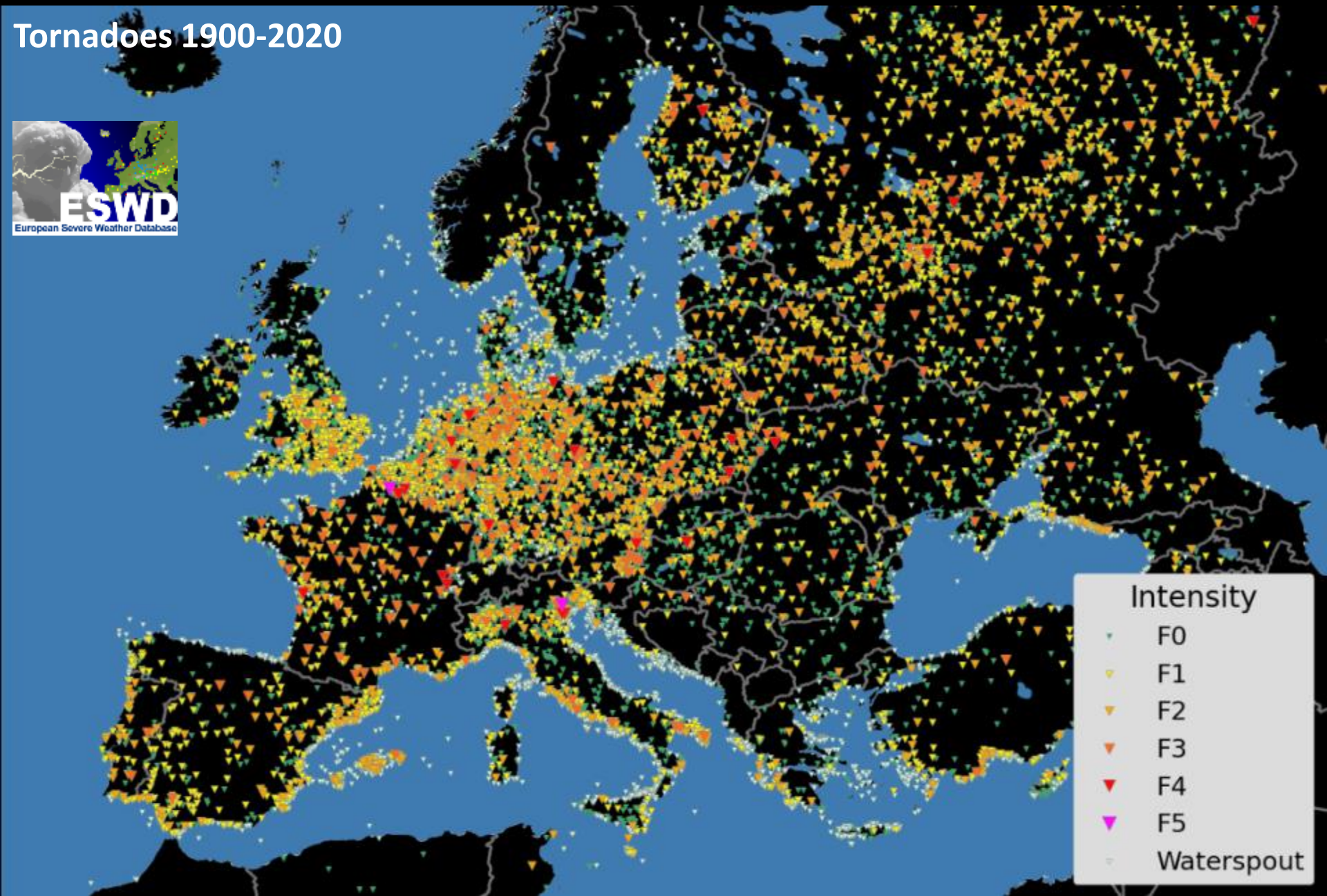
European Severe Storms Laboratory

Impacts



Trends

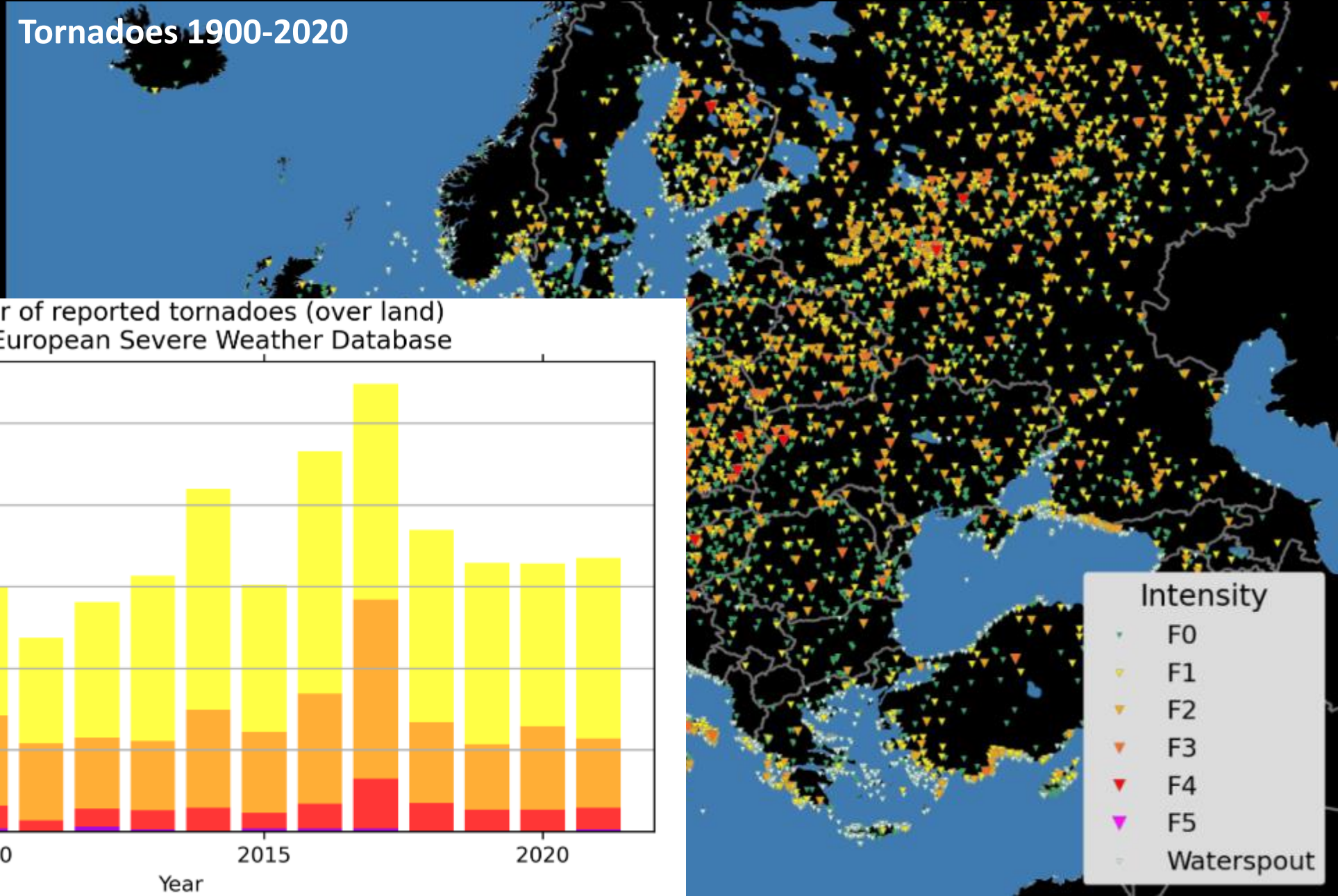
