

# THE ATMOSPHERIC RESERVOIR

*Examining the Atmosphere and Atmospheric Resource Management*

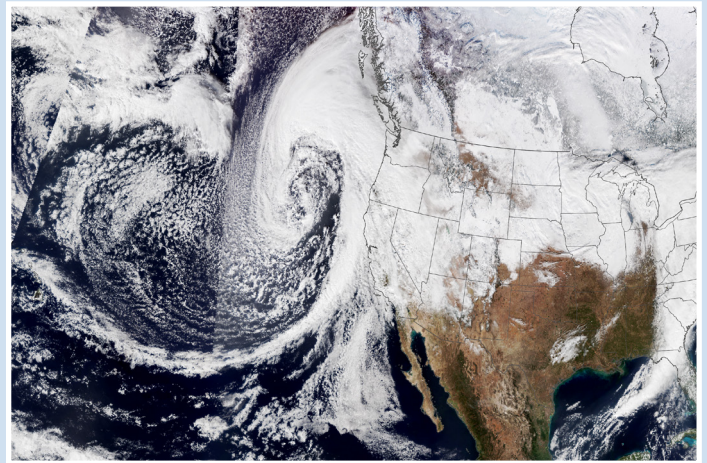
## TAKE ME TO THE "ATMOSPHERIC RIVER"

By Mark D. Schneider

From late last December through mid-January the western U.S. was inundated with precipitation from nine *Atmospheric River* (AR) events. During these AR events, the jet stream coincided with the location of low-pressure systems and moisture was literally pumped across the Pacific Ocean. Pacific storm systems normally provide west coast states with the majority of their annual precipitation between November and March. However, these storm systems are usually less numerous and more limited on the amount of moisture they carry.

The term *Pineapple Express* refers to an AR that originates near Hawaii and has winds that transport tropical moisture all the way east/northeastward to the U.S. mainland. ARs don't just originate from the Pacific Ocean and affect the western coast of the U.S. though. The Atlantic Ocean, Gulf of Mexico, and Caribbean Sea can serve as source regions for AR events. The central and eastern U.S. have experienced excessive rainfall and flooding during AR events like the one in May 2010 that dumped more than 13 inches of rain on Nashville in just two days. An AR that affects the southeastern U.S. is referred to as the *Mayan Express* because of the origins of its moisture in eastern Mexico and Central America. Some of the infamous *Nor'easters* that the mid-Atlantic states and New England have witnessed were "turbocharged" by streams of AR moisture. Across the Atlantic Ocean, parts of Europe routinely experience AR events.

When viewing the included satellite image of an AR event, one can see the long band of clouds from the Hawaiian Islands that extends the entire distance across the Pacific Ocean to California. The width of these moisture bands is typically 250 to 400 miles across, with a length of 1,000 miles or more. The amount of water transported by an AR



Courtesy of NASA's Earth Observatory.

can equal the flow in the Missouri, Mississippi, or even Amazon Rivers! Like tropical storms, ARs are categorized on a scale from one to five with one being weak (a beneficial event) and five being exceptional (a hazardous event).

Because of the record dry conditions that the western U.S. has experienced, it will take much more than the recent ARs to recover from the ongoing drought. In fact, California just recorded its three driest consecutive water years since 1896. It is encouraging, though, that the recent ARs produced 80 percent of California's average seasonal snowpack. For perspective, the state averaged 11.2 inches of precipitation during these three weeks (or almost half of the state's precipitation for a water-year).

Dry conditions have taken a hold on much of the western and central U.S. and North Dakota is included in these ongoing drought conditions. With that in mind, we anxiously await our version of a low level "atmospheric river" that brings Gulf of Mexico moisture northward and provides us our spring rains.

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