

Rogue storm system caused Pakistan floods that left millions homeless

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This photo, taken long after the initial floods hit in late July 2010, shows the significant effect of the monsoon on roads in the Muzaffargarh district near central Pakistan. Credit: World Vision

Last summer's disastrous Pakistan floods that killed more than 2,000 people and left more than 20 million injured or homeless were caused by a rogue weather system that wandered hundreds of miles farther west than is normal for such systems, new research shows.

Storm systems that bring widespread, long-lasting rain over eastern India and Bangladesh form over the Bay of Bengal, at the east edge of India, said Robert Houze, a University of Washington atmospheric sciences professor. But Pakistan, on the [Arabian Sea](#) west of India, is substantially more arid and its storms typically produce only locally heavy rainfall.

The flooding began in July and at one point it was estimated that 20 percent of Pakistan's total land area was under water. Structural damage was estimated at more than \$4 billion, and the World Health Organization estimated that as many as 10 million people had to drink unsafe water.

Houze and colleagues examined radar data from the [Tropical Rainfall Measuring Mission](#) satellite and were able to see that the rainfall that caused the Indus River in Pakistan to overflow was triggered over the Himalayas, within a storm system that had formed over the Bay of Bengal in late July and moved unusually far to the west. Because the rain clouds were within the moisture-laden storm from the east, they were able to pour abnormal amounts of rain on the barren mountainsides, which then ran into the Indus.

The progress of the storm system stood out in the [satellite radar data](#), Houze said.

"We looked through 10 years of data from the satellite and we just never saw anything like this," he said. "The satellite only passes over the area a couple of times a day, but it just happened to see these systems at a time when they were well developed."

Houze is the lead author of a paper detailing the findings to be published in the [Bulletin of the American Meteorological Society](#). Co-authors are Kristen Rasmussen, Socorro Medina and Stacy Brodzik of the UW and Ulrike Romatschke of the University of Vienna in Austria.

Houze also will discuss the findings during a session Tuesday (Jan. 25) at the American Meteorological Society's annual meeting in Seattle

The storms were associated with a wind pattern that could be traced in the satellite data back to its origin over the Bay of Bengal, Houze said.

Finding the [storm](#) system's signature in the satellite data makes it possible to incorporate that information into weather forecast models. That could make it possible for meteorologists to forecast when conditions are favorable for such an event to occur again and provide a warning.

"I think this was a rare event, but it is one you want to be thinking about," Houze said. "Understanding what happened could lead to better predictions of such disasters in the future."

Provided by University of Washington

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