Tornadoes 1900-2020



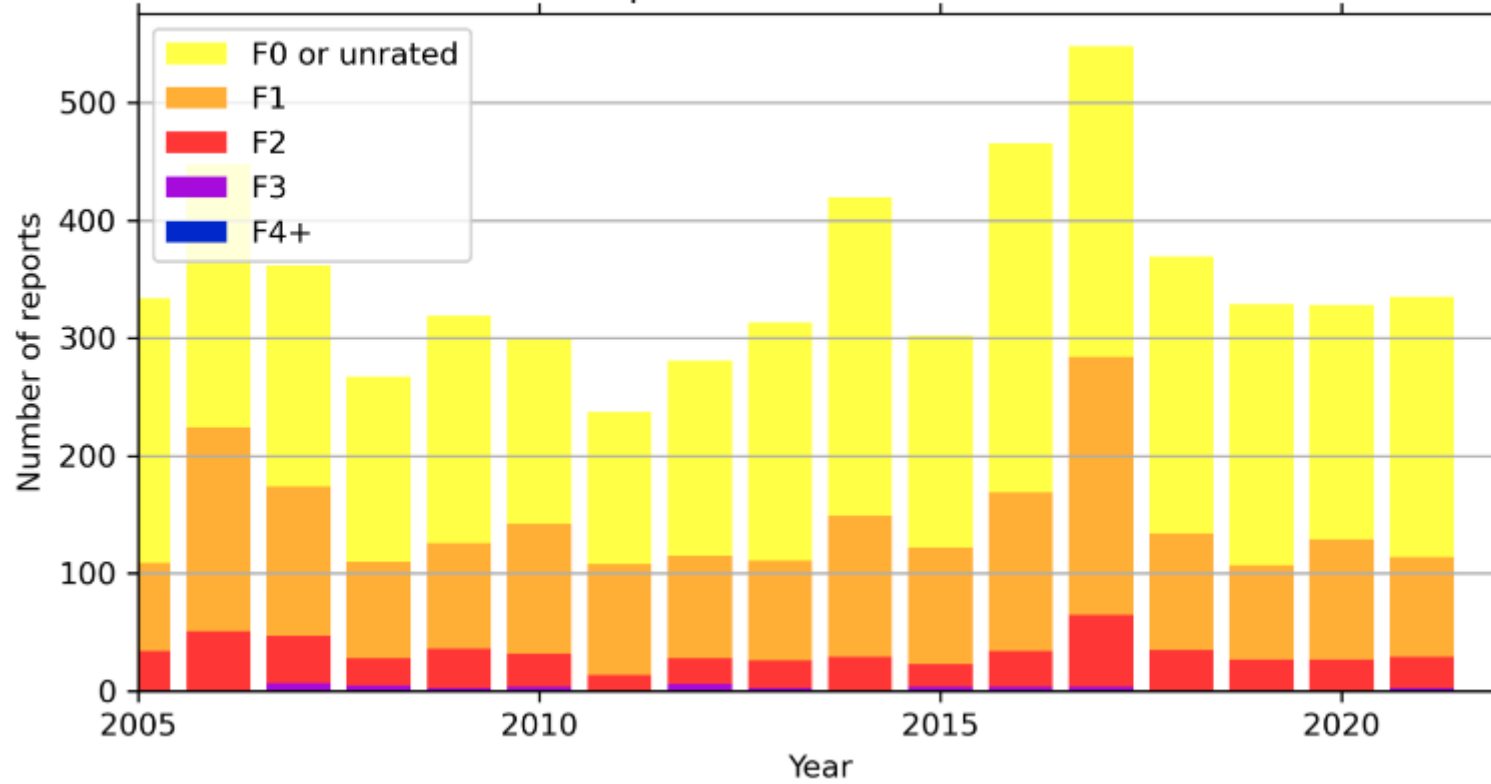
Intensity	
●	F0
●	F1
●	F2
●	F3
●	F4
●	F5
○	Waterspout

