



*climate extreme events*

*Examples of extreme weather/climate events*



## *Outline*

- *Examples of extreme weather/climate events*
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## *Examples of extreme weather/climate events*

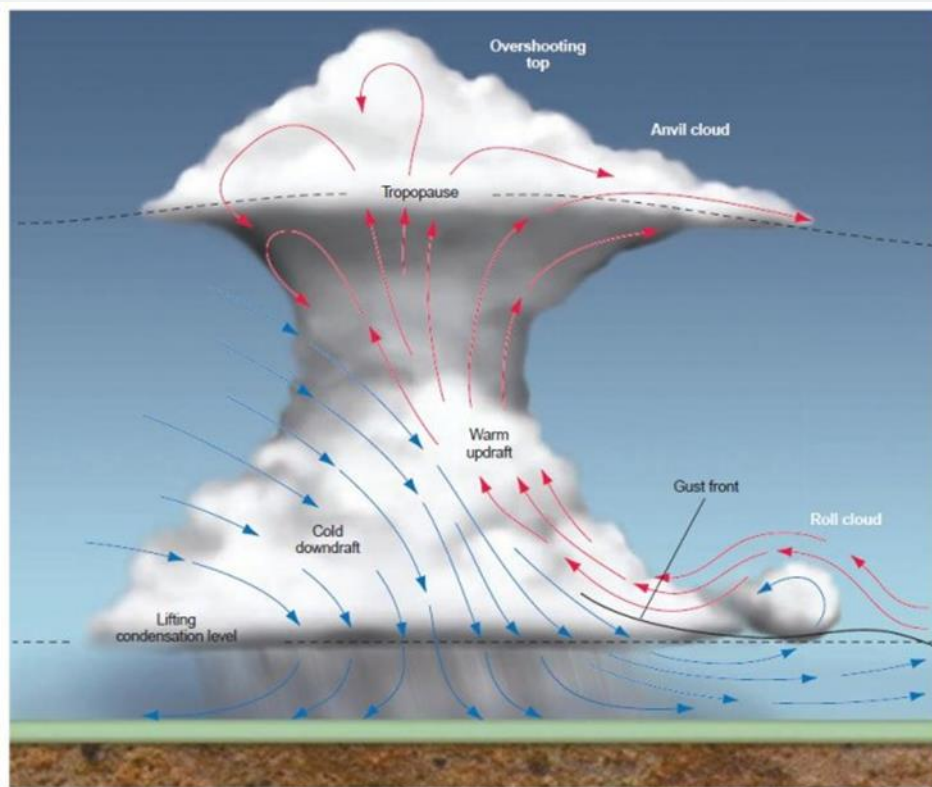
One approach towards creating a definition is to try to list and classify all events that one considers to be extreme. For example, the following events are often cited as examples of extreme weather/climate events.

- *Tropical cyclones and hurricanes* (e.g., Typhoon Tracy, Hurricane Hugo, etc.). These storms are the major source of global insured catastrophe loss after earthquakes.



- *Extratropical cyclones* (e.g., the “Perfect Storm” that hit the northeast coast of the United States, October 28–30, 1991). These storms are generally referred to as “windstorms” by the reinsurance industry.
- *Convective phenomena* such as tornadoes, waterspouts, and severe thunderstorms. These phenomena can lead to extreme local wind speeds and precipitation amounts on horizontal scales of up to about 10 km. Deep convection often leads to precipitation in the form of hail, which can be very damaging to crops, cars, and property.





#### 4.29 Anatomy of a severe thunderstorm

A severe thunderstorm can maintain convection and precipitation for long periods of time if it can continuously incorporate warm, moist air. Gust fronts associated with downdrafts extending ahead of the storm system force warm, moist surface air aloft and into the advancing storm.



- *Mesoscale phenomena* such as polar lows, mesoscale convective systems, and sting jets. These features can lead to extreme wind speeds and precipitation amounts on horizontal scales from 100 to 1,000 km.



- *Floods* of rivers, lakes, coasts, etc., due to severe weather conditions; for example, river floods caused by intense precipitation over a short period (e.g., flash floods) and persistent/recurrent precipitation over many days (e.g., wintertime floods in northern Europe), river floods caused by rapid snowmelt due to a sudden warm spell, or coastal floods caused by high sea levels due to wind-related storm surges.



- *Drought.* Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some “normal” or average amount) and the duration of the dry period. Simple definitions relate actual precipitation departures to average amounts on monthly, seasonal, or annual timescales. However, meteorological drought also depends on other quantities such as evaporation that depend on variables such as temperature.



- *Heat Waves.* Periods of exceptionally warm temperatures can have profound impacts on human health and agriculture. Duration is a key component determining the impact.



- *Cold waves/spells* (e.g., extremely cold days or a succession of frost days with minimum temperatures below 0 8C).

