Severe Convective Storms in the European Societal Context

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Introduction - Basics

- Assume a *perfect* forecast – to be useful:
  - Users must receive the information
  - Users must understand the information
  - Users must know what to do with the information
  - Users must believe the information
  - Users must be able to take effective action
- The situation in Europe re: severe convective storms – virtually none of these are in effect!

Background

- Into the early 20th century, a few Europeans were the *world leaders* in severe convective storm research (e.g., Wegener, Letzmann)
- Records of severe weather were dependent on *someone* taking the responsibility
- European hazards from severe convection
  1. Flooding
  2. Hail
  3. Wind
  4. Tornadoes

What has been happening …

- Detailed, continuous records of severe convective storm events: nearly non-existent in Europe, with exceptions …
- Not thought of as an important priority
- No infrastructure to deal with such events
  - Most national forecasting services do little or nothing about severe convection
  - The process by which information about severe storms becomes useful to the public has little or no infrastructural support

Compare with USA

- Tornado and severe storm forecasting – 1953
- Major disasters - occur ~10-20 years
  - Public wants information in tornado-prone areas!
- Infrastructure – substantial and complex
  - Local, state, and federal responses to the hazard
    - Before, during, and after
  - Private sector disaster relief agencies
  - Insurance
  - Some effort aimed at public education

