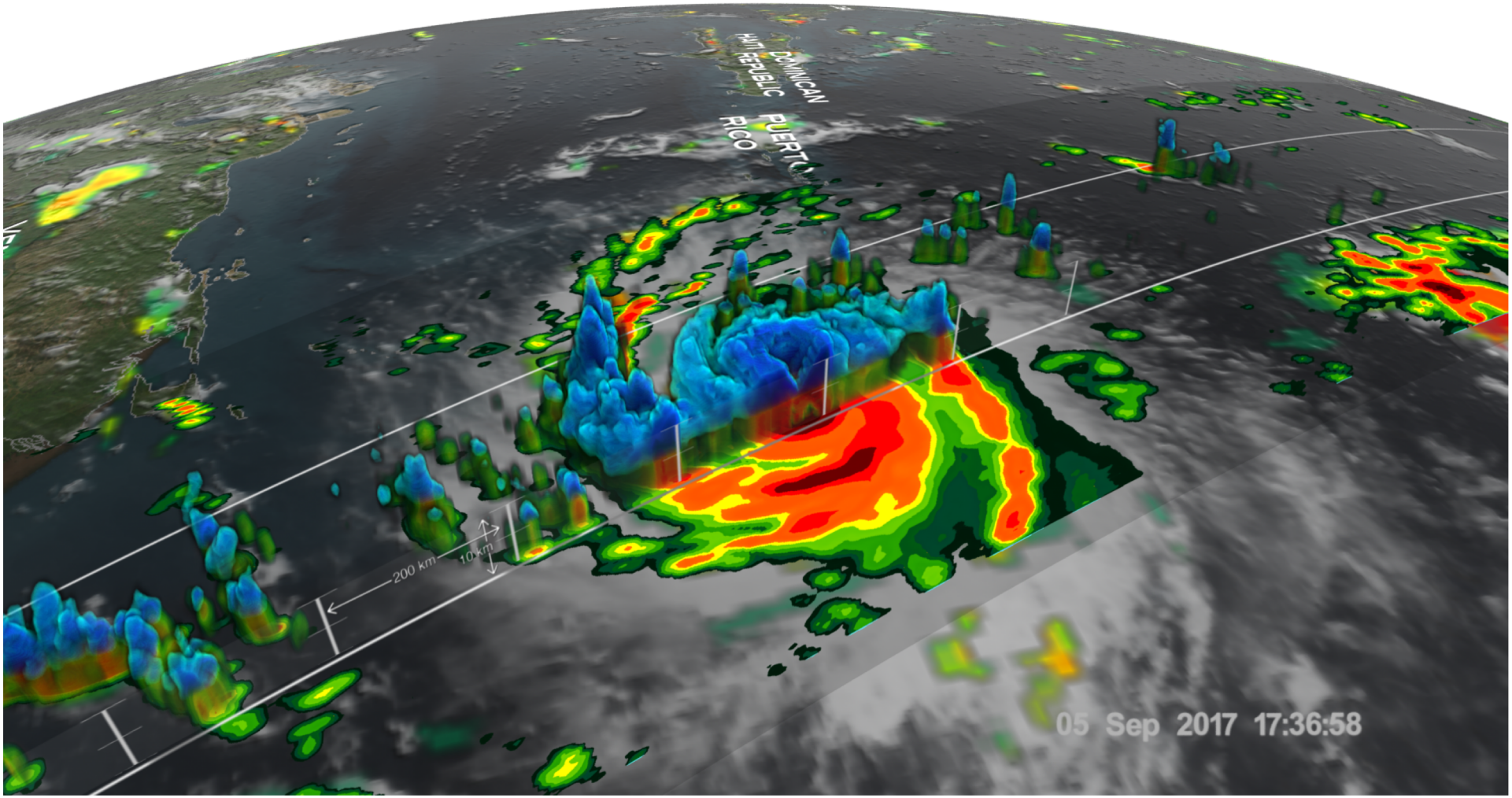


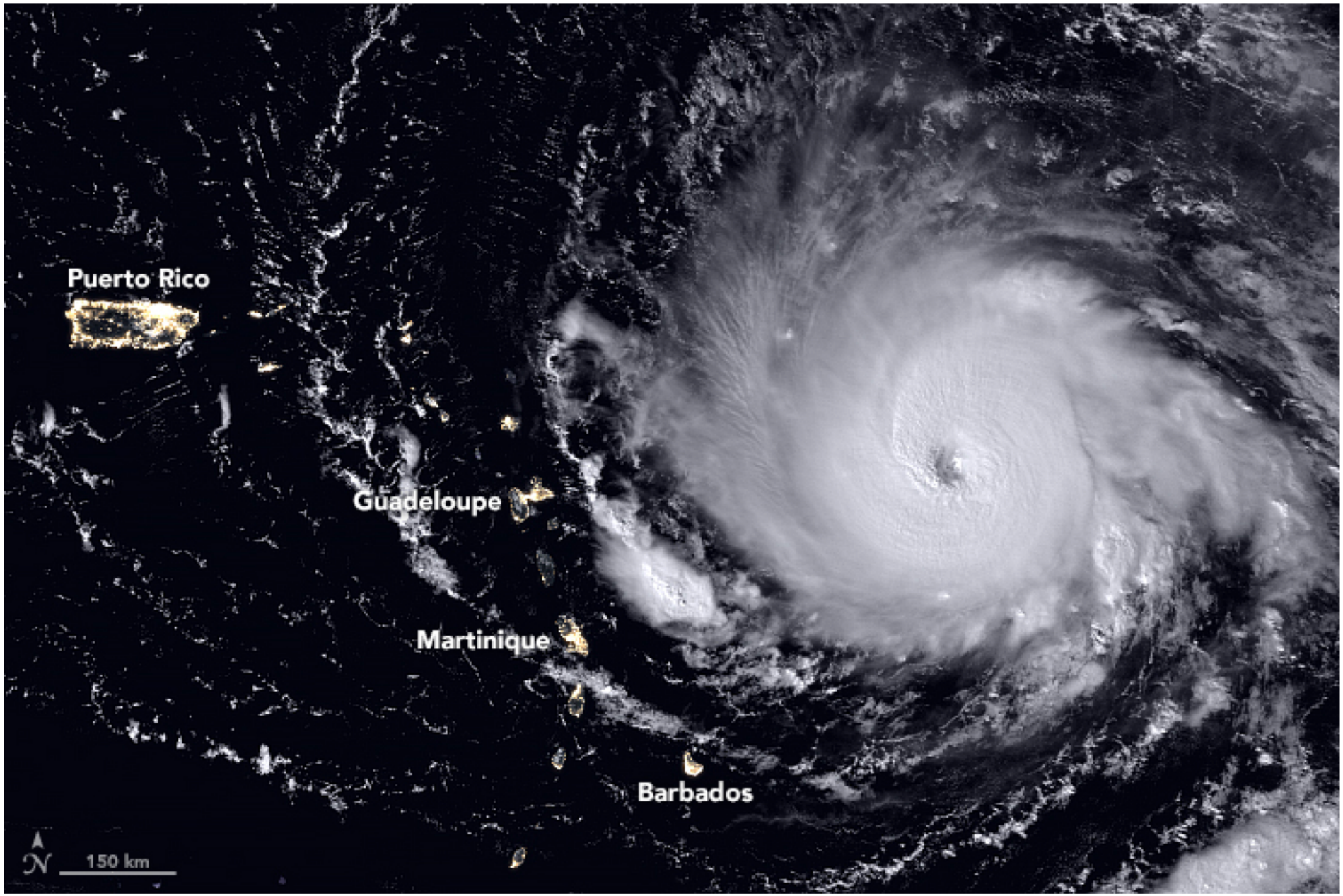
View of Hurricane Irma from the Global Precipitation Measurement Mission Core Observatory on September 5th, 2017

The GPM core observatory satellite had an exceptional view of hurricane Irma's eye when it flew above it on September 5, 2017 at 12:52 PM AST (1652 UTC). This visualization shows a rainfall analysis that was derived from GPM's Microwave Imager (GMI) and Dual-Frequency Precipitation Radar (DPR) data. Irma was approaching the Leeward Islands with maximum sustained winds of about 178 mph (155 kts). This made Irma a dangerous category five hurricane on the Saffir-Simpson hurricane wind scale. Intense rainfall is shown within Irma's nearly circular eye.