Trends

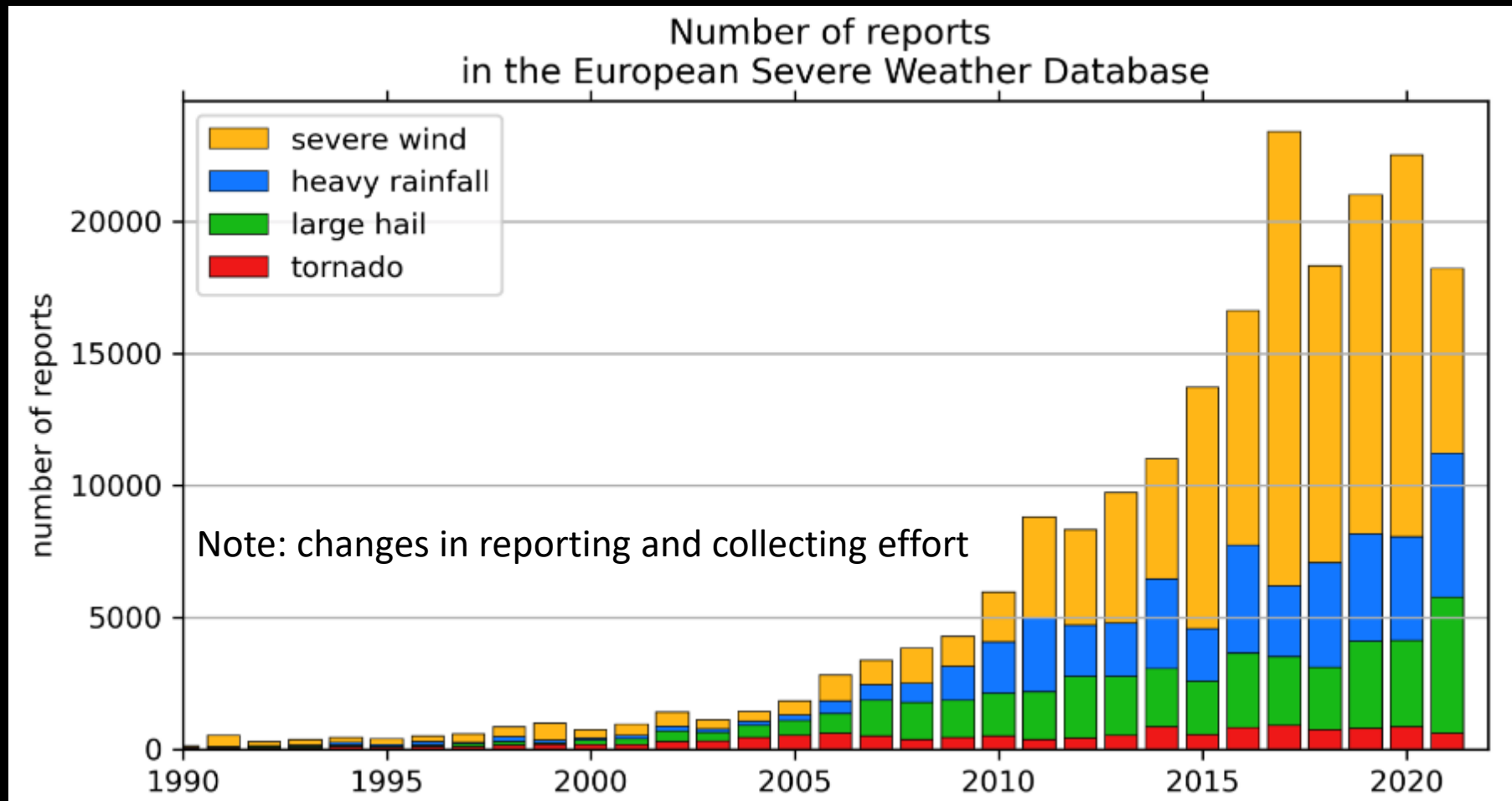
Tornadoes 1900-2020



Number of reported tornadoes (over land)
in the European Severe Weather Database



Trends



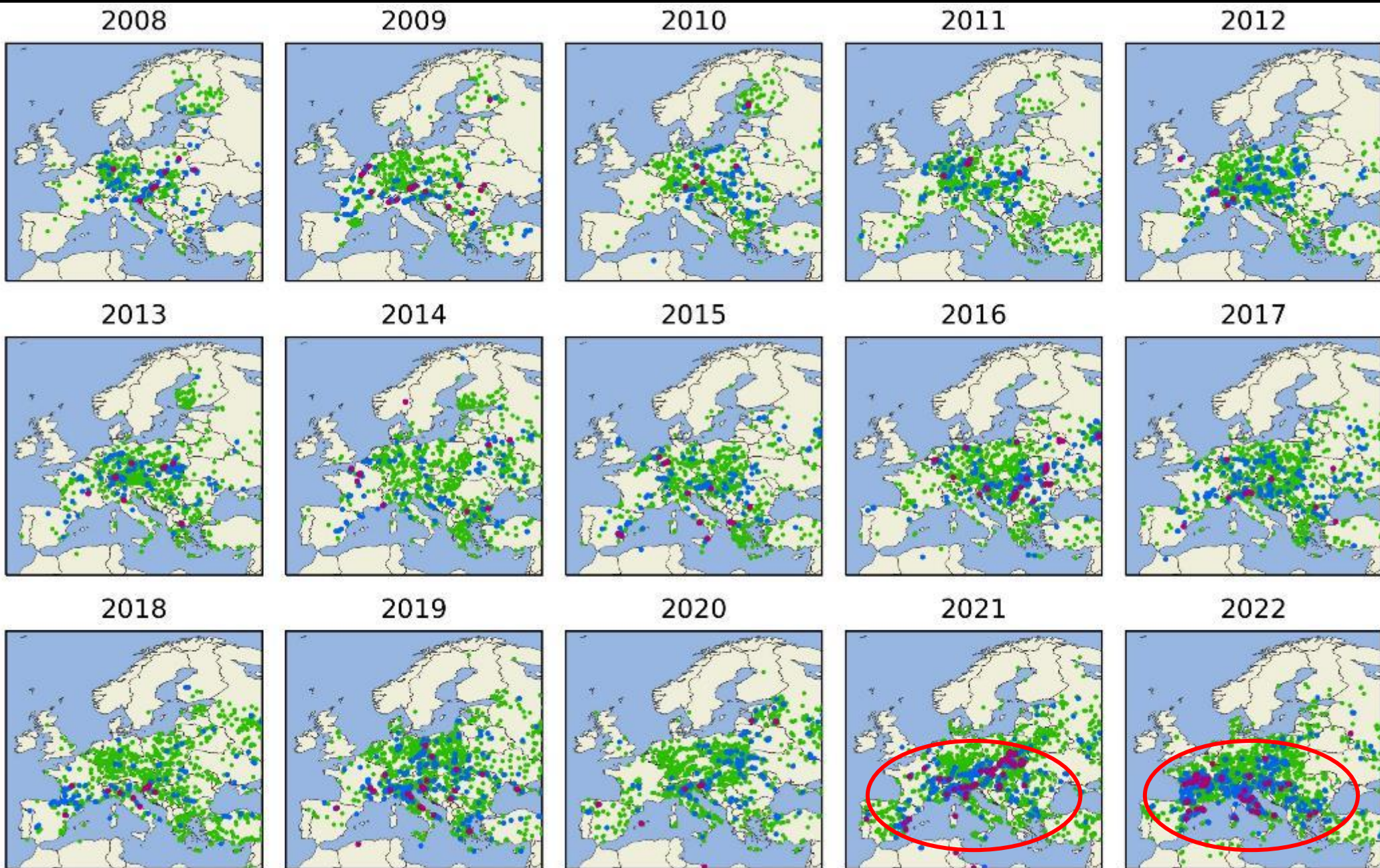


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Trends

Reports of hail
diameters
of at least
2 cm (green)
5 cm (blue)
or 8 cm (magenta)



