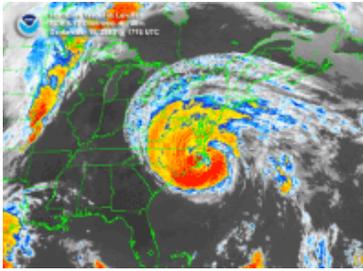


Climate of 2003

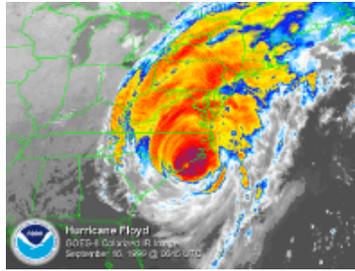
Comparison of Hurricanes Floyd, Hugo, and Isabel

National Climatic Data Center, Last updated - 24 Sept. 2003

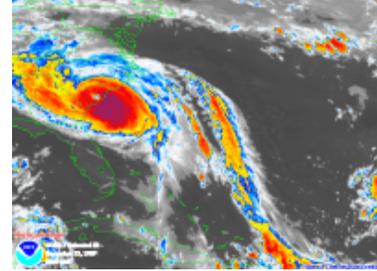
[Summary of 2003 Atlantic Hurricanes](#)



[Isabel, Sept. 18th, 2003](#)



[Floyd, Sept. 16th, 1999](#)

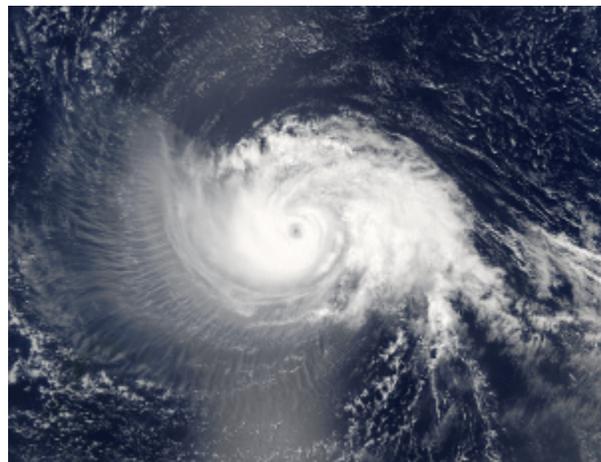


[Hugo, Sept. 22nd, 1989](#)

Click on images above for larger versions

Storm History

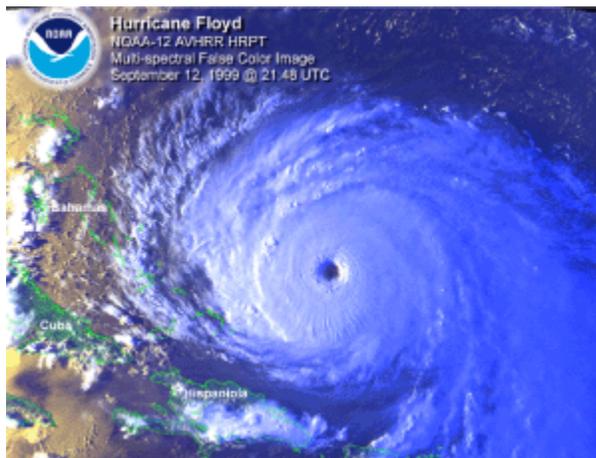
A tropical wave moving off the shore of Africa developed into Tropical Storm Isabel in the far eastern Atlantic, near the Cape Verde Islands on September 6th 2003. The next day, as it moved west-northwestward, Isabel developed an eye and reached hurricane strength on the 7th. Conditions were very favorable for Isabel's continued development with warm sea surface temperatures ahead of it, low shear and an impressive outflow pattern from the storm. Rapid intensification occurred over the next several days and [Isabel](#) became a [category 5 hurricane](#) on the 11th. Isabel weakened slightly on the 13th but did not weaken considerably until overnight on the 15th/16th when westerly shear began to affect the storm. Isabel decreased in strength to a category 2 storm, and eventually came ashore along North Carolina's Outer Banks on September 18th with sustained winds of approximately



[larger image](#)

85 knots - a minimal category 2 storm.

Floyd was also a [Cape Verde hurricane](#). The precursor to Floyd was a tropical wave which moved off the coast of Africa on September 2nd, 1999. The wave did not get organized enough to become a tropical depression until September 7th when it was approximately 1000 miles east of the Lesser Antilles. Sufficient strengthening had occurred for the depression to be classified as Tropical Storm Floyd the following day about 750 miles east of the Leeward Islands. Though conditions were favorable for rapid intensification, Floyd's inner core was not well defined, nor was there much deep convection, so strengthening was slow and TS Floyd did not become a hurricane until September 10th, 200 miles east-northeast of the northern Leeward Islands.

