



interview with **Ricardo García Herrera**

President of the Spanish State
Meteorological Agency, AEMET
Madrid - Spain



Ricardo García Herrera was born in Valladolid in 1958 and holds a Doctorate in Physics from the Complutense University of Madrid, where he is also a Professor. He is a graduate of the IESE Management Programme as well. He considers himself to be a climatologist –an expert on climate– with extensive experience in the analysis of climatic variability and its impact on public health. His career has been a mixture of university life and the field of management and public institutions. He started working at the age of 22 as an assistant at the Complutense University and took advantage of those early years to write his doctoral thesis on air pollution models. In addition, he also specialised in the environment and public health, which led him to leave his work mark on various bodies in the Autonomous Regions of Castile and Leon, Navarre, the Basque Country and Madrid. He went on to become the Director of Public Health for the Basque Government and Director-General for Prevention and Health Promotion of the Regional Government of Madrid.

Ricardo García Herrera is the author of more than 80 scientific and research articles published in international journals and he has also written various books. He has coordinated numerous national and international research projects and also the Master's Degree course in Geophysics and Meteorology at the Complutense University. He has been a contributing author to the IPCC's Fourth Report and represents Spain on different international programmes. He was appointed President of the Spanish State Meteorological Agency, AEMET, at the suggestion of the Ministry for the Environment and Rural and Marine Affairs on 12 February 2010.



AEMET Headquarters

“The future depends on improving weather forecasting and offering more climate information”

Concerns about weather and climate have become two constants in our lives, supported by ever more precise and accurate forecasting models. Learning first hand about the objectives and daily work of Spain's State Meteorological Agency, as well as its most pressing challenges, from the words of its President is a real treat on account of both the information provided and the simplicity with which its development over 125 years is explained.

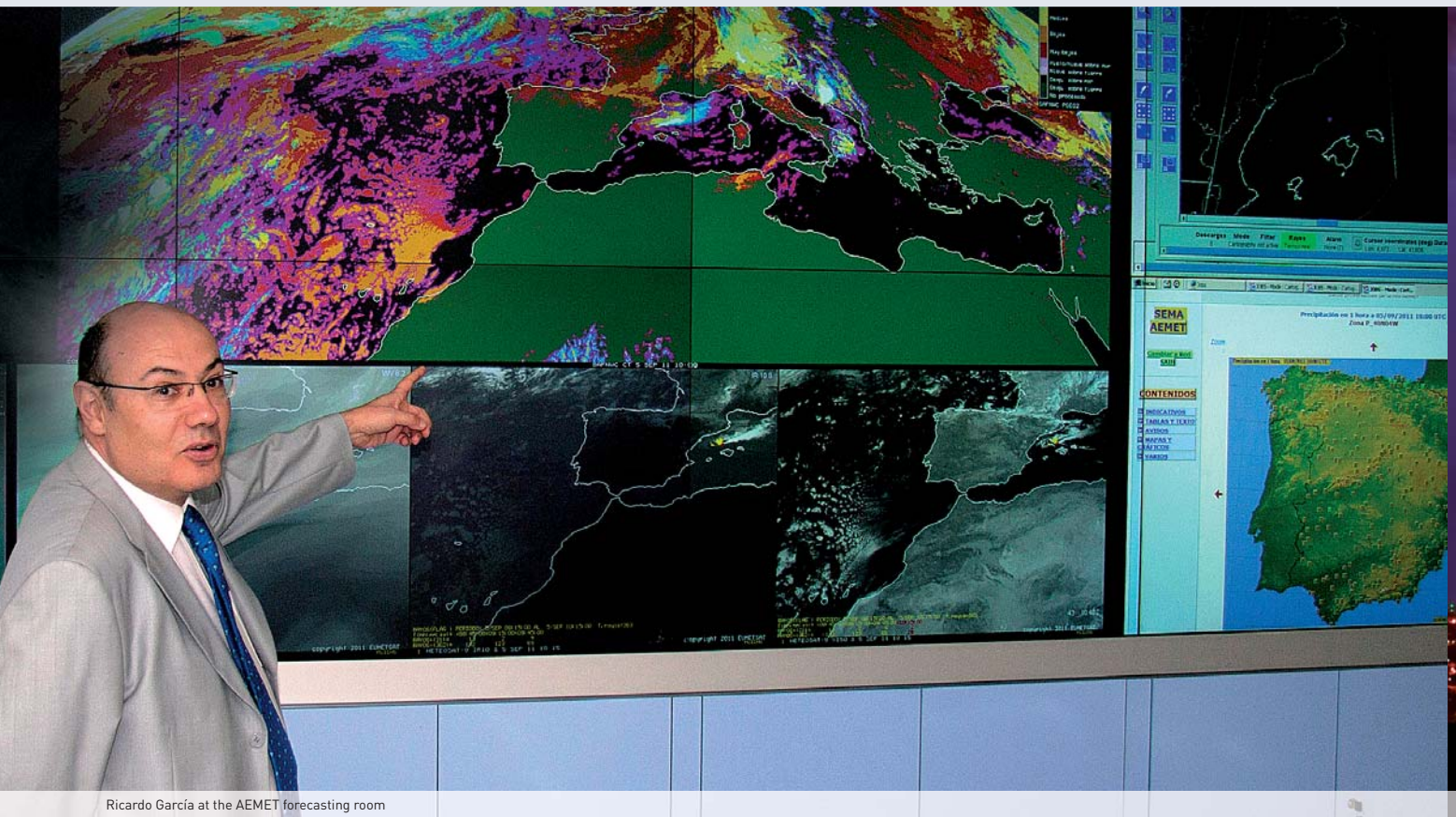
Broadly speaking, how was the historical development of meteorological services in Spain up to the establishment of the State Meteorological Agency?

