Atmospheric rivers found to carry more wind than thought

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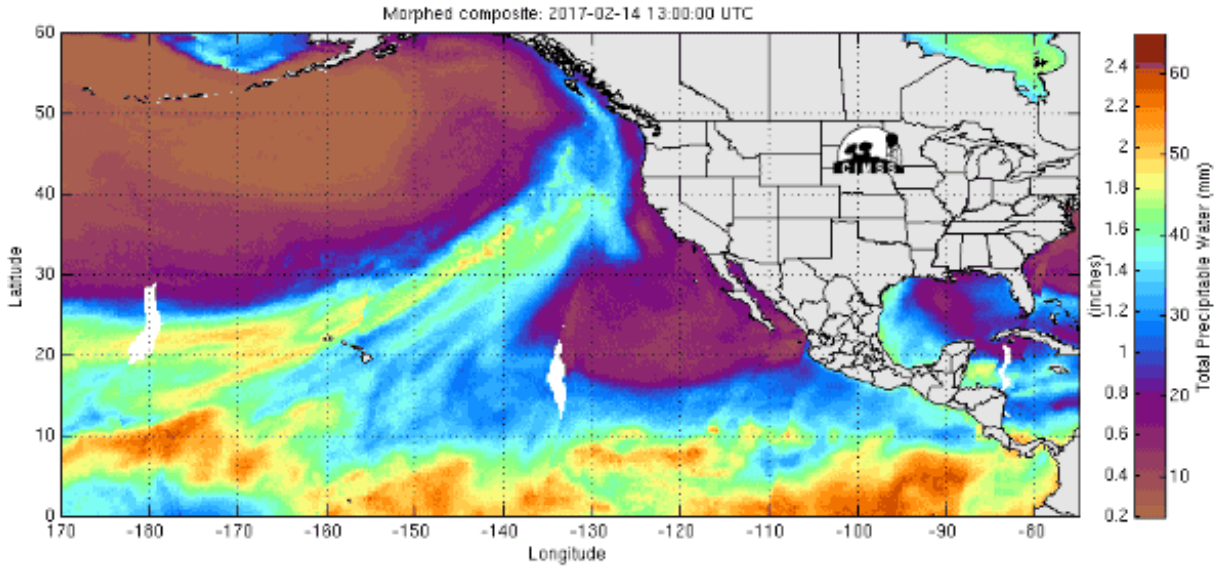

Credit: *Nature Geoscience* (2017). DOI: 10.1038/ngeo2894

(Phys.org)—A pair of researchers with the California Institute of Technology and the University of California has found evidence that suggests atmospheric rivers carry wind speeds higher than has been thought. In their paper published in the journal *Nature Geoscience*, Duane Waliser and Bin Guan describe their analyses of atmospheric river events that occurred over the years 1997 to 2014.

Atmospheric rivers are streams of air containing very large amounts of

moisture—they typically move through storms releasing very large amounts of water (or snow) to the ground over short periods of time—generally in the mid-latitudes. Meteorologists have known about them for several years, but up until now, it was believed that their major impact was the huge amount of precipitation they deliver. In this new effort, the researchers have found that they occur more often than was known, and that they also carry higher winds.

In looking at the data, the researchers found that coastal areas are most likely to be hit by atmospheric rivers—approximately half of the top 2 percent of very strong coastal storms were found to be associated with atmospheric rivers. They also found that 40 to 70 percent of high wind and heavy precipitation events that occur along coastlines are at least partly linked to atmospheric rivers. Most surprising, they note, was the high winds that came with them—associated speeds were on average twice as fast as those with average storms. As an example, California has been hard hit this winter by multiple atmospheric river events—the huge amounts of rainfall have alleviated the drought that prevailed over the past few years, but there has also been a tremendous amount of flooding—and high winds have caused damage, perhaps most noticeably by the toppling of the iconic Tunnel Tree sequoia in Yosemite National Park.

The researchers note that atmospheric rivers can be extremely costly—over the time period studied, they determined that 14 of 19 storms that caused billions of dollars of damage in Europe were atmospheric river events. They also point out that global warming, by its nature, will mean more water in the atmosphere, which likely will mean bigger and stronger atmospheric river events.

More information: Duane Waliser et al. Extreme winds and precipitation during landfall of atmospheric rivers, *Nature Geoscience* (2017). DOI: 10.1038/ngeo2894

Abstract

Atmospheric rivers—long, narrow filaments of large integrated water vapour transport—are associated with weather and water extremes, such as precipitation extremes and flooding in western North America and northern Europe. Here we apply a global detection algorithm for atmospheric rivers to reanalysis data during 1997–2014 to investigate the impact of atmospheric rivers on wind extremes as well as precipitation extremes. We find that atmospheric rivers are associated with up to half of the extreme events in the top 2% of the precipitation and wind distribution, across most mid-latitude regions globally. Landfalling atmospheric rivers are associated with about 40–75% of extreme wind and precipitation events over 40% of the world's coastlines. Atmospheric rivers are associated with a doubling or more of the typical wind speed compared to all storm conditions, and a 50–100% increase in the wind and precipitation values for extreme events. We also find that the majority of extreme wind events catalogued between 1997 and 2013 over Europe with billion US dollar losses were associated with atmospheric rivers. We conclude that landfalling atmospheric rivers can represent a significant hazard around the globe, because of their association with not only extreme precipitation, but also extreme winds.