

- During the predawn hours of last Monday morning September 26<sup>th</sup>, Tropical Storm Ian intensified to become the fourth Atlantic hurricane of 2022 as it was traveling to the northwest over the Caribbean Sea 90 miles to the southwest of Grand Cayman Island or 315 miles to the southeast of the western tip of Cuba. Passing to the west of Grand Cayman Island by midday on Monday, Ian took aim at western Cuba. Coincidentally, Ian strengthened from a category 1 to a major category 3 hurricane by early Tuesday morning. Two hours later, the central eye of Ian made landfall along the coast of Cuba just southwest of the town of La Coloma in Cuba's Pinar Del Rio Province with maximum sustained winds at landfall estimated to be 125 mph, which is a category 3 hurricane. After traveling across western Cuba, Ian emerged off the coast and out over the waters of the southeastern Gulf of Mexico late Tuesday morning approximately 125 miles to the south-southwest of the Dry Tortugas, a collection of islands located nearly 70 miles west of Key West, FL. By late Tuesday evening, Ian passed over the Dry Tortugas as a category 3 hurricane with sustained winds of 130 mph. The National Ocean Service tide gauge at Key West measured a peak water level of about 2.5 ft above Mean Higher High Water during the evening. As Ian approached the southwest coast of Florida, as many as 10 tornadoes were spawned across the Miami and Palm Beach metropolitan areas of South Florida on

Tuesday afternoon and evening. While several of these tornadoes were detected by radar, the public reported at least four tornadoes causing damage along with downed trees and utility lines. National Weather Service survey crews determined that the tornadoes were either EF-0 or EF-1 on the Enhanced Fujita Scale, indicating light to moderate damage. Tornado "spin-ups" are not uncommon especially in the front-right quadrant of approaching and landfalling tropical cyclones because the wind shear that is created on land.

During the predawn hours of Wednesday morning, Air Force Hurricane Hunter aircraft determined that Ian had become a major category 4 hurricane with maximum sustained near-surface winds of 140 mph as the hurricane's center was heading toward the north-northeast approximately 105 miles to the south-southwest of Punta Gorda, FL. Ian made landfall during the midafternoon of Wednesday at Cayo Costa Island, FL (just south of Punta Gorda) as a high-end category 4 hurricane with maximum sustained winds of 155 mph and a central minimum central pressure of 937 mb (27.67 inches of mercury); this 155-mph wind speed is just below the 157-mph threshold for category 5 status.

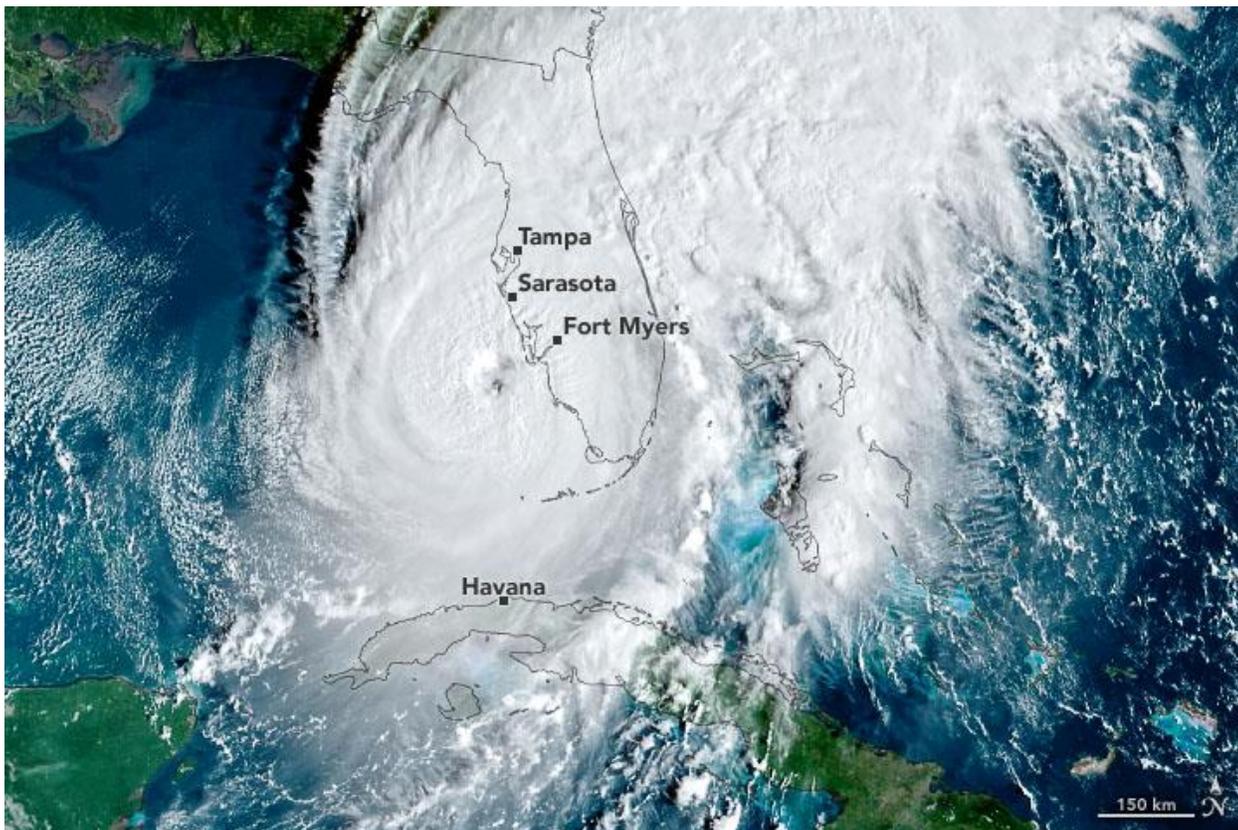
According to National Hurricane Center records, Hurricane Ian was the fifth hurricane since 2001 to make landfall in the U.S. to be ranked in the top ten for wind speed, with Hurricane Michael (2018) having a 155-mph wind speed, followed by Hurricanes Charley (2004 in Florida), Laura (2020 in Louisiana) and Ida (2021 in Louisiana) all having 150-mph wind speeds at landfall. Furthermore, only three other hurricanes during the 20th century had wind speeds in excess of 155 mph: the Labor Day Hurricane of 1935 (185-mph in Florida), Camille in 1969 (175-mph in Mississippi) and Andrew in 1992 (165-mph in Florida).