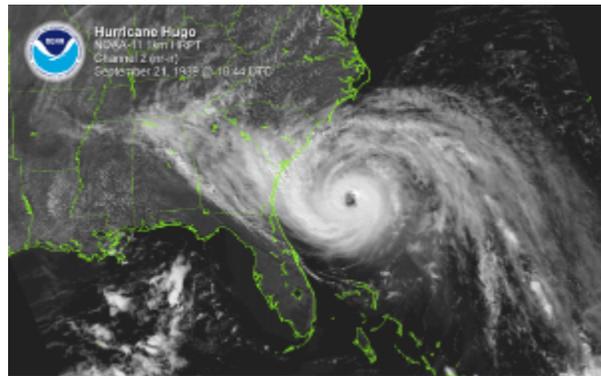


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Floyd reached windspeeds of 135 knots (upper category 4) on the 13th while it was just north of the central Bahamas, though not before it had undergone some strengthening then weakening and then reintensifying. It is likely that warm sea surface temperatures contributed to Floyd's re-strengthening. Floyd turned slightly to the west-northwest late on the 13th and its eye passed just 20-30 n mi northeast and north of San Salvador and the Cat Islands. Floyd continued to turn more to the north as upper level conditions (a trough) along the eastern Seaboard of the U.S. helped to steer it. By the 15th, Floyd was paralleling the coast of Florida and passed just 95 n mi east of Cape Canaveral on its way north to the Carolinas. Floyd diminished in strength from the 13th to the 15th such that maximum windspeeds were near 90 knots (category 2) at landfall on the 16th at Cape Fear, North Carolina. Two possible reasons for the weakening were the entrainment of drier air from the northwest and some south-southwesterly vertical shear.

After moving on shore at Cape Fear, Floyd continued up the coast, passing over Norfolk, Virginia before diminishing to a tropical storm as it continued across New Jersey, eventually moving into New England on the 17th. The storm became extratropical as it moved into Maine and Floyd's remnants eventually merged with an extratropical low over the north Atlantic.

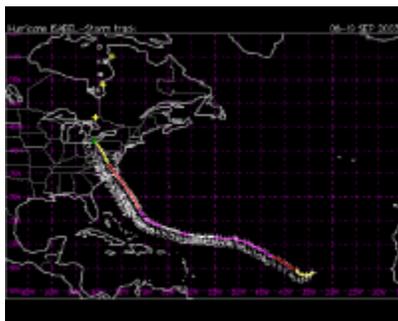
Hurricane Hugo in September 1989, was the strongest storm to strike the US since Camille hit the Louisiana and Texas coast in 1969. Hugo was a category 5 storm at its strongest and was still a category 4 when it affected the Virgin Islands, Puerto Rico and South Carolina. A cluster of thunderstorms off the coast of West Africa became a tropical depression on September 10th, 1989, about 125 miles south of the Cape Verde Islands. Hugo gradually strengthened over the next several days to become a hurricane on September 13th approximately 1100 miles east of the Leeward Islands.



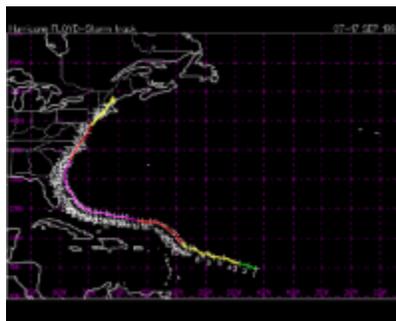
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By the time the storm was 400 miles east of Guadeloupe on the 15th, windspeeds had reached 150 mph, leading to a classification of 4 on the Saffir-Simpson scale. The hurricane's eye passed over Guadeloupe on September 16th (local time), and then impacted the Virgin Islands, especially St. Croix on the 18th. Windspeeds were maintained at approximately 140 mph as it crossed the islands. As the storm passed over the eastern tip of Puerto Rico windspeeds diminished somewhat, but the storm regained strength as it again moved over open waters. The storm moved northwestward and as it came into contact with the warm waters of the Gulf Stream on September 21st, Hugo once again reached category 4 status. Hugo also picked up forward speed and by the time it reached Charleston, SC just before midnight (local time) on the 22nd, windspeeds were sustained at 135 mph and the forward speed of the storm was 30 mph. An unofficial observer reported a minimum central pressure of 937 mb (27.68 inches) as the eye made landfall.

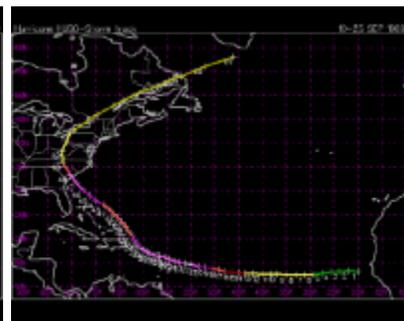
Storm Tracks



[Isabel, Sept., 2003](#)



[Floyd, Sept., 1999](#)



[Hugo, Sept., 1989](#)

Click on images above for larger versions

Floyd, Hugo and Isabel were all [Cape Verde hurricanes](#), beginning in the far eastern Atlantic and moving west and northwest through their lifespan. The tracks are quite similar, generally tending to move west before recurving in the western Atlantic to come ashore in the Carolinas. Cape Verde hurricanes tend to occur later in the season, and the long track of the storm allows it plenty of opportunity to strengthen to become a 'major' hurricane.