Tornado Tracks in the USA

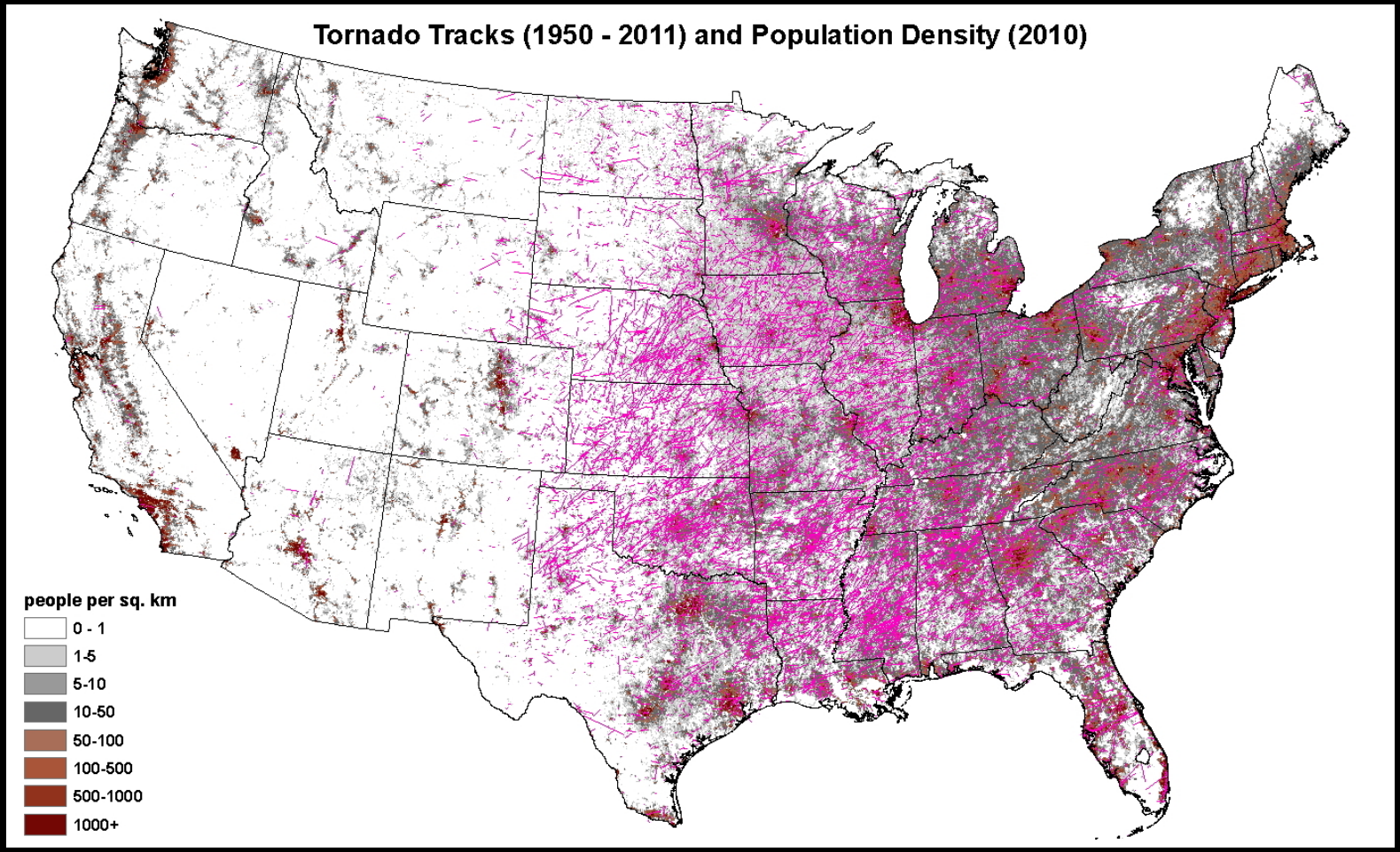
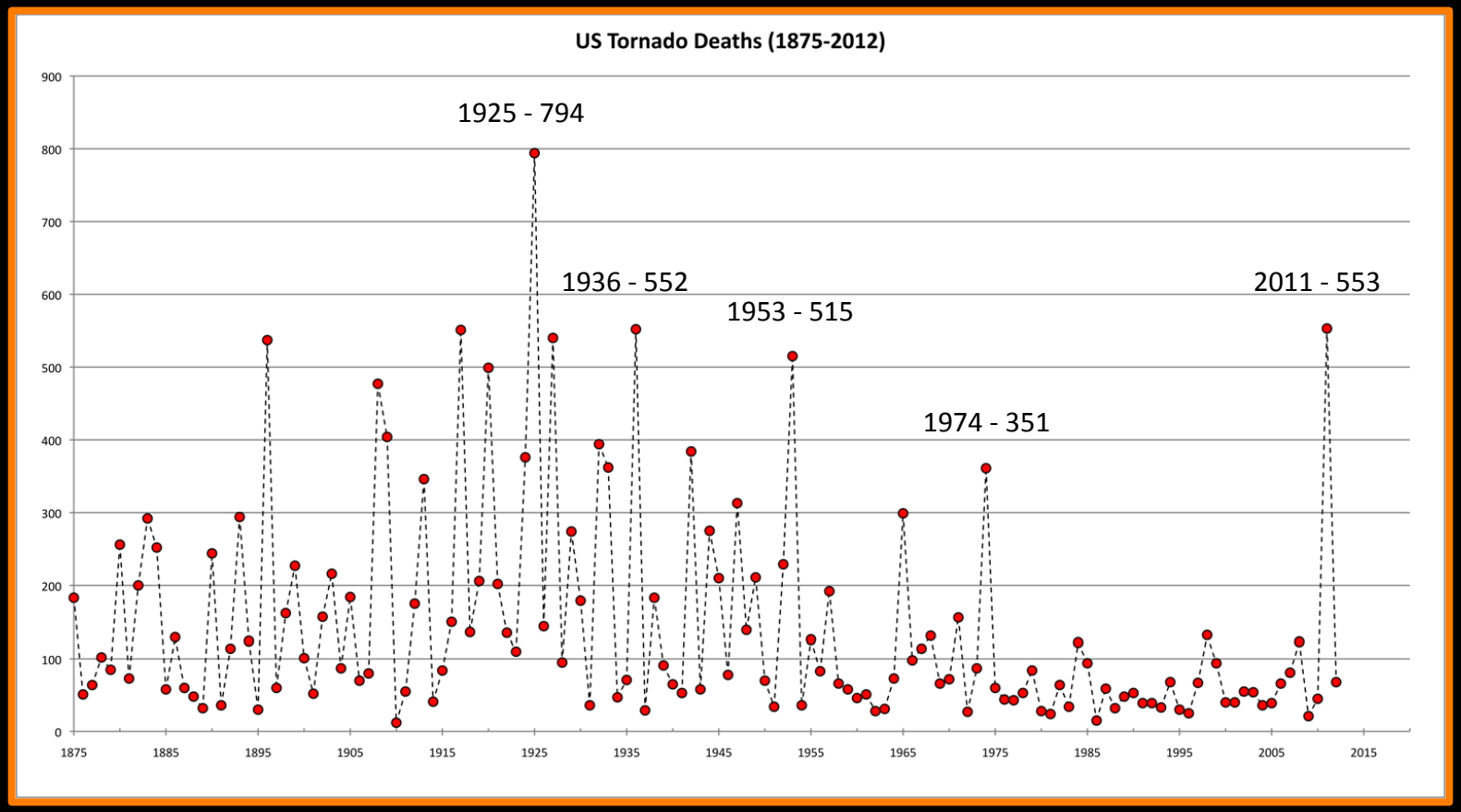