AEMET is the continuation of an organisation which in 2012 will formally be 125 years old, although its origin is even older. It became a State Agency at the beginning of 2008, and so we are a bit like a Directorate-General, but with more competence; for example, we have some degree of freedom as regards the management of resources, be they budgets or personnel.

In Spain, meteorology arose from astronomers who, depending on weather events, like the presence or lack of clouds, could observe the sky. The beginnings were in



Our functions are to protect people and property by forecasting the weather and supporting environmental and climate change policies



Ricardo García at the AEMET forecasting room

AEMET is not an organisation dedicated to R&D –Research and Development– but it needs to be up to date, as we use very advanced technologies such as space- and ground-based remote sensing

some facilities at *El Retiro* Park in Madrid, and for a long time a strong statistical approach involving tables of meteorological data prevailed, but this offered little forecasting capability. This led to a delay of about 40 years in the creation of Spain's Meteorological Service compared with those set up in the UK, Germany or France, a lag further aggravated by problems relating to the competencies and capacities of local bodies and bureaucracies. Finally, the Central Meteorological Institute was merged with the *Retiro* Observatory. These facilities still exist and now belong to AEMET. Until 1976, the organisation was called the National Meteorological Service and was dependent on the Air Ministry. It was then run by the Transport Ministry and was called the National Meteorological Institute. Finally, it depended on the Ministry for the Environment and Rural and Marine Affairs and, through the Secretary of State for Climate Change, became the State Meteorological Agency (AEMET) and assumed all the competencies of the former National Institute of Meteorology (INM).

What are AEMET's mission and roles?

We are an atypical agency because although the main mission of meteorological agencies and services is to help protect people and property by forecasting the weather, we combine other functions, like supporting environmental and climate change policies. This means that, besides making short- and medium-term forecasts, we produce climate scenarios which can be accessed on our website. We support environmental quality policies by, for example, designing air-quality forecasting models. We also manage the Spanish background pollution monitoring network. This means that we have about twelve sensors installed outside cities which are not disturbed by the emissions from any big city and help us to measure the background pollution and also the transboundary transport of air pollutants. AEMET is not an organisation dedicated to R&D –research and development– but it needs to be up to date, as we use very advanced technologies such as space- and ground-based remote sensing. We are also the government body for mat-



Electric storm at Barcelona. Spain

ters of international cooperation on the subject of meteorology and climate. We maintain two very active programmes, one in Latin America and the other in Western Africa.