This 3-D cross-section through Irma's eye was constructed using GPM's radar (DPR Ku band) data. GPM's radar revealed that the heavy precipitation rotating around the eye was reaching altitudes greater than 7.75 miles (12.5 km). The tallest thunderstorms were found by GPM's radar in a feeder band that was located to the southwest of Irma's eye. These extreme storms were reaching heights of over 10.0 miles (16.2 km). Intense downpours in the eye wall were found to be returning radar reflectivity values of over 80dBZ to the GPM satellite.

Irma rapidly intensified on September 4-5 as it moved over very warm waters and into an environment will weak vertical wind shear (the change of winds with height). Irma maintained maximum winds of 185 mph for a day and a half, making it one of the longest-lived storms at this intensity. That intensity made it the strongest observed storm over the Atlantic Ocean (excluding the Gulf of Mexico and Caribbean). Irma’s rapid intensification was very similar to Hurricane Harvey's in the Gulf about 10 days earlier.

Scientific Visualization Studio: https://svs.gsfc.nasa.gov/4584



View of Hurricane Irma from the VIIRS instrument on the Suomi NPP satellite on September 5th, 2017

On September 5, 2017, Hurricane Irma intensified into a strong and ”potentially catastrophic” category 5 storm. By definition, category 5 storms deliver maximum sustained winds of at least 157 miles (252 kilometers) per hour. Irma’s winds that morning approached 180 miles per hour—the strongest ever measured for an Atlantic hurricane outside of the Gulf of Mexico or north of the Caribbean.

The Visible Infrared Imaging Radiometer Suite (VIIRS) on the Suomi NPP satellite captured this nighttime view of the storm in the early hours of September 5. The image was acquired by the VIIRS “day-night band,” which detects light in a range of wavelengths from green to near-infrared and uses filtering techniques to observe signals such as city lights, auroras, wildfires, and reflected moonlight. In this case, the clouds were lit by the nearly full Moon. The image is a composite, showing storm imagery combined with VIIRS imagery of city lights.

When the image was acquired, the storm’s center was moving due west. A National Hurricane Center forecast called for the hurricane to turn west-northwest toward the northern Leeward Islands. After that, the potential track area shows Irma’s path could move over areas between Puerto Rico, Cuba, and Florida.