ESWD

European Severe Weather Database

Modeling severe weather occurrence

ESSL Additive Regression Convective Hazard Model

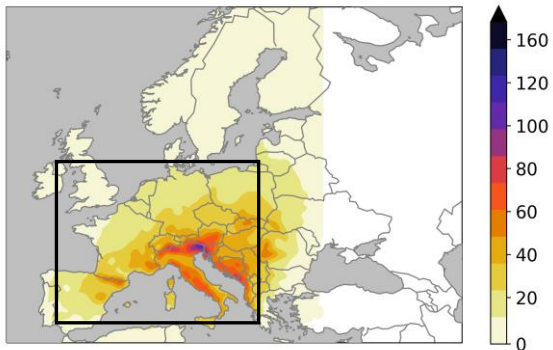
AR-CHaMo

$$P_{hail} = P_{storm} \times P_{hail|storm}$$

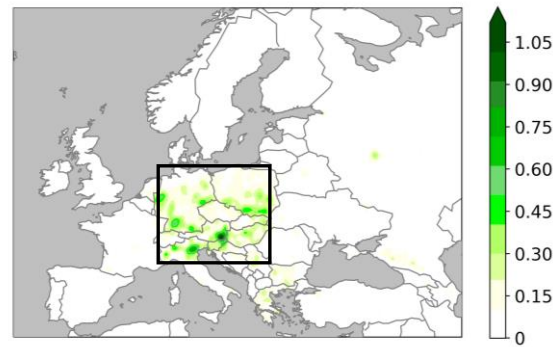
Training data:

2008-2020 - Central Europe

Lightning



Hail ≥ 2 cm

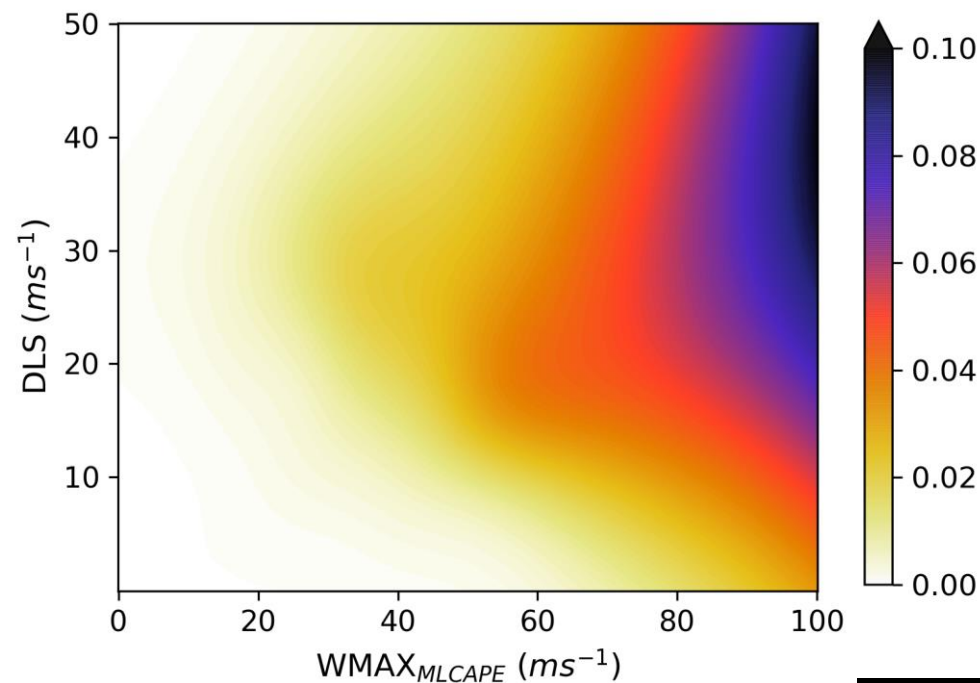


ERA5 reanalysis

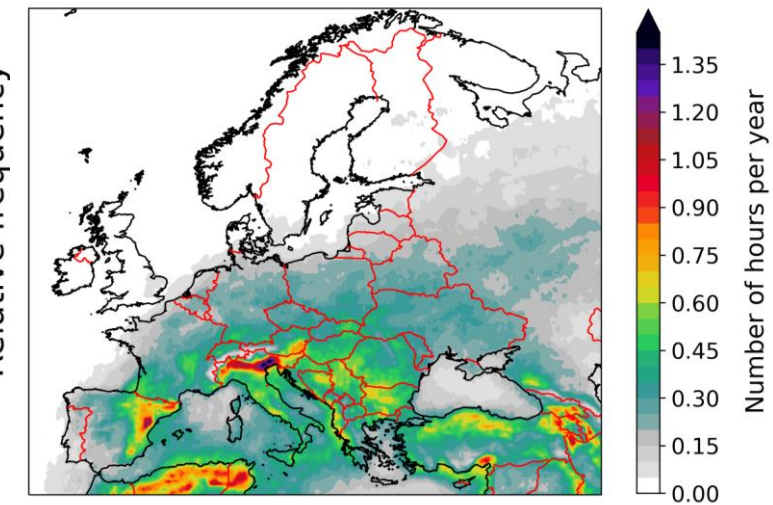
Application

1950-2020 – All Europe

Fraction of environments with hail ≥ 2 cm
(modelled)