What resources do you have?

We have about ninety workplaces and a staff of 1,300 highly-skilled people who fit three types of profiles: meteorologists, who carry out development and management tasks; graduates, most of whom are in charge of weather forecasts; and then observers, who take care of operating and maintaining the observation network. A third of the staff are located at our headquarters in Madrid. The rest are integrated into seventeen territorial delegations, one for each Autonomous Region, and we also have eleven forecasting and monitoring groups. These groups manage warnings and forecasts from the regional point of view. There are also personnel in all observatories, air bases and airports.

What weather hazards can threaten a territory like Spain?

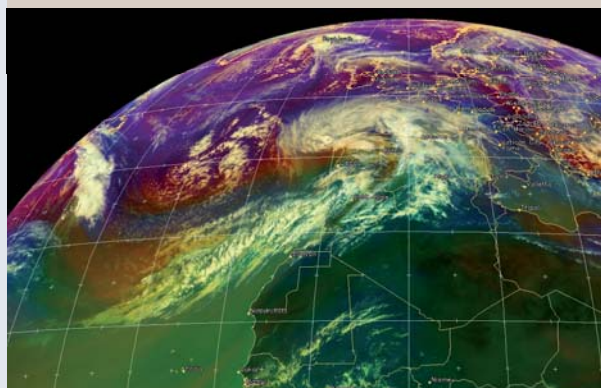
The use of satellites

Do you have your own satellites?

No country in Europe owns satellites. In 1986 the European countries decided to create a consortium known as EUMETSAT, with its headquarters in Germany, to operate weather satellites at European level. It combines various types of programmes: the Meteosat programme, a set of geostationary satellites which capture images of Europe every 15 minutes; the polar satellite programme, offering images of different strips of the Earth on each pass; and then there are others, like the Jason programme, dedicated to monitoring ocean variations. The satellites are launched from French Guyana. Our participation is the fifth largest in this consortium through Spain's financial contribution of eight per cent. This contribution is made on the basis of gross domestic product.

What has the use of satellites meant for weather forecasting, and how long have they been used?

The satellite images that we see on television each day are the input data for obtaining the weather diagnosis and forecast. In fact, we could not make the planned jump to a kilometre-scale forecast without the help of satellites. Last year at EUMETSAT they approved the construction of the third-generation Meteosat, which will probably be operational in 2017. This will allow a higher resolution and offer more variables, thereby improving the forecasting quality.



Cynthia storm image captured by Meteosat-9 (27th February 2010)
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The 'gota fría' is an atmospheric structure in which cloud systems develop which are small in size and short-lived but cause very intense precipitation. With these characteristics, it is very difficult for a forecasting model to give a sufficiently accurate warning

Given our characteristics, what worries us now is a phenomenon which is very difficult to predict: storms and what is commonly known as "gota fría" (literally: "cold drop"), which is actually an atmospheric structure in which cloud systems that are small in size and short-lived develop but cause very intense precipitation. With these characteristics, it is very difficult for a forecasting model to give a sufficiently accurate warning. We are making efforts to downscale our predictions.

How is your forecasting system organised?

Thirty-five years ago, various European meteorological services decided to combine forces and create a centre of excellence for making very good medium- and long-term forecasts: the European Centre for Medium-Range Weather Forecasts (ECMWF) in Reading in the United Kingdom, which

is rated the best in the world. The ECMWF provides two daily forecasts on a hemispheric scale, at midnight and midday, with a resolution of about 15 kilometres. We then use this information to run our own high-resolution model for two areas – one centred on the Iberian Peninsula and the other on the Canary Islands – to release four daily forecasts. All AEMET products such as warnings and different types of forecasts are produced from these models. What we are now working on is to increase the ten- or fifteen-kilometre resolution of the current models to a one-kilometre resolution, which will be available in 2013 or 2014.

