= Maximum sustained wind =

The maximum sustained wind associated with a tropical cyclone is a common indicator of the intensity of the storm . Within a mature tropical cyclone , it is found within the eyewall at a distance defined as the radius of maximum wind , or RMW . Unlike gusts , the value of these winds are determined via their sampling and averaging the sampled results over a period of time . Wind measuring has been standardized globally to reflect the winds at 10 metres (33 ft) above the Earth 's surface , and the maximum sustained wind represents the highest average wind over either a one @-@ minute (US) or ten @-@ minute time span (see the definition , below) , anywhere within the tropical cyclone . Surface winds are highly variable due to friction between the atmosphere and the Earth 's surface , as well as near hills and mountains over land .

Over the ocean , satellite imagery determines the value of the maximum sustained winds within a tropical cyclone . Land , ship , aircraft reconnaissance observations , and radar imagery can also estimate this quantity , when available . This value helps determine damage expected from a tropical cyclone , through use of such scales as the Saffir @-@ Simpson scale .

= = Definition = =

The maximum sustained wind normally occurs at a distance from the center known as the radius of maximum wind , within a mature tropical cyclone 's eyewall , before winds decrease at farther distances away from a tropical cyclone 's center . Most weather agencies use the definition for sustained winds recommended by the World Meteorological Organization (WMO) , which specifies measuring winds at a height of 10 metres (33 ft) for 10 minutes , and then taking the average . However , the United States National Weather Service defines sustained winds within tropical cyclones by averaging winds over a period of one minute , measured at the same 10 metres (33 ft) height . This is an important distinction , as the value of the highest one @-@ minute sustained wind is about 14 % greater than a ten @-@ minute sustained wind over the same period .

= = Determination of value = =

In most tropical cyclone basins , use of the satellite @-@ based Dvorak technique is the primary method used to determine a tropical cyclone 's maximum sustained winds . The extent of spiral banding and difference in temperature between the eye and eyewall is used within the technique to assign a maximum sustained wind and pressure . Central pressure values for their centers of low pressure are approximate . The intensity of example hurricanes is derived from both the time of landfall and the maximum intensity . The tracking of individual clouds on minutely satellite imagery could be used in the future in estimating surface winds speeds for tropical cyclones .

Ship and land observations are also used , when available . In the Atlantic as well as the Central and Eastern Pacific basins , reconnaissance aircraft are still utilized to fly through tropical cyclones to determine flight level winds , which can then be adjusted to provide a fairly reliable estimate of maximum sustained winds . A reduction of 10 percent of the winds sampled at flight level is used to estimate the maximum sustained winds near the surface , which has been determined during the past decade through the use of GPS dropwindsondes . Doppler weather radar can be used in the same manner to determine surface winds with tropical cyclones near land .

= = Variation = =

Friction between the atmosphere and the Earth 's surface causes a 20 % reduction in the wind at the surface of the Earth . Surface roughness also leads to significant variation of wind speeds . Over land , winds maximize at hill or mountain crests , while sheltering leads to lower wind speeds in valleys and lee slopes . Compared to over water , maximum sustained winds over land average 8 % lower . More specifically , over a city or rough terrain , the wind gradient effect could cause a reduction of 40 % to 50 % of the geostrophic wind speed aloft ; while over open water or ice , the

reduction is between 10 % and 30 % .

= = Relationship to tropical cyclone strength scales = =

In most basins , maximum sustained winds are used to define their category . In the Atlantic and northeast Pacific oceans , the Saffir @-@ Simpson scale is used . This scale can be used to determine possible storm surge and damage impact on land . In most basins , the category of the tropical cyclone (for example , tropical depression , tropical storm , hurricane / typhoon , super typhoon , depression , deep depression , intense tropical cyclone) is determined from the cyclone 's maximum sustained wind . Only in Australia is this quantity not used to define the tropical cyclone 's category ; in their basin , wind gusts are used .