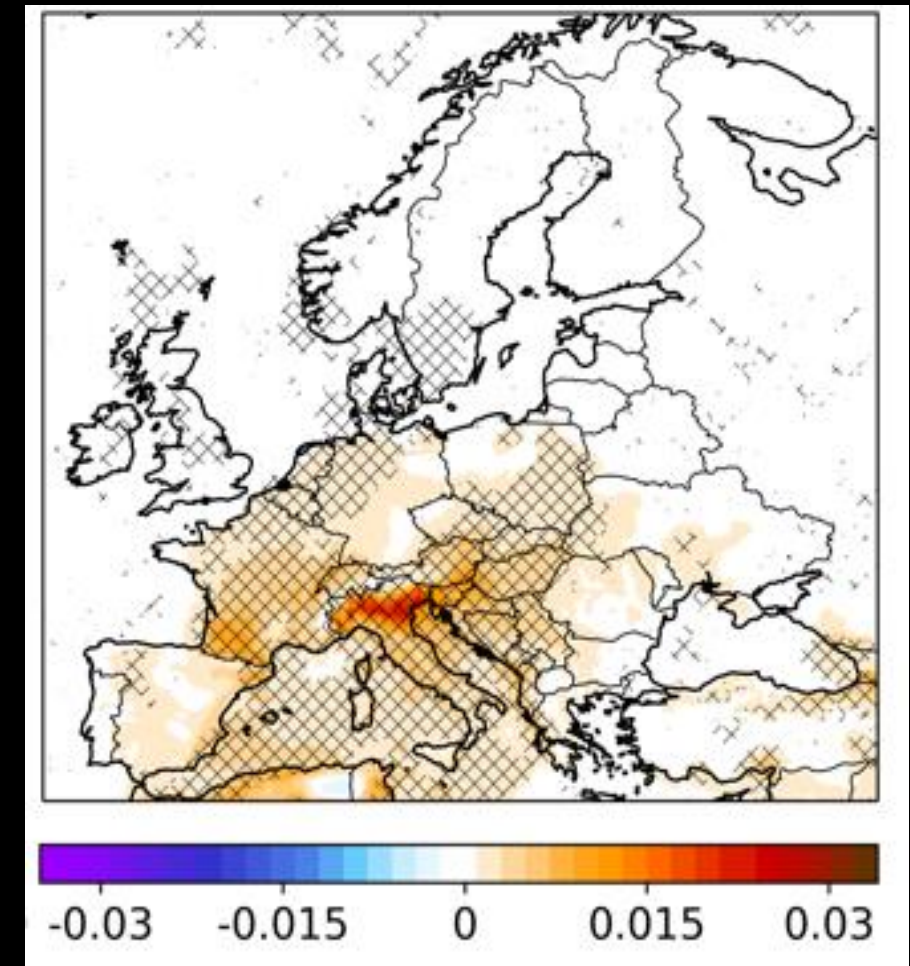
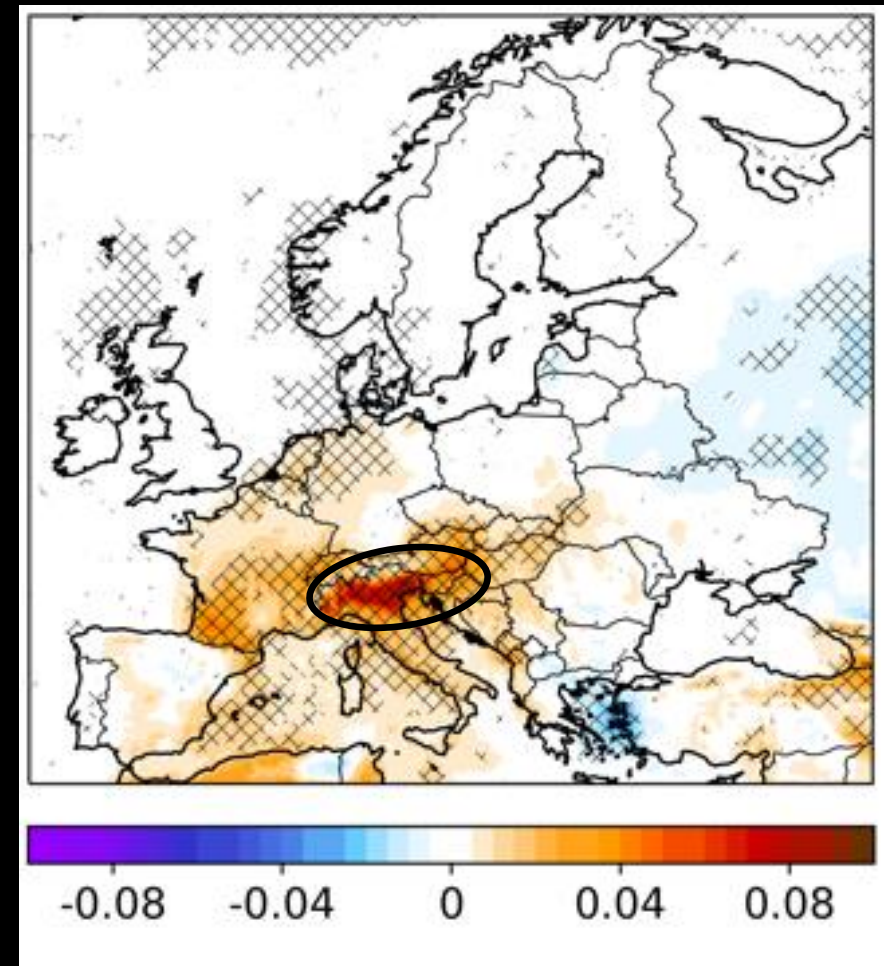
Modelled spatial distribution of hail ≥ 2 cm (2008-2020)



Past trends in hail ≥ 2 cm (1950-2021)

Past trends in hail ≥ 5 cm (1950-2021)

Number of hours per decade



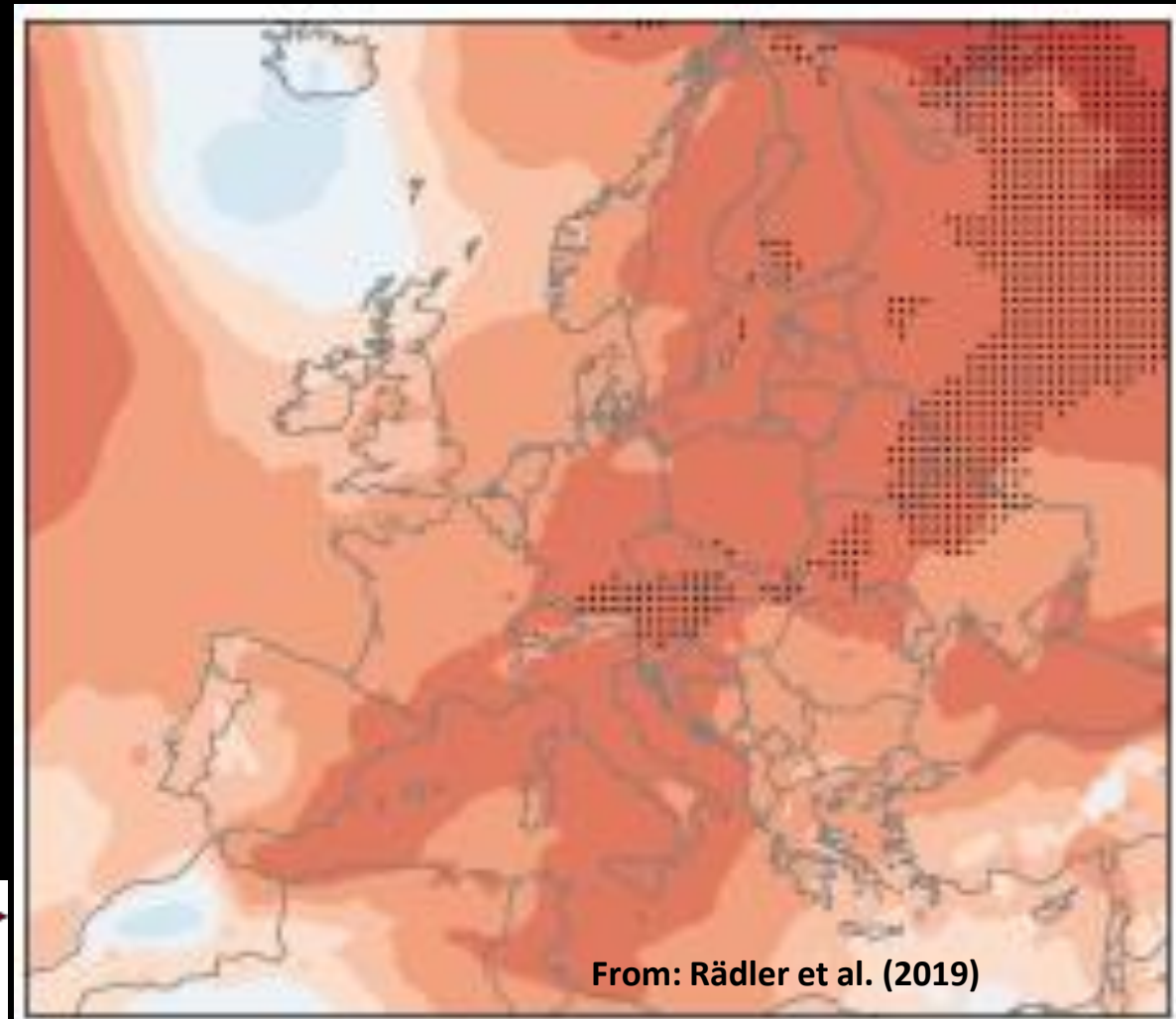
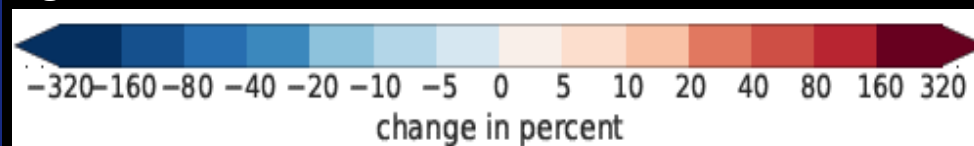
Annual