Does a weather forecast accurate to a kilometre not seem very ambitious?

Yes, it does. The strategic plan approved last June for the ECMWF includes the aim of getting down to the one-kilometre scale, but

Comparable services

Is Spain an advanced country when it comes to weather services?

I would support that. The quality of our forecasts is essentially the same as in the rest of the advanced countries of Europe.

And from the point of view of your available resources?

We have what is necessary to become members of various European consortia. Meteorology has been a global science since the invention of the telegraph and the first weather maps were produced from the meteorological data that were transmitted, with observations being transferred in this way to forecasting maps. At AEMET we also have antennas to receive images and data from the US satellites operated by the National Oceanic and Atmospheric Administration (NOAA), which means that we do not have any problems in terms of lack of technical equipment.

It is said that in 2012 there will be problems with solar winds that will impact on communications. Will they be affected?

There are certain concerns. At the last meeting of the American Meteorological Association, NOAA put forward a proposal on the need to do more in-depth work on this. The subject is not exactly meteorological but about the impact on satellites and communications.



whereas the Centre proposes achieving this by 2020, we want to get ahead of that date with our model at the Agency. To do this, we are going to get a new supercomputer which is going to entail considerable expenditure but will allow us to optimise the complexity of the calculations that need to be made. One of the specific features of meteorology is that it presents situations which are very difficult to predict, such as storms and fogs, which have a very local effect and greatly affect aviation. The movements of fronts, however, are much more predictable.

What work are you developing in relation to climate change?

We are concerned with how the climate is evolving. As part of a programme coordinated by the World Meteorological Organization (WMO), normal climatic conditions (see pp. 34) have been being measured since about

1970. For this, climate periods of 30 years are used and we see how all the variables develop, but especially temperature and precipitation. We have twenty-seven top-quality meteorological stations devoted to this, and these will support climate change data in the medium and long term. Precipitation patterns have not changed since 1970, but temperature has. Whereas between the periods 1961-1990 and 1971-2000 the average temperature in Spain increased by 0.22°C, it increased by 0.46°C between 1971-2000 and 1981-2010, doubling the observed variation between the previous two reference periods. Serious attention needs to be paid to this question. It is not a prediction but a fact. This will certainly trigger changes to the water cycle. When it rains, the rainfall will be very intense, and then there will be long periods of drought.

Whereas between the periods 1961-1990 and 1971-2000 the average temperature in Spain increased by 0.22° C, it increased by 0.46° C between 1971-2000 and 1981-2010



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Worrying for the climate

What is being observed on climate change?

There are two aspects concerning climate-change support policies. One is monitoring, which is not only for forecasting but is also used for climatology and for observing changing trends. Our main task is to take note of what is happening and to communicate it. Our other role is related to scenario modelling. Climate scenarios up to the year 2100 can be downloaded from AEMET's website for each Autonomous Region, something that has been done at the request of the sectors involved. The public feel that climate activity may have some impact on their lives and their activities. These models and the agreed scientific evidence say that by the end of this century, we will suffer temperature increases of between 3 and 5 degrees. Right now,

there is no scientific tool better than climate models. They conclude what would happen if the rate of emission of greenhouse gases does not change, and this is not a prediction but a projection.

According to environmentalists, if we do not reduce greenhouse emissions, climate change may become irreversible.

Once greenhouse gases are released into the atmosphere, they remain there for hundreds of years. Some of them remain for a longer time whereas others stay for less. Any solutions adopted now will be felt within 30 or 40 years. We do not have scientific evidence that might lead us to think that this is not being caused by human action; in fact, if we try to explain how the climate has developed in recent decades with our best models, the

Do all meteorologists use your services? Is it a driver for your marketing?

