

VENTAJAS DE LA ESCALA INTERNACIONAL DE FUJITA (IF) PARA CALIFICAR LOS DAÑOS POR TORNADOS Y VIENTOS

ADVANTAGES OF THE INTERNATIONAL FUJITA (IF) SCALE FOR RATING TORNADO AND WIND DAMAGE

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SUMMARY

The occurrence of a tornado or some other form of convective wind, of small temporal and spatial scope, is not easily detectable by conventional observations or remote sensing systems. Often its existence is only known a posteriori, based on news and testimonies that must be verified, and records of the maximum wind values reached are very rare. However, there is an obvious scientific interest in estimating the wind intensity of these phenomena, both to establish classifications and climatologies, and to improve the prediction of these adverse phenomena. In the case of Spain there is an added interest, as AEMET, as the state's meteorological authority, is often required to assess the occurrence of a tornado or wind gusts exceeding 120 km/h, which are two forms of "Atypical Cyclonic Storm" (TCA) recognized by the Insurance Compensation Consortium (CCS). The International Fujita (IF) Scale presented here offers a universally applicable, consistent and tested scale. A first full version was published on 28 July 2023 by the ESSL in collaboration with partners from weather services, engineering, and forestry.

In order to be able to assess the possible occurrence of a tornado or other form of intense convective winds, it is necessary to collect -optimally through a field visit- the maximum possible information about the damage caused, including its nature, extent and disposition. Following, it is crucial to have tools that allow the maximum gusts reached to be reliably estimated from the observed damages.

Over the last decades, various scales have been developed that attempt to relate the damage occurred with the intensity of the wind reached. First of all, in 1971, Dr. Ted Fujita developed the Fujita (F) scale to provide a method to rate the intensity of tornadoes. The meteorological and engineering communities almost immediately accepted the F-scale, despite some limitations:

- lack of damage indicators,
- no account of construction quality and variability, and
- no definitive correlation between damage and wind speed.

In order to minimize these limitations, some other scales have been developed around the world, namely the Enhanced Fujita (EF) scale, the Torro (T) scale, or national adaptations of the EF-scale. We have experienced difficulties trying to use any of them to account for the real damages that we have encountered in our experience studying tornado and convective wind episodes. In particular, when trying to use the EF-scale, we find that it includes a number of damage indicators that are dependent on American construction techniques and features, not always applicable in Europe. In addition, important types of damage and wind measurements are not considered in the EF-scale.

The International Fujita (IF) Scale presented here is an attempt to extract the best of all these scales and to offer a universally applicable, consistent and tested scale. A first full version of the IF Scale was published on 28 July 2023 by the ESSL in collaboration with partners from weather services, engineering, and forestry.

Main characteristics:

- Instead of referring to building types typical for a specific region, the IF-scale defines categories of Damage Indicators that are universal. Any building can be a damage indicator after being assigned a level of sturdiness.

- The IF-scale retains the original F-scale wind speed estimates. The wind speed range covered by the IF0 through IF5 steps correspond well to the speeds measured in tornadoes by mobile Doppler radar.
- The wind speeds estimated are instantaneous three-dimensional speeds at the height at which the damage occurred. This contrasts with typical horizontal three-second average wind measurements at 10 m AGL used by other scales.
- The scale allows for half steps on the Fujita scale until F3. Possible ratings are IF0, IF0.5, IF1, IF1.5, IF2, IF2.5, IF3, IF4, and IF5. The wind speeds of a given step on the scale are given using rounded values of the approximate instantaneous wind speed.
- The IF-scale heavily borrows from experience in regions that have adapted the EF-scale locally, such as the Japanese and Canadian adaptations, and adds additional damage indicators such as for trees, road and rail vehicles, and many other objects.

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