Central Valley irrigation intensifies rainfall, storms across the Southwest

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Agricultural irrigation in California's Central Valley doubles the amount of water vapor pumped into the atmosphere, ratcheting up rainfall and powerful monsoons across the interior Southwest, according to a new study by UC Irvine scientists.

Moisture on the vast farm fields evaporates, is blown over the Sierra Nevada and dumps 15 percent more than average summer rain in numerous other states. Runoff to the Colorado River increases by 28 percent, and the Four Corners region experiences a 56 percent boost in runoff. While the additional water supply can be a good thing, the transport pattern also accelerates the severity of monsoons and other potentially destructive seasonal weather events.

"If we stop irrigating in the Valley, we'll see a decrease in stream flow in the Colorado River basin," said climate hydrologist Jay Famiglietti, senior author on the paper, which will be published online Tuesday, Jan. 29, in the journal Geophysical Research Letters. The basin provides water for about 35 million people, including those in Los Angeles, Las Vegas and Phoenix. But the extra water vapor also accelerates normal atmospheric circulation, he said, "firing up" the annual storm cycle and drawing in more water vapor from the Gulf of Mexico as well as the Central Valley.

When the additional waves of moisture bump into developing monsoons, Famiglietti said, "it's like throwing fuel on a fire."

He and colleague Min-Hui Lo, a postdoctoral researcher at the University of California Center for Hydrologic Modeling who is now at National Taiwan University, painstakingly entered regional irrigation levels into global rainfall and weather models and traced the patterns.

"All percent differences in the paper are the differences between applying irrigation to the Central Valley and not applying it," Famiglietti said. "That's the point of the study – and the beauty of using computer models. You can isolate the phenomenon that you wish to explore, in this case, irrigation versus no irrigation."

Famiglietti's team plans to increase the scope of the work to track how major human water usage elsewhere in the world affects neighboring areas too. A better understanding of irrigation's impact on the changing climate and water availability could improve resource management in parched or flooded areas.

Provided by University of California, Irvine