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ENSO Impact On A Global Scale

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In 2017, weather-related catastrophes accounted for 98% of total insured natural catastrophe losses according to a November 2018 report from The Geneva Association[1]. Socio-economic factors such as population growth, rising urbanization, complex supply chains and interconnected global trade have significantly contributed to the increasing loss trend. **Our climate is also changing, compounding these effects.**

El Niño-Southern Oscillation (ENSO) is one of the large-scale climate systems that influence weather extremes globally. Here, we summarize known historical impacts to key peak catastrophe zones.

ENSO Phase	Drought & Wildfire	Tropical Cyclone & Hurricane
La Niña	Favors a drier outlook for southwest U.S. & southern California	Enhances hurricane activity in Atlantic and reduces typhoon activity in Pacific
El Niño	Enhances rainfall in California & causes hotter and drier weather across most of Australia and South America	Reduces hurricane activity in Atlantic and enhances typhoon activity in Pacific

As The Climate Continues To Warm, What Changes Can We Expect?

Factors	Drought & Wildfire	Tropical Cyclone & Hurricane
Climate Change	• Increase in wildfire risk in the southwest U.S. associated with La Niña events would become more acute • Cooler and wetter weather in the southern U.S. associated with El Niño events, enhancing flood risks	• An increase in severity of the storms (up to 10%) during both El Niño & La Niña • Sea level rise, causing storm surge to penetrate further inland than today • Higher precipitation rate (10-15%) due to higher atmospheric temperature
Exposure Change	• Approximately 30% of all housing units in California are in the wildland-urban interface (WUI) areas • The growth in WUI area between 1990 and 2010 was more than 40%	• Higher population density along the U.S. coast. In 2010, 39% of population lived in the U.S. coastal area (10% of the total U.S. land area) – projected to increase another 8% by 2020 • Florida housing units increased by 31% between 2010 and 2016 – 80% of Florida total insured value is in coastal counties

Studying California drought conditions and Atlantic hurricane activity since 1980 reveals evidence of ENSO impact on these phenomena.

- The 1988-1989 strong La Niña suppressed precipitation in California and increased the severity of the drought that began in 1987. The 1991 Oakland Hills Fire (a.k.a. Tunnel Fire) was a result of this drought (1987-92). The total area burned in Tunnel Fire was only 1,520 acres, but the damage was jaw-dropping ($1.7 billion at the time) as it impacted a suburban area.
- The 2007-2008 strong La Niña brought a three-year drought in California from 2007 to 2009 including the 2007 Witch Fire in Southern California. Due to the strong La Niña along with other favorable conditions in 2008, a

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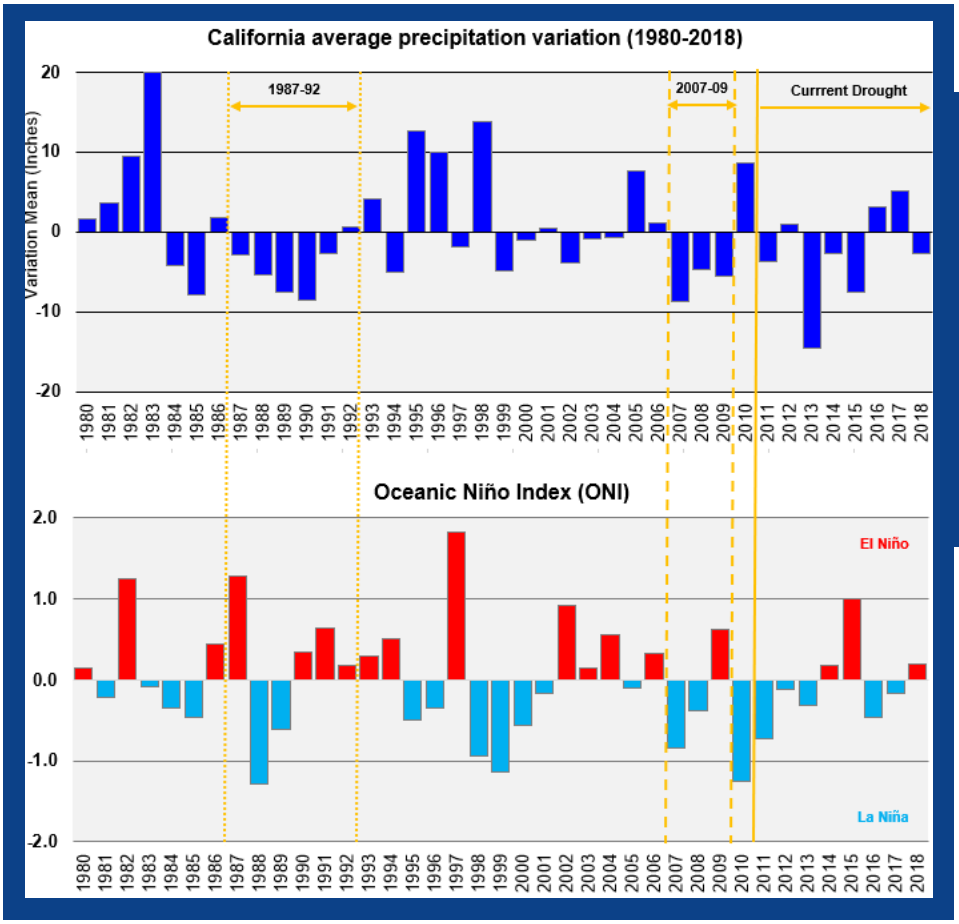
powerful storm (Hurricane Ike) impacted the Caribbean and Texas.

- The current drought period (2011-present) was influenced by the 2010 strong La Niña followed by a moderate La Niña phase in 2011.



- Lack of precipitation has significant impact on drought duration and severity
- Rainfall in California is suppressed by La Niña
- California drought conditions were strengthened by strong La Niñas during 1987-1992, 2007-2009 and period from 2011
- Global temperature is on the rise

The 2017 natural catastrophe events show that the La Niña influence, along other favorable conditions, intensified hurricane activity in Atlantic Basin (Harvey, Irma and Maria) and increased wildfire risk in California (Tubbs, Atlas, Mendocino Lake Complex and Thomas fires).

Although a negative North Atlantic Oscillation (NAO) phase provided a favorable setting for the 2017 Atlantic hurricane season, there is not enough evidence to project an upward trend of the NAO phases due to global warming.

TransReView: What the Future Holds

More acute La Niña due to climate change potentially increases risk of hurricane landfall on the U.S. Atlantic coast and in the Caribbean as well as elevates wildfire risk, especially in southern California. This points to correlation among peak region-perils. Managing the physical risk of climate change is necessary in order for the global (re)insurance industry to make informed and efficient capital allocation decisions. The recent California wildfire outbreak and multiple U.S. landfalling hurricanes showed that insurance linked securities (ILS) are not immune to these challenges that (re)insurance companies are facing.

Over the past 30 years, catastrophe models have transformed (re)insurers' ability to assess, price and manage risk. Embedding forward-looking climate assessment is a highly complex task that requires additional technological advancement and a new framework for properly modeling catastrophe risk. Perhaps, the first step doesn't have to be complex. Identification or categorization of ENSO phases into stochastic catalogues for weather-related perils is a start. This would allow (re)insurers to capture the correlation between regional perils influenced by climate risk in different markets.

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