Figure courtesy of Greg Carbin, NWS Storm Prediction Center

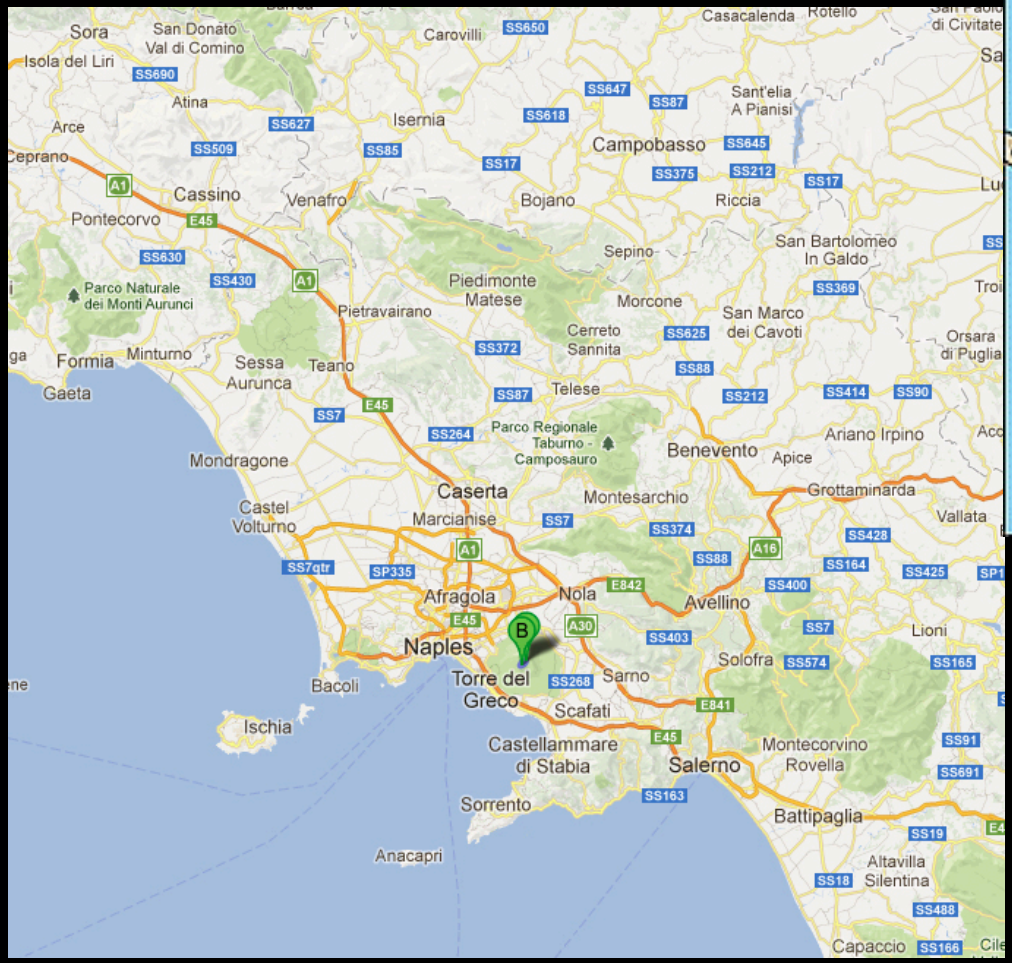
Why is this infrastructure in place?