Some meteorologists use our services, others don't. AEMET's priority is to be an efficient public service. For example, we have a new data policy. Until a year ago, you had to pay to get the data. Now we have decided that it is better for them to be freely available on our website, where there is a lot of information which is not shown only in the form of graphs but also by means of data files that can be used by professionals. When you consider that citizens pay for the content produced by AEMET through their taxes, it is logical for that information to go back to them. Secondly, we have learnt that, by making it freely available, we are helping the meteorological industry, which is immersed in a process of improvement. In the 1960s, forecasting was an art that depended on the way the meteorologist on duty had been trained. Currently, meteorology basically depends on the interpretation of models, making it much more systematic

and scientific. As there are many small users with specific requirements, our role focuses on the one hand on laying the foundations so that anyone can obtain this information and, on the other, on taking care of large institutional users: civil defence, aviation and the armed forces, for example. In the months that this policy of transparency has been in operation, users have downloaded around a hundred thousand files per day from us. We are the most-visited Spanish institutional website, with around 3.5 million visits each day, and the usage profile is growing. This is the best quality control we can have.

In what way are you collaborating in the programmes in West Africa and Latin America?

We are the World Meteorological Organization's foremost contributor for the areas of cooperation, our contribution being channelled through conferences in which the directors of hydrometeorological services take part. We are very keen in knowing their needs and try to meet them. On this basis,

change is not adequately reflected, and we only succeed if we simulate the effect of greenhouse gases increase. It is therefore irresponsible to ignore this, which means that we must try to reduce emissions. But the problem is quite complex. It requires political decisions affecting development and life quality, which must be adopted by all countries, and, as we all know, there are some countries that are not willing to do this for the time being.

What is the value of climate forecasting?

Climate projections, and particularly those of a regional scale, constitute one of the essential starting points for assessing impact, vulnerability and future needs to adapt to climate change. For AEMET, this is therefore a key priority in its objective of providing the most effective weather and climate information

for citizens. The first regionalised projections of climate change were presented by the Agency in 2007 and the information generated was immediately uploaded on to the Website and made available to users. In July 2010 the second phase of updating these regionalised scenarios was carried out using new data from the global models. It resulted in the basis of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), approved in Valencia in 2007. And when this interview is published, the Agency will already have more detailed results from various statistical dynamic models available and freely accessible on its website. All this demonstrates the Agency's desire to always offer the best available information on the probable development of the climate in Spain.



a plan of action is set in motion using the resources available to us at any time. We offer training and exchange programmes and courses, as well as access to some technologies, like handling the output from the ECMWF's models; we also make Meteosat images available. In the area of Africa extending from Mauritania to Guinea, we are carrying out three programmes: a meteorological one to support fishermen; another one dealing with meteorology and health; and another focused on agriculture. Four hundred meteorological stations have been set up, spread across various zones, in order to help them take decisions on sowing or watering. In addition, and more generally, they are given forecasts for sand and dust storms, which is something truly novel and useful for this entire region.

What is your most immediate challenge?

Our main challenge is to get the new Climate Services Site up and running as part of the Agency's new data policy. It is possible to give

a lot of very useful climate information not only through lists of data but also through threshold values, projections, forecasts or normal values, amongst other things, so that each user can use the information as required. This is so important that at the WMO's last congress in June, it was suggested that an extraordinary congress be held. Generally speaking, the European meteorological services are going to continue improving smaller-scale weather forecasts and are going to provide more climate information. This is an important development for the whole world and we are very well positioned for offering these services.

How do you interrelate with insurance?

