

Efficient assessments of the Fengyun-3 satellite instruments to improve weather forecasts

Explainer

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Satellite image of Earth, Image: Wikilimages, Pixabay

Focus

As part of CSSP China project, nine instruments of the Chinese Fengyun-3 satellites have been assessed against short-range forecasts from the Met Office global Numerical Weather Prediction system. The findings from the assessments have been fed back to the China Meteorological Administration (CMA) whilst the incorporation of some products in operational forecast has significantly benefited the Met Office global forecast system.

Importance

Satellite observations are a key method for observing the Earth, offering a valuable stream of measurement data with global coverage. As part of China's Fengyun (FY) programme, there are FY-3 polar orbiting satellites comprising four satellites FY-3A - FY-3D, with 11 high-performance detection instruments. They are an important source of observational data for applications in weather forecasting, global climate change studies, disaster monitoring, and specialised activities (e.g., aviation, marine activities). Currently, many countries use FY-3 satellite data.

To make use of satellite observations, a fundamental requirement is a detailed and thorough assessment of instrument data quality. However, as conventional observation-based assessment, such as matching satellite data with conventional observations, can typically take several decades, more efficient approaches need to be adopted to accelerate the process.

Approach

With the aim of reducing the delay between launch and successful application in climate services to less than a decade, several Chinese instruments of the FY-3 series have been assessed by comparing satellite observations against simulations of recent climate history and short-range forecasts from the Met Office global forecasting models, identifying biases and developing correction schemes where necessary. This method has proven to be able to accelerate the

overall assessment process in recent years.

Three Microwave Humidity Sounders, three Microwave Temperature Sounders and two Microwave Radiation Imagers on board the FY-3B, 3C, and 3D missions have been thoroughly assessed and prepared for operational use. Together, these instruments provide valuable information on surface and atmospheric temperature, humidity and ice particles.

In parallel, the Hyperspectral Infrared Atmospheric Sounder (detecting temperature, humidity, and trace gases) on board the FY-3D mission, has also been assessed and work is ongoing to evaluate the potential benefits from an operational use of its data.

Next steps

The thorough assessments have allowed rapid feedback to the CMA of observation data quality for efficient and timely redesign and correction.

As part of the CSSP China project, the three humidity sounders, the two radiation imagers and one temperature sounder are, or have been, used operationally and have significantly contributed to improvements in the 24-hour forecast accuracy. 2020 marked the 50th anniversary of China's Fengyun meteorological satellite programme. Another significant milestone was that observations from the programme were used in the UK's global weather forecast model for the first time, which has significantly benefited the Met Office global forecast system.

References

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www.viewpoint-CSSP.org