The Future

Future trends of severe thunderstorm risk in different RCP scenarios (here RCP 4.5), based on a 14 regional climate model ensemble.

Hail > 2 cm 2071 – 2100

Black-dotted areas: statistically significant agreement between models



From: Rädler et al. (2019)

Adaption-Beiträge des ESSL

Verbesserte Preparedness als Basis für Resilience

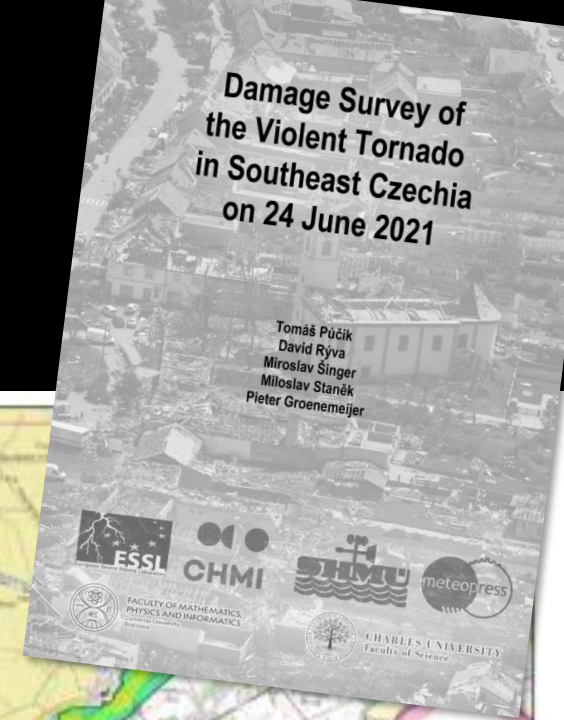
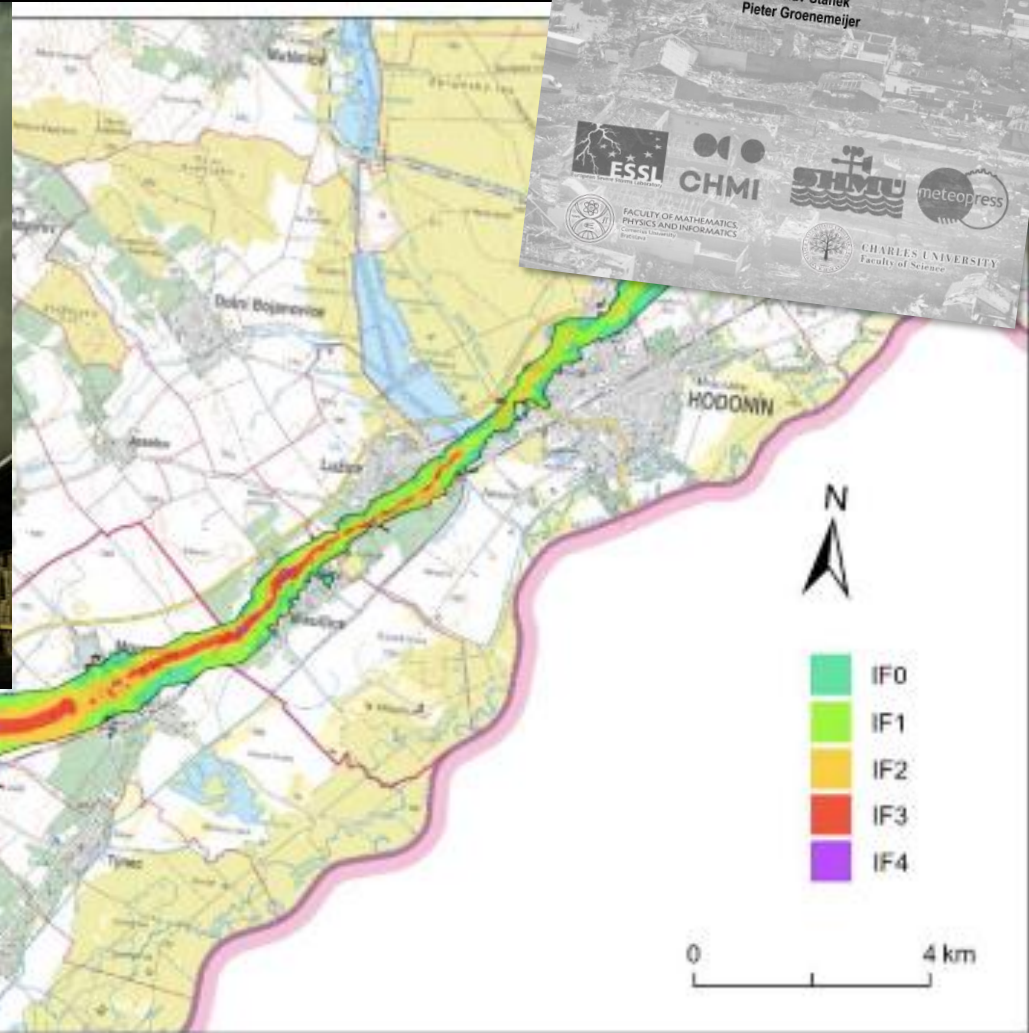
durch Bewusstseinsbildung über konvektive Unwettergefahren auf Basis von soliden Beobachtungen und Beispielen

