Severe convective storm activity and trends in Europe and the US

Sam Phibbs

Oasis Insight Conference

25th April 2024
Record Breaking Hail in Europe

15 cm on 20 June 2016
Sântandrei, western Romania

16 cm on 19 July 2023
Carmignano di Brenta, northern Italy

19 cm on 24 July 2023
Azzano Decimo, northern Italy

Trends in Observations of Hail in Europe

Number of reports and days with:
- large (2+ cm),
- very large (5+ cm),
- giant (10+ cm) hail between 2006 and 2023 according to the European Severe Storms Laboratory (ESWD)

2023 Italian Hail Loss

Unprecedented Event

- Initial industry loss estimate $2.2 bn
- Deterioration to latest loss estimate $5.4 bn
- The event will be ~5% of the 2023 insured loss from natural catastrophes

Understanding of the Impact of Climate Change on European Hail

2016
Attribution of Extreme Weather Events in the Context of Climate Change

2019
Frequency of severe thunderstorms across Europe expected to increase in the 21st century due to rising instability

- Long term climate change scenario
- 40-80% increase in very large hail (>=5 cm) in northern Italy from 1971-2000 to 2071-2100 for RCP 4.5
- Equivalent to an increase of 0.3% - 0.6% / year

2023
Modeled Multidecadal Trends of Lightning and (Very) Large Hail in Europe and North America (1950–2021)

- Historical analysis
- 200% increase in very large hail (>=5cm) in northern Italy from 1950s to 2017-2021
- Equivalent to an increase of 1.7% / year

Mean modelled annual number of hail hours (1950-2021) and annual trends in change in the number of hail hours per decade

Trends significant at a 95th percentile level are cross hatched.

Modelled time series (1950-2021) of hail ≥ 2 cm and hail ≥ 5 cm for two regions (a) northern Italy and (b) central Oklahoma.

Illustrative catastrophe model input data periods:

Hazard data

Loss data

Colours indicate the area-averaged percent departure of each hazard from the long-term (1950–2021) average.

On 30 August 2022, a severe hailstorm event occurred in north-eastern Spain, with hailstones reaching up to 12 cm. It occurred during a period of exceptionally warm sea surface temperatures on top of a warming trend. Weather models show the influence of climate change on the probability of large hail for the event.

Industry Loss for Severe Convective Storm in the US

9.1% increase in loss per year

Boise, Idaho
Urban area in 2001 in grey; 2021 in purple

Reno, Nevada
Urban area in 2001 in grey; 2021 in purple
Modelled time series (1950-2021) of hail ≥ 2 cm and hail ≥ 5 cm for two regions (a) northern Italy and (b) central Oklahoma.

Colours indicate the area-averaged percent departure of each hazard from the long-term (1950–2021) average.

Thank you