The cyclonic (counterclockwise) circulation of hurricane-force winds surrounding the central eye of Ian created a catastrophic storm surge and coastal flooding across several counties in southwestern Florida to the east (or right) of Ian's track as winds from a southerly direction (from the south) piled water along the coast and into the several bays and harbors found near Naples, Ft. Myers, Punta Gorda and Port Charlotte. The peak storm-surge inundation in some of these bays ranged from 12 to 18 feet, along with destructive wind-blown waves. However, a reverse situation occurred farther north in the Tampa Bay area, where strong easterly winds (from the east) drove water from Tampa Bay westward and out into the Gulf of Mexico in what some called a "reverse storm surge," leaving typically submerged areas of the Bay exposed near Tampa and St. Petersburg.

After landfall, Ian headed to the north-northeast, making the trip across the central Florida Peninsula to reach Florida's Atlantic Coast near Cape Canaveral by midmorning of Thursday. During its travel across the Florida Peninsula, Ian weakened to a tropical storm with sustained winds dropping to 65 mph. Rainfall totals across central Florida to the north of the storm track ranged from 24 to 35 inches. After moving off the Atlantic coast, Tropical Storm Ian strengthened to become a hurricane once again late Thursday afternoon offshore of the northeastern Florida coast. Ian underwent some strengthening on Friday morning as it headed toward the north over the warm Gulf Stream in the offshore waters of the Atlantic. On Friday afternoon, Hurricane Ian made landfall along the South Carolina coast near the coastal city of Georgetown, or approximately 55 miles northeast of Charleston, SC.

At landfall, Hurricane Ian was a strong category 1 hurricane with maximum sustained winds of 85 mph and an estimated minimum central pressure that was 977 mb (28.85 inches of mercury). Within three hours after landfall, Ian was reclassified as a post-tropical cyclone that continued northward across the Carolinas during Friday evening and early Saturday morning. By midmorning on Saturday, this remnant low that had been Ian was traveling somewhat erratically across southern Virginia. Winds had dropped to 25 mph by late Saturday afternoon as the center of the low was 95 miles to the west-northwest of Richmond, VA.

Ian continued to strengthen and made landfall in western Cuba on September 27 as a category-3 storm. Next the storm entered the Gulf of Mexico and headed toward Florida. Forecasters expected that warm waters in the Gulf of Mexico would help the hurricane regain strength before making landfall along the west coast of Florida. They were correct.



September 28, 2022 [JPEG](#)

The simulated natural-color image above was acquired at 9:10 a.m. local time (13:10 Universal Time) on September 28, 2022, by the Advanced Baseline Imager (ABI) on the Geostationary Operational Environmental Satellite 16 (GOES-16). The satellite is operated by the National Oceanic and Atmospheric Administration (NOAA); NASA helps develop and launch the GOES series of satellites.

At about the time of the GOES image, the storm had sustained winds of 155 miles (250 kilometers) per hour—making it a major category-4 hurricane and putting it near the threshold of a category-5 storm. Cloud bands already covered much of Florida. By afternoon, the category-4 storm made landfall near Cayo Costa in southwest Florida, according to the National Hurricane Center.

In Cuba, about 11 million people were left without power, according to news reports. Winds and floodwaters destroyed buildings, farms, and left many roads impassable. As the storm approached Florida, the U.S. hurricane center warned of potentially catastrophic storm surges and wind damage along the southwest coastline and life-threatening flooding across some central parts of the state.

NASA Earth Observatory image by Joshua Stevens, using GOES 16 imagery courtesy of NOAA and the National Environmental Satellite, Data, and Information Service (NESDIS). Astronaut photograph ISS067-E-31826990 was acquired on September 26, 2022, with a Nikon D5 digital camera using an 20 millimeter lens and is provided by the ISS Crew Earth Observations Facility and the Earth Science and Remote Sensing Unit, Johnson Space Center. The image was taken by a member of the Expedition 67 crew. The image has been cropped and enhanced to improve contrast, and lens artifacts have been removed. The International Space Station Program supports the laboratory as part of the ISS National Lab to help astronauts take pictures of Earth that will be of the greatest value to scientists and the public, and to make those images freely available on the Internet. Additional images taken by astronauts and cosmonauts can be viewed at the NASA/JSC Gateway to Astronaut Photography of Earth. Story by Kathryn Hansen.