Climate Variability and Change Affecting Wildfires in Southwest North America

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Purpose

In 2011, the southwest United States endured one of the most severe wildfire seasons on record. Williams et al. (submitted 2013) found that the southwest area burned in 2011 correlated better with vapor pressure deficit (r=0.72) than other variables, inspiring investigation into increased vapor pressure deficit as a climatological indicator for wildfires.

The purpose of this research is to establish vapor pressure climatologies and to understand how vapor pressure deficit and other climatological factors contribute to fire risk in the southwest U.S. We examined two wildfires as case studies, the Hayman Fire (2002) and the Rodeo-Chediski Fire Complex (2002), which were notable for their large sizes and extent of severely burned areas.

Methods

Data from the PRISM group at Oregon State University spanning the years 1961-2012 was used to establish seasonal vapor pressure climatologies and to understand spatial and temporal relationships of climate indices in the continental U.S. and the southwest region, defined as 100°W to 115°W, 28.5°N to 38°N. Severely burned area is categorized by the Montoring Trends in Burn Severity Project (MTBS).

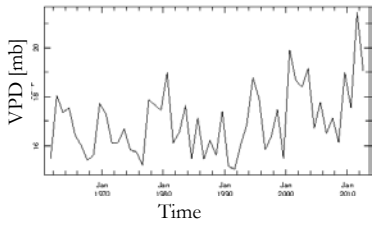

Figure 1: Average vapor pressure deficit July-September for the southwest region over time.

Seasonal Climatology of Vapor Pressure

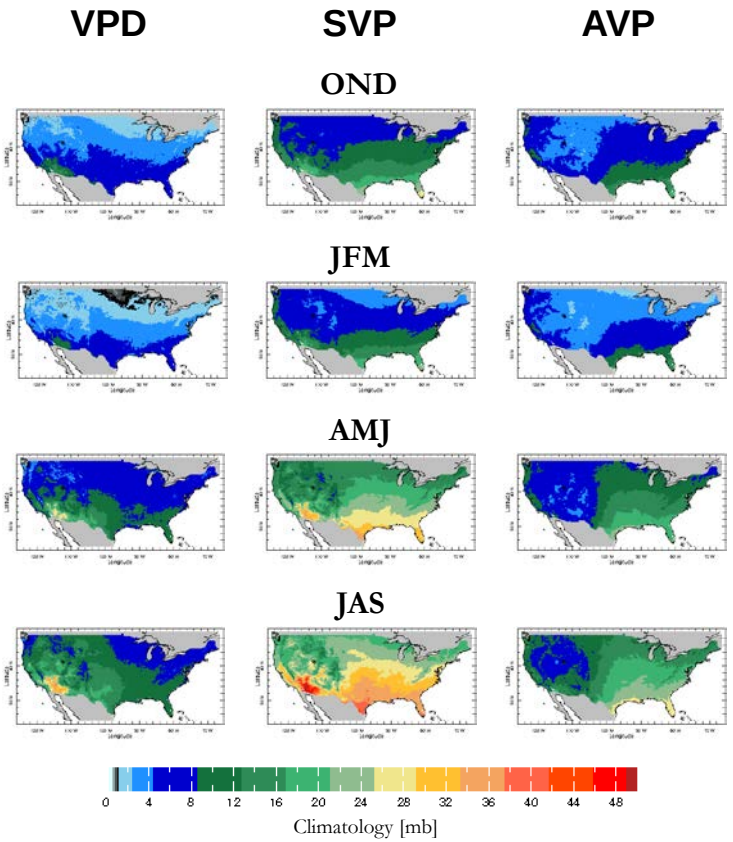

Figure 2: The maps show the vapor pressure deficit seasonal climatology (left), the saturation vapor pressure seasonal climatology (middle) and the actual vapor pressure seasonal climatology (right). Maximums occur in July-September in the southwest. Vapor pressure deficit is primarily temperature-driven.

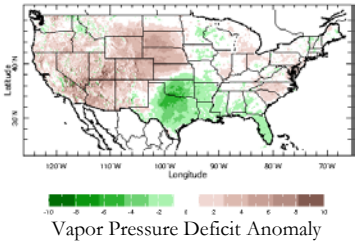

Figure 3: Average vapor pressure deficit anomalies for June and July of 2002, representative of the conditions during the Hayman and Rodeo-Chediski fire complex.

Discussion

In the southwest U.S., vapor pressure deficit is chiefly influenced by temperature. For the southwest region vapor pressure deficit is greatest in the summer months and has been on average increasing throughout time. In June and July of 2002, the vapor pressure deficit was anomalously high, contributing to the conditions for the Hayman fire and for the Rodeo-Chediski fire complex. This research is ongoing.

Sources

National MTBS Burned Area Boundaries Dataset. Digital image. *Monitoring Trends in Burn Severity*. Wildland Fire Leadership Council. Web. 13 Dec. 2013.

PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu, created 6 Dec 2013.

Williams, Park A., Richard Seager, Max Berkelhammer et al. "Vapor-pressure Deficit as the Driver of Extreme 2011 Wildfire in the Southwest United States." (submitted 2013).

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