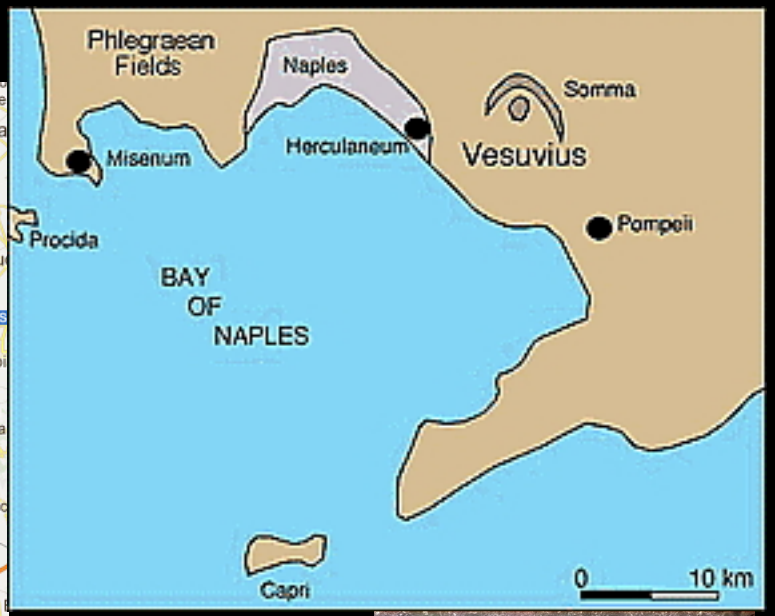
- Much of it was not in place before the 1950s – start of modern tornado forecasting (in 1953)



Anyone recognize this?

Naples - and Vesuvius





The Psychology of Disasters

- Why would someone live near a volcano?
  - Or near an earthquake fault?
  - Or in a home on a seacoast less than 1 m above sea level?
  - Or in a river flood plain?
- Tornado risk not so well-defined
  - In central OK, you could live 1000 years without ever being hit … a matter of good/bad luck