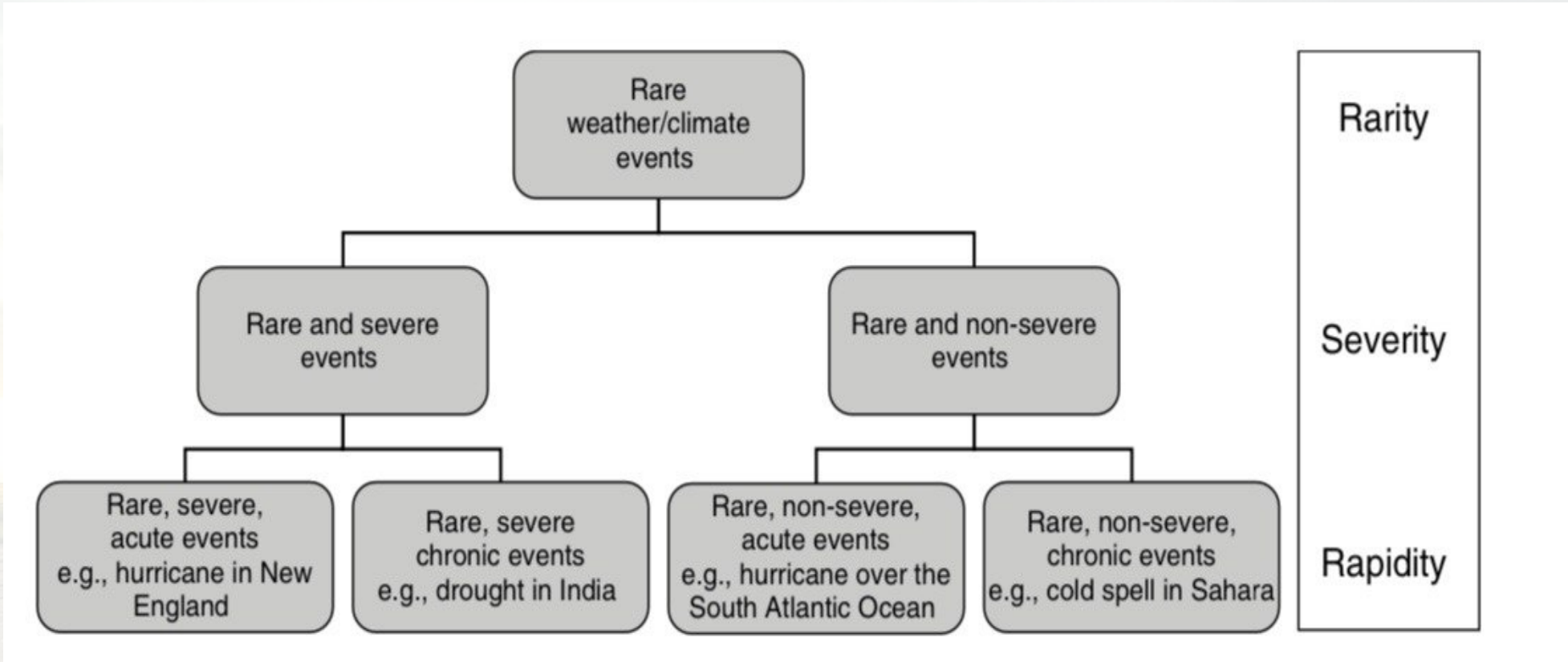


- *Fog.* Extremely low visibility has major impacts on various sectors such as aviation and road transport.





- In order to make more sense of this set of diverse events, it is useful to try to classify them into smaller subgroups. A simple binary taxonomy of weather and climate events can be based on the attributes of rarity, severity, and duration as shown in Figure below:



- First, for any particular location an event can be considered to be either rare or not rare depending on how often such an event happens. For example, events can be considered rare if they happen less frequently than once every 250 years (a return period often used by the reinsurance industry to assess acceptable levels of risk).
- Second, depending upon its impacts, an event can be considered either severe or not severe. Severity depends not only upon the characteristics of an event but also upon the exposure and vulnerability of the system it impacts. For example, a heat wave in the Gobi Desert is not a severe event in terms of human impact, because there is very little human exposure (i.e., very few people live there).
- Finally, events can be classified by their longevity into either acute or chronic events. In contrast to the medical situation, where severe syndromes can generally not be sustained over a long period of time and therefore tend to be acute rather than chronic (e.g., severe acute respiratory syndrome [SARS]), severe weather events can be either acute (e.g., a major hurricane) or chronic (e.g., a major drought).

A dramatic landscape photograph. In the foreground, a paved road curves through a field of tall, green grass. The middle ground shows a flat, green field with a few trees and a small building. In the distance, a line of wind turbines is visible against a horizon. The sky is filled with dark, heavy clouds, and a bright lightning bolt strikes in the upper right corner. The overall mood is one of a storm brewing over a rural landscape.

## References

- **Stephenson, D. B., Diaz, H. F., & Murnane, R. J. (2008). Definition, diagnosis, and origin of extreme weather and climate events. *Climate extremes and society*, 340, 11-23.**



*Thank you*