



Phenomena related to weather and climate extremes

Observed and Projected Changes in Phenomena Related to Weather and Climate Extremes

1. Monsoons

Changes in monsoon-related extreme precipitation and winds due to climate change are not well understood. Generally, precipitation is the most important variable, but it is also a variable associated with larger uncertainties in climate simulations and projections. Changes in monsoons should be better depicted by large-scale dynamics, circulation, or moisture convergence more broadly than via precipitation only.

2. El Niño-Southern Oscillation

The El Niño-Southern Oscillation (ENSO) is a natural fluctuation of the global climate system caused by equatorial ocean-atmosphere interaction in the tropical Pacific Ocean. The term 'Southern Oscillation' refers to a tendency for above-average surface atmospheric pressures in the Indian Ocean to be associated with below-average pressures in the Pacific, and vice versa. This oscillation is associated with variations in SSTs in the east equatorial Pacific. The oceanic and atmospheric variations are collectively referred to as ENSO. An El Niño episode is one phase of the ENSO phenomenon and is associated with abnormally warm central and east equatorial Pacific Ocean surface temperatures, while the opposite phase, a La Niña episode, is associated with abnormally cool ocean temperatures in this region. Both phases are associated with a characteristic spatial pattern of droughts and floods. An El Niño episode is usually accompanied by drought in southeastern Asia, India, Australia, southeastern Africa, Amazonia, and northeast Brazil, with fewer than normal tropical cyclones around Australia and in the North Atlantic.



3. Other Modes of Variability

Other natural modes of variability

that are relevant to extremes and disasters include the North Atlantic Oscillation (NAO), the Southern Annular Mode (SAM), and the Indian Ocean Dipole (IOD) . The NAO is a large-scale seesaw in atmospheric pressure between the subtropical high and the polar low in the North Atlantic region.



4. Tropical Cyclones

Tropical cyclones occur in most tropical oceans and pose a significant threat to coastal populations and infrastructure, and marine interests such as shipping and offshore activities. Each year, about 90 tropical cyclones occur globally, and this number has remained roughly steady over the modern period of geostationary satellites (since around the mid-1970s).



5- Extratropical Cyclones

Extratropical cyclones (synoptic-scale low-pressure systems) exist throughout the mid-latitudes in both hemispheres and mainly develop over the oceanic basins in the proximity of the upper-tropospheric jet streams, as a result of flow over mountains (lee cyclogenesis) or through conversions from tropical to extratropical systems.. Extratropical cyclones are the main poleward transporter of heat and moisture and may be accompanied by adverse weather conditions such as windstorms, the buildup of waves and storm surges, or extreme precipitation events. Thus, changes in the intensity of extratropical cyclones or a systematic shift in the geographical location of extratropical cyclone activity may have a great impact on a wide range of regional climate extremes as well as the long-term changes in temperature and precipitation.