Verbesserte Warnungen durch

- Feedback an Entwickler numerischer Modelle
- Entwicklung eigener statistischer Modelle
- Training von Forecastern (Vorbild: Flugsimulator für Piloten)
- Veranstaltung multidisziplinärer Workshops (von Ethik und Psychologie über Meteorologie bis Kommunikation)

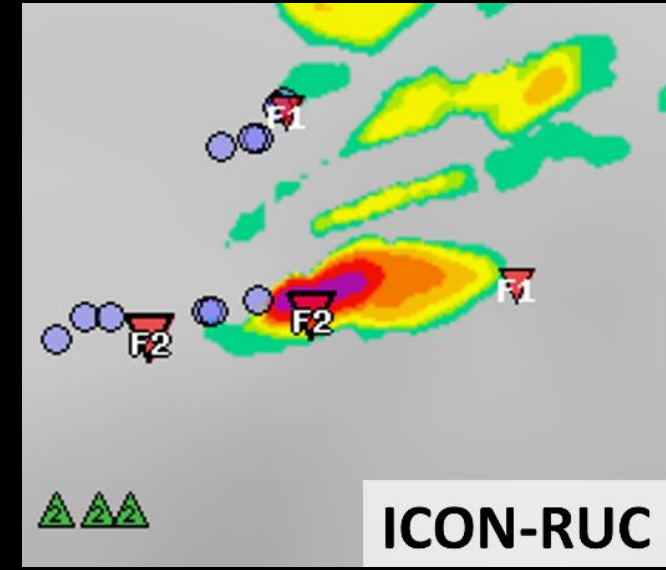
Preparedness durch Bewusstseinsbildung: Analysen und Beispiele im sozialen Kontext z. B. Tornado in Südmähren am 24. Juni 2021

- Interviews with witnesses
- 6 fatalities and 200 injuries
- 1202 buildings damaged or destroyed
- Damage path up to 2.8 km wide
- Maximum intensity IF4
~ 105 m/s or 380 km/h

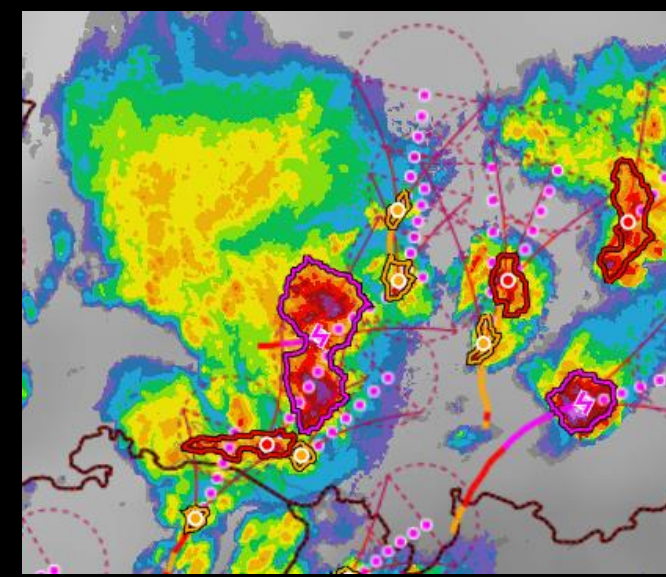
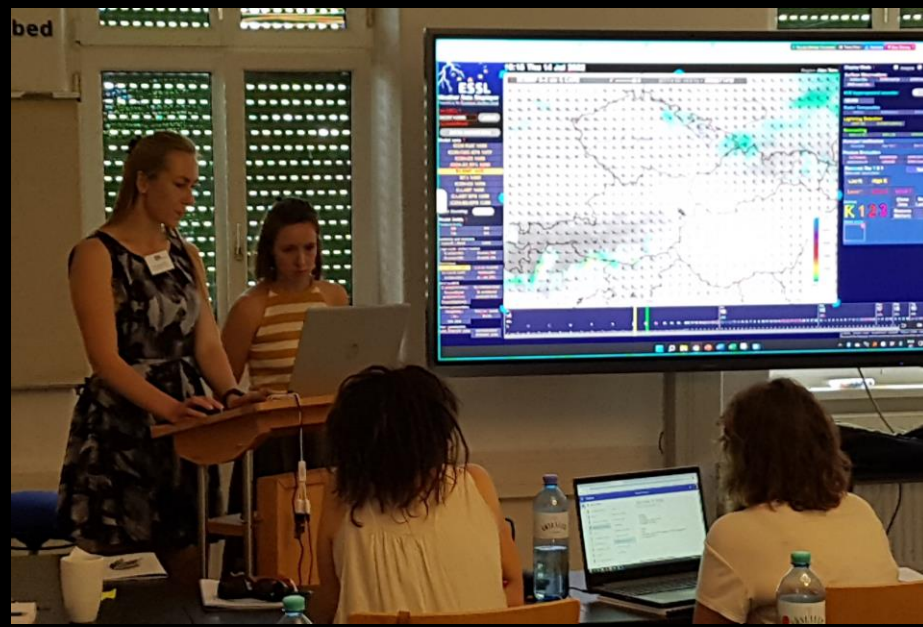
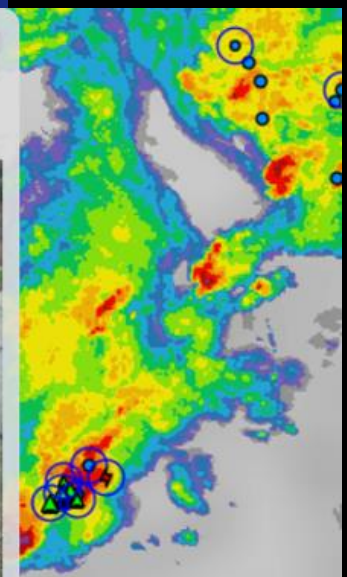


Verbesserte Warnungen durch Feedback an Entwickler numerischer Wettermodelle und von Satellitenprodukten

Beispiel Deutscher Wetterdienst beim ESSL Testbed 2022



WarnWetter User Report
Neuwied
15:20 UTC
Hail around 5 cm
QC Checked





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The Testbed 2022 in Cooperation with EUMETSAT

Testing of novel products combined with intense real-time training of forecasters

