



Atmospheric data from the Spanish PAZ satellite reaches meteorological services worldwide in "near real-time" via WMO

- **PAZ offers well-distributed information on the vertical structure of the atmosphere around the world, with information on temperature, pressure and atmospheric humidity, allowing for more accurate predictions.**
- **Worldwide distribution is possible thanks to the agreement between NOAA, the Institute of Space Sciences and the Institute of Space Studies of Catalonia(ICE-CSIC, IEEC), and Hisdesat.**
- **This is the first Spanish satellite data to be distributed to meteorological services around the world continuously and in near real-time.**

October 14, 2019.- The atmospheric data obtained by the **Spanish PAZ satellite** have started to reach all meteorological services around the world, through the communications system of the World Meteorological Organisation (WMO), a specialised agency of the United Nations. This phase, called "operations", was activated on Friday, 4 October 2019 and represents the culmination of the data use preparation phase, allowing the continuous and automated data collection, as well as processing, quality control and distribution to weather forecasting centres around the world so they can integrate the data into their models. Weather forecasting requires that measurements of atmospheric parameters arrive with a maximum delay of three hours from their acquisition by the satellite; this is the so-called "near real-time".

The atmospheric measurements obtained by PAZ are derived from observations made with a GPS receiver on board, using a technique called "radio occultation". This data is temporarily stored in the on board computer until the satellite passes near a National Oceanic and Atmospheric Administration (NOAA) receiving station in Alaska.

From that station, the raw data is sent to the University Corporation for Atmospheric Research (UCAR), where it is processed, controlled and sent back to NOAA for final transmission to the global weather services communication system. This entire process takes less than three hours from its acquisition on orbit.

This milestone has been possible thanks to agreements between NOAA and the CSIC Institute of Space Sciences and the Institute of Space Studies of Catalonia (ICE-CSIC, IEEC), which are responsible for the GPS experiment on board PAZ, as well as agreements with Hisdesat, the company owning, managing and operating the satellite.

"NOAA's great interest in having the data with minimal delay and Hisdesat's flexibility to accommodate the changes necessary for NOAA's operations have allowed this mission milestone to be reached," says Dr. Estel Cardellach, IEEC researcher at ICE-CSIC and responsible for the experiment. "It is an excellent example of international collaboration, where NOAA finances the US effort, the Spanish Ministry of Science, Innovation and Universities finances the cost of the experiment aboard PAZ through its National Space Plan, and thanks to WMO's infrastructure, meteorological services from all over the world benefit", adds Cardellach.

A technique of barely 20 years

The GPS radio occultation technique was developed between the mid-1990s and early 2000s, and its data has been integrated into weather models since 2006. Last June, NOAA launched six satellites with this technology, covering the tropics and mid-latitudes (COSMIC-2 constellation); however, initial plans to launch six more satellites to cover the poles and high altitudes were cancelled. PAZ complements data acquired from other satellites in polar orbits by densifying these measurements in areas not covered by the COSMIC-2 constellation. This is why NOAA was interested in participating in the Spanish mission's radio occultation experiment.

Different studies have determined that this type of data significantly improve weather prediction, giving them great operational value. Radio occultation data is one of the observations with the greatest impact on weather prediction, which means that the prediction is more accurate and, therefore, with fewer errors, when these data are integrated into the models. This technique makes it possible to obtain information well distributed throughout the world on the atmosphere's vertical structure, with information on temperature, pressure and atmospheric humidity. In addition, it functions as a self-calibrated thermometer, which helps to correct the biases of other techniques that do require calibration.

UCAR scientists who process the data operationally have evaluated its quality, comparing it to similar missions. The quality of the PAZ data is equivalent to the missions also operationally processed, which has led to their worldwide distribution.

During the final preparation phase, data has been preliminarily distributed in the network of NOAA-related centers. This early access enabled the verification of its operability. As a result, the U.S. Navy Meteorological Service is already incorporating PAZ data into its weather forecasts. The U.S. Naval Research Laboratory (NRL) has implemented this process, which has been operational since 15 August 2019. "The PAZ data are having a positive impact on weather

analysis and prediction, similar to that of other radio occultation satellites," says the scientist responsible for this implementation, Dr. Benjamin Ruston (NRL). "This effort is extremely useful for the community of scientists working with radio occultation data, and an important step toward incorporating PAZ data into other weather forecasting models," he adds.

From the Spanish National Meteorological Agency (AEMET), Marcelino Manso, Technical Advisor for New Observation Developments, recalls that "the radio occultation data taken by the PAZ satellite are the first Spanish satellite data that are distributed to the world's meteorological services continuously and in almost real-time". Thus, the PAZ satellite reaches one of its milestones in operational meteorology and service to society, beyond the purely scientific objectives that originally motivated the radio occultation experiment by ICE-CSIC and IEEC.

Observatories and instruments

The ROHP (Radio-Occultation and Heavy Precipitation) experiment aboard the Spanish Earth-observation satellite PAZ is designed to test a new technique of surveying the atmosphere. It will provide coincident thermodynamic and precipitation information with high vertical resolution within regions with thick clouds. ROHP-PAZ is the work of an IEEC team of the Institute of Space Sciences (ICE-CSIC) who has created the new measurement concept, has found international funding and partners, has designed the experiment and will be responsible for its execution. Experimental precipitation data are not part of the operational packages distributed by WMO.

Links

- [IEEC](#)
- [ICE-CSIC](#)
- [ROHP-PAZ experiment](#)
- [ROHP-PAZ website](#)
- [Hisdesat](#)

Contact experiment: : estel@ice.csic.es

<https://paz.ice.csic.es/>

Videos: [https://paz.ice.csic.es/documents/outreach/01 ROHP-PAZ Castellano.mp4](https://paz.ice.csic.es/documents/outreach/01_ROHP-PAZ_Castellano.mp4)

About Hisdesat

Hisdesat was born in 2001 as an operator of satellite government services to act fundamentally in the areas of defense, security, intelligence and external services. Since 2005, the company provides secure satellite communications services to government agencies in different countries and since September 2018, it provides Earth observation services with radar technology through the PAZ satellite, successfully launched on February 22nd. At present, the company is developing new constellations of maritime Satellite Traffic Information Satellites (AIS). More information: www.hisdesat.es

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