

## The BBVA Foundation recognizes Kerry Emanuel for detecting and predicting the intensification of hurricanes as a consequence of climate change

- His “fundamental contributions” have, in the view of the committee, elucidated the physics underlying the formation of tropical cyclones and the way that climate change is magnifying the destructiveness of such extreme events
- “His theories predict the observed intensification of hurricanes and typhoons with global warming,” the citation continues, while “his research has opened new approaches for assessing risks from weather extremes”
- The Professor of Atmospheric Science at MIT warns that the human population in many coastal zones is at risk of experiencing “the terrible destructive power” of increasingly severe hurricanes, if steps are not taken to reduce polluting greenhouse gases

The BBVA Foundation Frontiers of Knowledge Award in Climate Change has gone in this twelfth edition to American scientist Kerry Emanuel, “for his fundamental contributions to understanding of tropical cyclones and how they are affected by climate change,” according to the committee’s citation. Current evidence on these extreme climate events bears out Emanuel’s predictions, made in the late 1980s, to the effect that hurricanes would grow in intensity along with the increase in global temperatures.

“By understanding the essential physics of atmospheric convection,” says the committee, “he has unraveled the behavior of tropical cyclones – hurricanes and typhoons – as our climate changes.” His theories, they add, “predict the observed intensification of hurricanes and typhoons with global warming,” while his research, “has opened new approaches for assessing risks from weather extremes.”

For committee chairman Bjorn Stevens, Director of the Max Planck Institute for Meteorology, “it is hard to imagine an area of climate science where one person’s leadership is so incontestable.” Kerry Emanuel is a professor in the Department of Earth, Atmospheric and Planetary Sciences at Massachusetts Institute of Technology (MIT).

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Hurricanes rank with earthquakes as the natural events causing most deaths and the heaviest economic losses. But when Emanuel began studying them, the underlying physics was still largely unknown. It was the work he did in the 1980s and 1990s that characterized them as heat engines, “massive, natural machines that convert the heat they extract from the ocean into wind energy,” explains Emanuel, whom the committee additionally singles out for his “extraordinary effectiveness in communicating the science of climate change to the public and policy-makers.”

Besides unraveling the mechanisms of how hurricanes develop, Emanuel was the first to link them with the warming of sea surface waters driven by climate change. His models currently predict a 5% increase in hurricane intensity, i.e., wind speed, for each one degree rise in ocean temperatures.

“Three degrees of warming would mean hurricanes 15% more intense, but that would actually triple if we talk about their destructive potential; in other words, with this three percent increase their power to wreak damage would increase by around 45%,” remarked Emanuel on the phone yesterday after hearing of the award.

“Today’s most intense hurricanes may have a wind speed at the surface of 85 meters per second, but by the end of this century, unless we curb greenhouse gas emissions, we could start to see speeds of up to 90-92 meters per second. A hurricane’s destructive potential is determined by its wind speed, so in fact the destructiveness of these storms for human populations would be considerably greater.”

### A visionary prediction

Emanuel was exploring the link between hurricanes and global warming as early as 1987. In a widely cited paper in *Nature* he discussed “the changes in tropical cyclone frequency and intensity that might result from short-term man-induced alterations of the climate,” hypothesizing that we would likely face a jump in hurricanes’ destructive power if climate change could not be reined in.

For decades there was no way these predictions could be tested, largely, he admits, due to a lack of reliable data on hurricanes at global level. In recent years, however, satellite observations particularly have brought scientists round to a consensus on the issue.

“The weight of evidence supports the hypothesis that higher temperatures ramp up hurricane intensity. Nothing in science is bullet proof, but the models show it, the data are beginning to show

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it, and we hope to be able to prove it in the next few years as more observations come in.”

### Hurricanes in the Mediterranean

Another of Emanuel’s predictions increasingly borne out by the data is that hurricanes will form across more regions of the planet. In the Mediterranean, this will mean an increase in the “medicanes” which Emanuel studied, alongside researcher Romualdo Romero, during a sabbatical year spent at the University of the Balearic Islands (Mallorca) in 2005.

“In some sense we are already seeing the geographical expansion of hurricanes,” Emanuel points out. “Regarding the specific effect of climate change on “medicanes,” our observations indicate that, in effect, as the Mediterranean warms up, we would expect to see a higher incidence of this type of hurricane. They occur under rather different weather conditions to tropical cyclones, but they’re basically the same kind of storm.”

Not only that, a changing climate means hurricanes will develop more rapidly, becoming faster and more intense. And this, he warns, will complicate the already tough task of making accurate forecasts.

In light of these predictions and the escalating risk to humanity, the new laureate does not hesitate to affirm that, right now, the international community “is not doing nearly enough” to combat climate change. “Hurricanes are devastating. It is our responsibility to do everything reasonable that we can to reduce this risk. We need to stop listening to the voices of denial out there, and instead listen to our own children, who are crying out for us to act. To me it is shameful that so little is being done.”

### Bio notes

Kerry Emanuel (Cincinnati, Ohio, United States, 1955) holds an SB degree in Earth and Planetary Sciences (1976) and a PhD in Meteorology (1978) both from Massachusetts Institute of Technology.