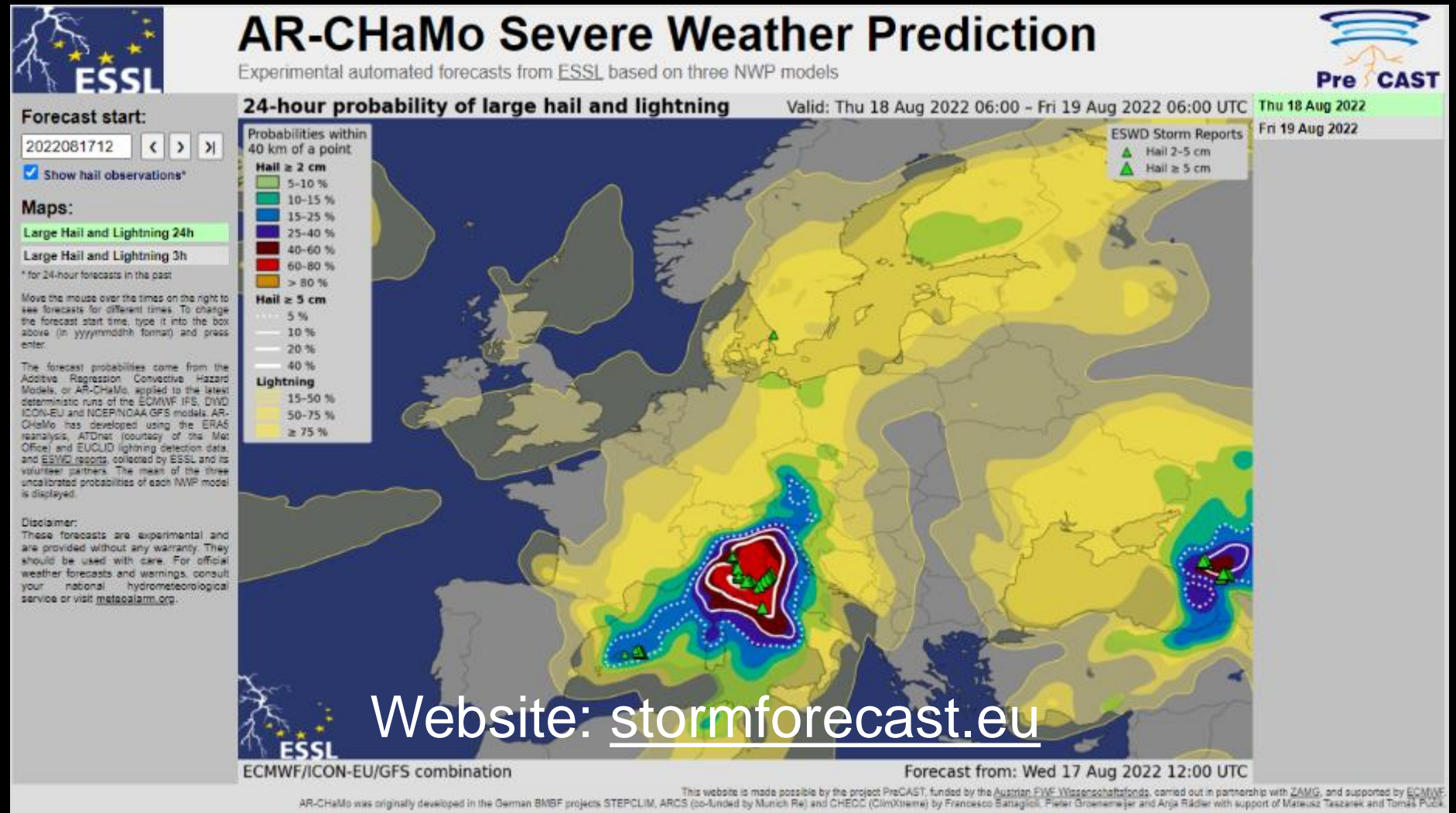
- 3 weeks with forecaster testbeds at the ESSL Research and Training Centre in Wiener Neustadt, Austria
- 45 participants from 18 different countries:
BG, HR, FI, DE, HU, PL, PT, RO, SK,
UK, IT, AT, GR, EE, LT, ES, CZ, DK



Group photo of
the first
EUMETSAT-ESSL
Testbed week in
June 2022



Verbesserte Warnungen durch Entwicklung eigener statistischer Modelle: Experimental probabilistic forecasting of large hail





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Verbesserte Warnungen durch real-time-Training von Forecastern („Warnern“)

Im Plenum



In kleinen breakout groups



Verbesserte Warnungen durch Veranstaltung multidisziplinärer Workshops von Ethik und Psychologie über Meteorologie bis Kommunikation

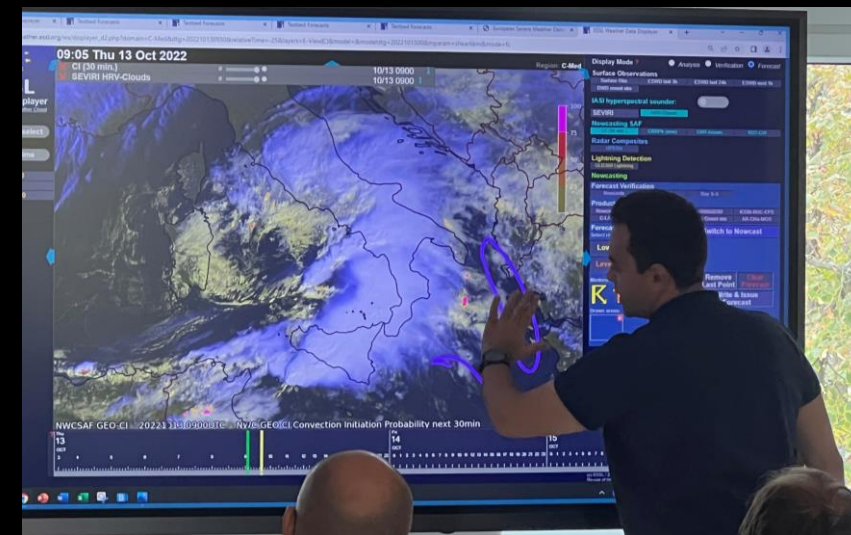
16 – 18 October 2023

ESSL Expert Workshop on Severe Weather Warnings

from Expectations via Physical Ingredients to Impact-based Warnings and Beyond

ESSL Research and Training Centre Wiener Neustadt

events.essl.org





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Vielen Dank für die Aufmerksamkeit!

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**European Conference on Severe
Storms in Bucharest, Romania**

For more information on the
conference and other ESSL
events see: www.essl.org



ECSS2023

Bucharest, Romania

8–12 May 2023



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