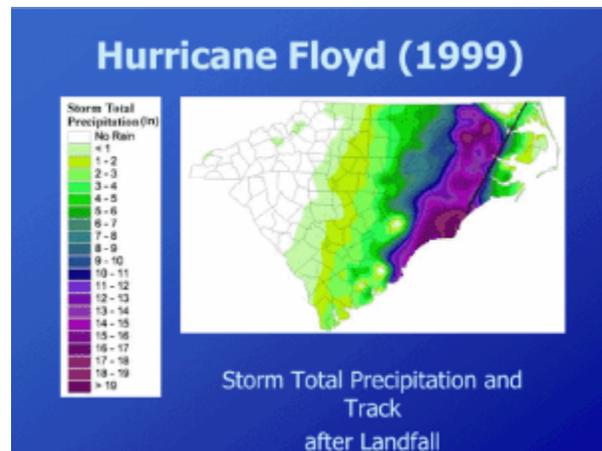
Rainfall and Damage



[larger image](#)

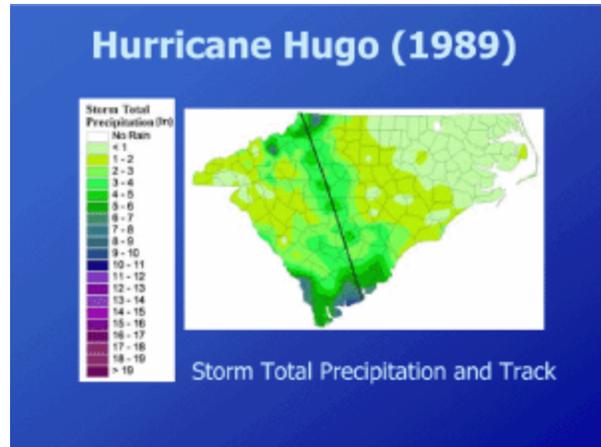
Floyd was the deadliest hurricane in the United States since Hurricane Agnes in 1972. Official statistics from Floyd include 57 deaths, 35 of which were in North Carolina. Most of the deaths were attributed to drowning in freshwater floods brought on by the intense rainfall associated with the hurricane. The total damage estimates from Floyd range from 3-6 billion dollars. Much of the damage was from flooding. A full NOAA/National Weather Service assessment of the floods resulting from Floyd can be found [here](#).

Precipitation for Floyd was by far the greatest of the three storms compared here. The heaviest precipitation fell in the eastern part of North and South Carolina, with cities such as Wilmington, NC and Brewster, NY receiving as much as 19.06 and 13.7 inches, respectively. Although the preceding several months had been quite dry in 1999, Tropical Storm Dennis made landfall only 2 weeks before Floyd also [dumping 5-7 inches](#) in some of the same areas that Floyd impacted. The storm surge from Floyd was only half that of Hugo with 9-10 foot surges reported on the North Carolina coast.



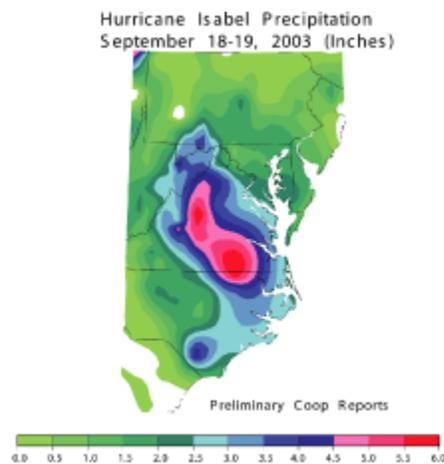
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Hugo's rainfall was much less intense than either Floyd or Isabel. However, Hugo's main impact was its wind. Hugo was at its strongest in the Caribbean, however, even after landfall on the mainland United States, hurricane force winds extended as far inland as Charlotte NC, 175 miles from the coast. 50 people died as a direct result of Hugo, 21 of those in the mainland United States. A storm surge of 20 feet was observed in the Cape Romain-Bulls Bay area of South Carolina as a result of the hurricane.



[larger image](#)

Preliminary estimates of Isabel's precipitation are shown to the right, and interior Virginia bore the brunt of the rainfall from Hurricane Isabel. Despite an extremely wet 12 months for Virginia and the Carolinas, flooding was not too severe, with most flooding occurring at the coastal margin. However, hurricane force winds and a [storm surge of as much as 7-10 feet](#) from Cape Hatteras and into the Chesapeake Bay area led to a great deal of [destruction at Cape Hatteras, NC](#), and flooding in coastal Virginia and Maryland. Preliminary estimates suggest that 38 people died as a result of Isabel.



[larger image](#)

Useful Links

- [Saffir-Simpson Scale](#)
- [NOAA's National Hurricane Center](#)
- [Southeast Regional Climate Center](#) - for tropical systems affecting the Southeast.

Citing the Article

Lawrimore, Jay; "Climate of 2003 Comparison of Hurricanes Isabel, Floyd, Hugo"; February 24, 2003; NOAA's National Climatic Data Center, Asheville, NC