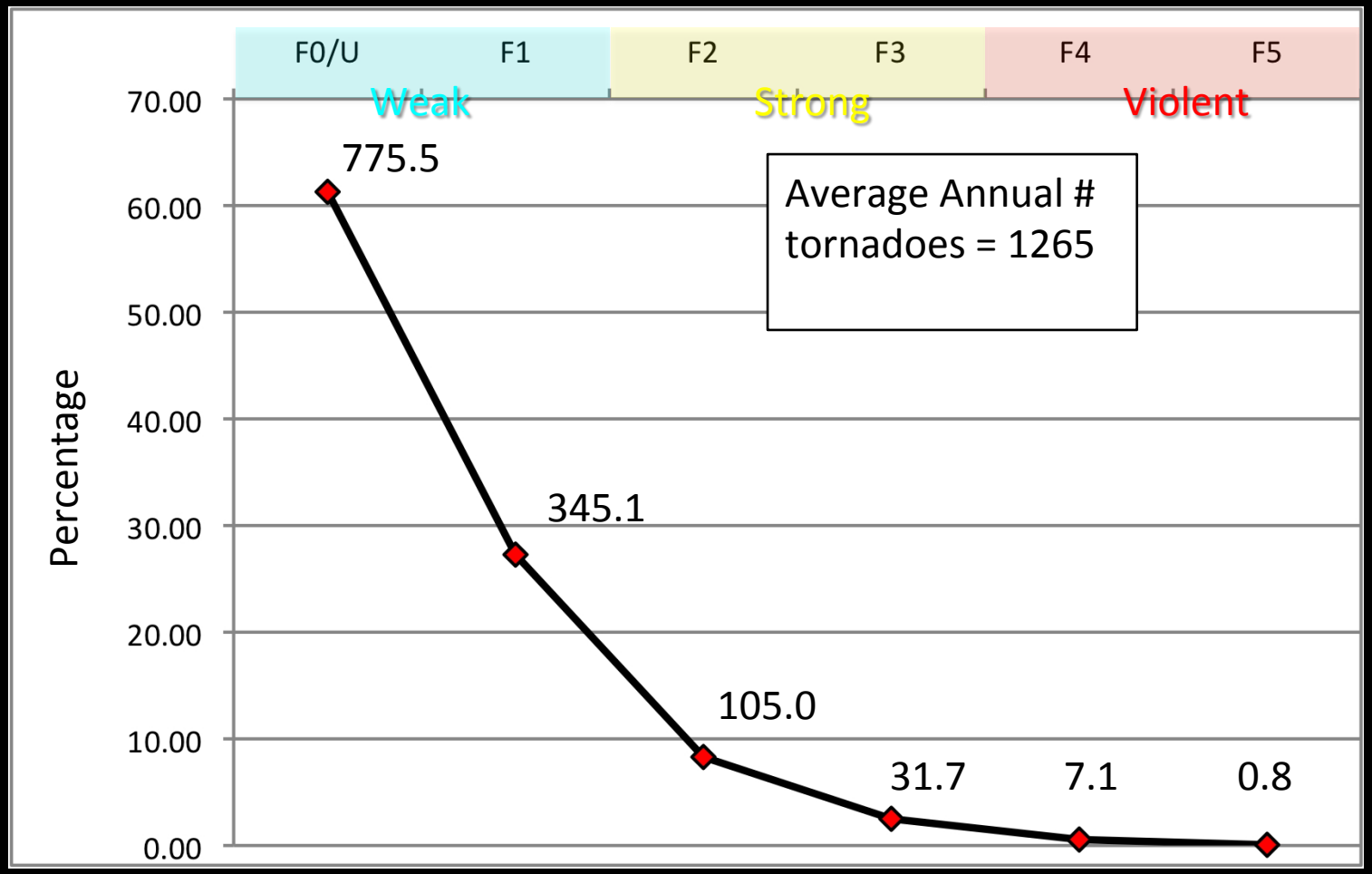
Geophysical hazards and risk perception

- Compensating factors
  - Fertile soil/access to water
  - Desirable location/beautiful scenery
  - Family history of occupancy
  - Comforting myths
  - Complacency – won't happen to me!
- Really big, disastrous events are rare
- Collective memories of the past can fade to insignificance in about 1-2 generations
  - Gainesville, Georgia (1998-1936)

European Severe Convective Storms

- All Europe has about 1/3 the number of tornadoes as the USA annually (ESWD)
- The intensity distribution of tornadoes in Europe is roughly the same as in the USA! (except in the U.K.)
  - Should be ~2 *major* events per 100 years
  - Better construction reduces European fatalities
  - Comparable to the northeast USA

US tornado distribution by F/EF-scale --1990-2011



The making of a severe convective storm forecaster

- Education at least comparable to that of a B.Sc. Degree (USA)
- Experience (at SPC ~5 years = 5 yr x150 days yr^{-1})
  - Passion for the job!
  - SPC has severe convective storms to forecast on a majority of days in a year
- Individual nations in Europe - ~10 days per year?
- Most European national met services offer little or no information about severe convective storms

Reality, as I see it

- Public Myth – Big, damaging tornadoes don't happen in Europe
  - Hence, no record need be kept
  - Hence, little public demand for infrastructure or severe convective storm forecast service
  - Hence, severe storms almost always strike with no warning – this eventually will become a problem!
- Infrequent events, many unrecorded, known only locally and quickly forgotten
- Storm chasing in Europe – evidence this does happen here!

Poland – April 2012

Big tornado disasters in Europe

- Malta – 1551 - ~600 fatalities
- Sicily – 1851 - ~ 500 fatalities
- Soviet Union – 9 June 1984 - ~400 fatalities
- France – 18 August 1845 - ~70 fatalities
- … it's just a matter of time! …
- No location is completely immune – it can happen to you!!

The challenges to being prepared

- Low frequency ≠ zero frequency!
- A tornado disaster with no warning is bad!
- Pan-European version of the SPC
  - Not competition for national met services!
  - ESTOFEX forecasters already doing this …
- Public education
- Infrastructure – public and private
  - Before, during, and after the event

Where do we even begin?

- Accept the reality of the risk
- Convince the general public of that reality
- Begin to develop a system
  - Training forecasters about severe convection
  - Disseminate forecast products (time scale!)
  - Work with other disciplines to make the forecasts as effective as possible:

A reminder:

- For a forecast to be effective:
  - Users must receive the information
  - Users must understand the information
  - Users must know what to do with the information
  - Users must believe the information
  - Users must be able to take effective action
- Forecaster training and forecast verification (for feedback)

Spotter networks

- Radar does not detect tornadoes!
- Spotter networks
  - Amateur radio
  - Enlist responsible storm chasers
  - Two-way communication with met. service offices
- Improves the climatological record of events
- Training provided to spotters
  - Knowledge of storms
  - How to operate effectively and safely

European Severe Weather Database

ESWD

Version 4.0.1 (2 Jan 2012)