NASA’s Earth Observatory: https://go.nasa.gov/2wKn9hG

Example of an anvil cloud/thunderhead

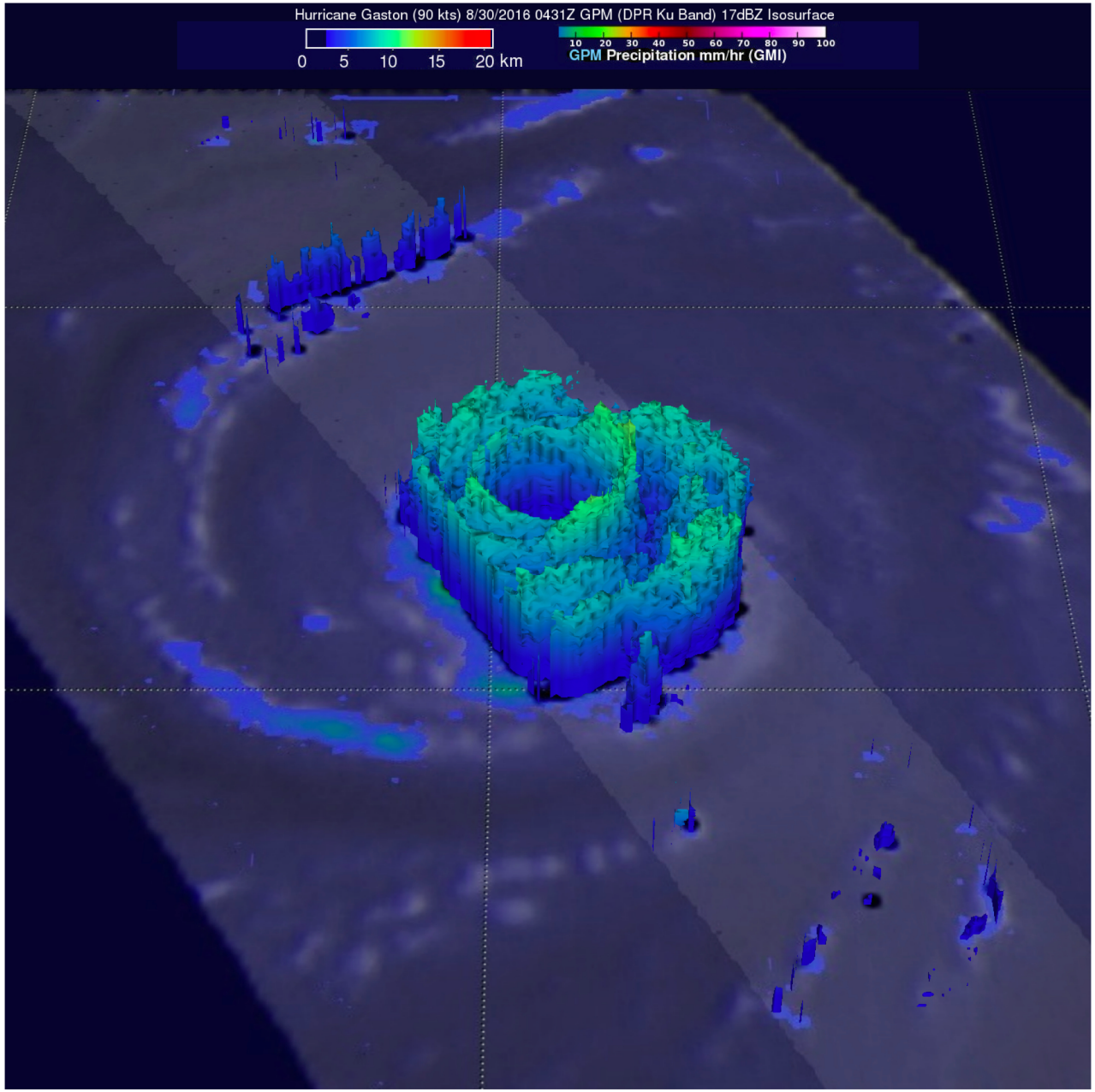
This image shows the classic “anvil” shape that thunderstorms can take. The shape arises from the lifting of air in the cloud right up to the tropopause, at which point it cannot rise any more and spreads out into the anvil. While this image is not from the same storm as the 3D printed example, it does show a similar structure.

Image source: Jeff Kubina on Flckr, www.flickr.com/photos/Kubina (CreativeCommons Share with Attribution license)

Example of a squall line

This image shows an example of a squall line, a line of thunderstorms forming along or ahead of a cold front. This storm can be compared to the hurricanes, showing the very different structure – moving in one direction rather than the distinctive spiral of the hurricane. While this image is not from the same storm as the 3D printed example, it does show a similar structure.

Image source: SturmjaegerTobi on Pixabay, pixabay.com/en/sky-landscape-agriculture-3171382
(CreativeCommons Share without Attribution license)



Hurricane Gaston undergoing an eyewall replacement, August 30th, 2016

Hurricane Gaston was located in the central Atlantic Ocean west of Bermuda when the GPM core observatory satellite passed over on August 30, 2016 at 00:31 AM EDT (0431 UTC). Gaston was a category two on the Saffir-Simpson hurricane wind scale with maximum sustained winds of about 103.5 mph (90 kts). GPM happened to fly over as Gaston was undergoing an eye wall replacement. Intense rainfall was clearly shown by GPM in rain bands of both the inner and the outer replacement eye walls. Precipitation was calculated from data collected by GPM's Microwave Imager (GMI) and Dual-Frequency Precipitation Radar (DPR) instruments. GPM's DPR found that in some storms rain was falling at a rate of greater than 5.4 inches (138 mm) per hour.

The most striking feature seen by GPM was Gaston's large relatively rain free inner eye area. A simulated 3-D flight above hurricane Gaston was made possible by GPM's radar (DPR ku Band). The structure of rain within the multiple eye walls are clearly shown by these series of views. Also the lack of rain within the inner calm area is evident. Many storm tops were measured by GPM's radar stretching to altitudes higher than 8 miles (13 km).

Images and caption by Hal Pierce (SSAI/NASA GSFC)
https://pmm.nasa.gov/extreme-weather/gpm-views-hurricane-gaston-eye-wall-replacement