After his doctorate, he took up an appointment in the Department of Atmospheric Sciences at the University of California, Los Angeles, where he remained for three years, except for a spell spent filming tornadoes in Oklahoma and Texas.

In 1981, he returned to MIT, where he has pursued his research and teaching career for little short of forty years. Since 1987, he has held the post of Cecil & Ida Green Professor of

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Atmospheric Science in the Department of Earth, Atmospheric and Planetary Sciences (EAPS). From 1989 to 1997, he headed the EAPS Center for Meteorology and Physical Oceanography, and from 2009 to 2012 chaired the EAPS Program in Atmospheres, Oceans, and Climate. His is co-founder (with Daniel H. Rothman) and currently Co-Director of the MIT Lorenz Center, created in 2010 as a climate think tank which fosters creative approaches to learning how climate works.

He has authored more than 200 scientific papers and several books, including *Divine Wind: The History and Science of Hurricanes* and *What We Know about Climate Change*.

### Climate Change committee and evaluation support panel

The committee in this category was chaired by Bjorn Stevens, Director of the Max Planck Institute for Meteorology (Hamburg, Germany), with Carlos M. Duarte, holder of the Tarek Ahmed Juffali Research Chair in Red Sea Ecology at King Abdullah University of Science and Technology (Thuwal, Saudi Arabia), acting as secretary. Remaining members were Sandrine Bony, Director of Research with the Centre National de la Recherche Scientifique at Sorbonne University (Paris, France); Miquel Canals, Director of the Department of Earth and Ocean Dynamics at the University of Barcelona (Spain); Martin Heimann, Director Emeritus in the Department of Biogeochemical Systems at the Max Planck Institute for Biogeochemistry (Jena, Germany); Edward Rubin, Alumni Chair Professor of Environmental Engineering and Science at Carnegie Mellon University (Pittsburgh, United States); and Julie Winkler, Professor of Geography in the Department of Geography, Environment and Spatial Sciences of Michigan State University (United States).

The evaluation support panel of the Spanish National Research Council (CSIC) was coordinated by M. Victoria Moreno, the Council's Deputy Vice President for Scientific and Technical Areas, and formed by: Santiago Beguería Portugués, tenured scientist at the Aula Dei Experimental School (EEAD); Francisca Martínez Ruiz, research scientist at the Andalusian Earth Sciences Institute (IACT); Ángel Ruíz Mantecón, Deputy Coordinator of the Global Life Area and research professor at the Mountain Stockbreeding Institute (IGM); Rafael Simó Martorell, research professor at the Institute of Marine Sciences (ICM); and Blas Valero Garcés, Deputy Coordinator of the Global Life Area and research professor at the Pyrenean Institute of Ecology (IPE).

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## About the BBVA Foundation Frontiers of Knowledge Awards

The BBVA Foundation centers its activity on the promotion of world-class scientific research and cultural creation, and the encouragement of talent.

The BBVA Foundation Frontiers of Knowledge Awards, established in 2008, recognize and reward contributions of singular impact in diverse fields of science, technology, social sciences and the humanities with demonstrated power to significantly expand the frontiers of the known world, opening up new paradigms and knowledge fields. Their eight categories are expressive of the knowledge map of the 21st century, encompassing basic research in Physics, Chemistry and Mathematics, Biology and Biomedicine, Information and Communication Technologies, Humanities and Social Sciences, Economics, Finance and Management, Ecology and Conservation Biology, Climate Change, and the innovative artistic realm of music.

The BBVA Foundation is aided in the evaluation process by the Spanish National Research Council (CSIC), the country's premier public research organization. The Foundation and CSIC jointly appoint the evaluation support panels charged with undertaking an initial assessment of the candidates proposed by numerous institutions across the world and drawing up a reasoned shortlist for the consideration of the award committees. CSIC is also responsible for designating the chair of each committee, formed by eminent authorities in the subject area.

### LAUREATE'S FIRST DECLARATIONS AND IMAGES

A video recording of the new laureate's first interview on receiving news of the award is available from the Atlas FTP with the following coordinates:

Server: 5.40.40.61

Username: AgenciaAtlas4

Password: mediaset17

The video is in the folder labelled:

**"PREMIO CAMBIO CLIMÁTICO"**



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In the event of connection difficulties, please contact Miguel Gil at production company Atlas:

Mobile: 619 30 87 74

E-Mail: [mgil@mediaset.es](mailto:mgil@mediaset.es)

### [Calendar of announcement events](#)

Biology and Biomedicine	Wednesday, 22 January, 2020
Ecology and Conservation Biology	Tuesday, 4 February, 2020
Information and Communication Technologies (ICT)	Wednesday, 19 February, 2020
Basic Sciences	Tuesday, 3 March, 2020
Economics, Finance and Management	Tuesday, 17 March, 2020
Music and Opera	Tuesday, 31 March, 2020
Humanities and Social Sciences	Wednesday, 15 April, 2020

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For more information on the BBVA Foundation, visit [www.fbbva.es](http://www.fbbva.es)