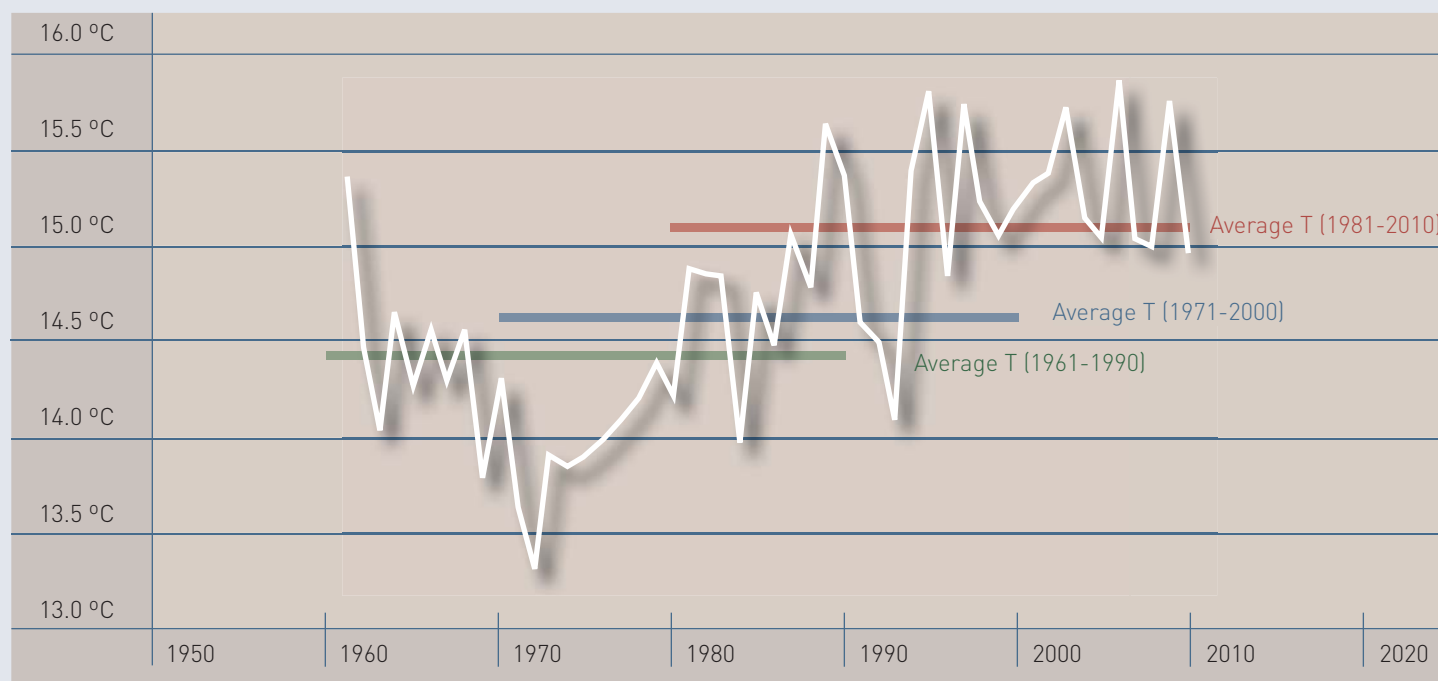
Our experience is basically linked to the *Consorcio de Compensación de Seguros* (Insurance Compensation Pool), to which we supply the data they request on certain climatic events that have a major claims impact, such as windstorms or tempests.

Our main task is to take note of what is happening with regard to climate change and to communicate it.

Variation in average temperature in Spain between the 1971-2000 and 1981-2010 reference periods

[Source: AEMET "Note on the average variation in temperature and precipitation in Spain between the 1971-2000 and 1981-2010 reference periods"]

Reference period	Annual average temperature in Spain	Difference between two consecutive periods
1961-1990	14.43 °C	
1971-2000	14.63 °C	+ 0.20 °C
1981-2010	15.09 °C	+ 0.46 °C



Normal values

In climatology, the normal value of a climatic factor is the average value over a period of time that is long enough to allow short-term fluctuations, i.e. such as interannual variation. In order for climate data to be compatible and comparable in the various regions of the planet, the World Meteorological Organization (WMO) has defined a time interval of 30 consecutive years to calculate these normal climatological values, this period being known as the "reference period".

Source: AEMET "Note on the average variation in temperature and precipitation in Spain between the 1971-2000 and 1981-2010 reference periods".

For more information, please look up:

AEMET

www.aemet.es

ECMWF: European Centre for Medium-Range Weather Forecasts

www.ecmwf.int

WMO: World Meteorological Organization

www.wmo.int

EUMETSAT

www.eumetsat.int

NOAA

www.noaa.gov

IPCC Intergovernmental Panel on Climate Change

www.ipcc.ch