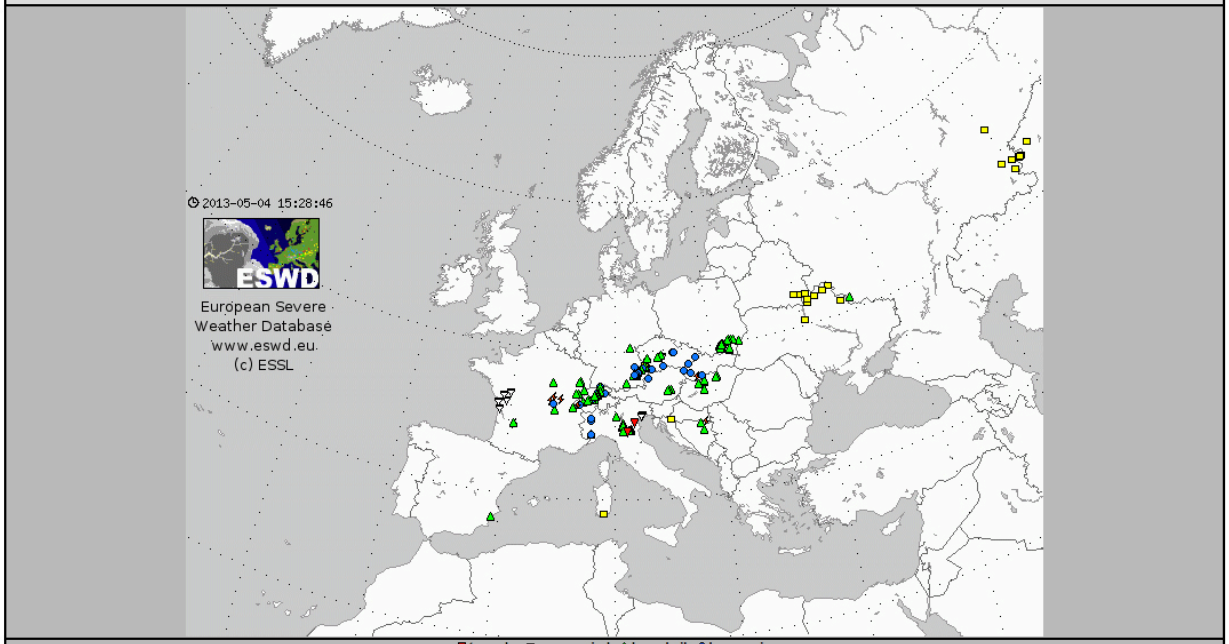
partners: Skywarn Deutschland, Skywarn Austria, Skywarn Polska, ACAMET, Kerauno, Skywarn CzechoSlovak, Skywarn Slovenia, ThunderstormTeam, Assoc. Thunderstorms

Submit a report to the ESWD | Make a selection | Information, terms and conditions...

Selected data from the database

selected: all reports
- occurring between 27-04-2013 00:00 and 04-05-2013 24:00 GMT/UTC

number of selected reports: 167
Only the first 25 selected events are shown in the table



tornado | severe wind | large hail | heavy rain
funnel cloud | gustnado | dust devil
heavy snowfall/snowstorm | ice accumulation | avalanche | damaging lightning
DEFINITIONS

table of all selected reports

large hail	**Birkfeld** Steiermark **Austria** (47.35 N, 15.70 E) **03-05-2013** (Friday) **19:50** UTC	based on: information from an eye-witness report maximum hail diameter: **3 cm** *Laut Spottermeldung (Hannes) 3 cm Hagel in Miesenbach um ca. 21:30* report status: **plausibility check passed** (QC0+) contact: Andreas Schindel [e-mail]
large hail	**Birkfeld** Steiermark **Austria** (47.35 N, 15.70 E) **03-05-2013** (Friday) **19:21** UTC	based on: information from an eye-witness report maximum hail diameter: **2.5 cm** average hail diameter: **2 cm** *Aus Miesenbach bei Birkfeld wird trockener Hageschlag (2,5 cm) gemeldet!* report status: **plausibility check passed** (QC0+) contact: Christoph Grossegger [e-mail]
large hail	**Mixnitz** Steiermark **Austria** (47.33 N, 15.36 E) **03-05-2013** (Friday) **18:53** UTC	based on: information from an eye-witness report maximum hail diameter: **4 cm** *laut Spottermeldung Hagel mit Korngröße 4 cm bei Mixnitz* report status: **plausibility check passed** (QC0+) contact: Andreas Schindel [e-mail]

Emergency management

- Develop relationships – establish communication, mutual respect and trust
- Working with forecast uncertainty
- Two-way feedback with national met services
- First responders may need forecast support
  - Police
  - Firefighters
- Long-term disaster mitigation efforts

Concluding remarks:

- What resources are you willing to ask for?
- What is the public willing to pay for?
- If the choice is to do little or nothing, what happens *when* (not if) a big disaster occurs?
- Will such a disaster happen while you're on duty?
- How many tornado fatalities would be "acceptable losses"?

Thank you!

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