

Satellite data fusion enhances the early detection of convective clouds

September 26 2024



Developing cumulus clouds. Credit: Yang Gao

As global warming continues, convective weather events are becoming more frequent. The early stage of these storms, known as convective initiation (CI), can be monitored using geostationary satellites. However,

detecting CI accurately remains a challenge.

The current detection methods still have a high rate of false alarms and missed events. One key reason for this is that the resolution of existing geostationary meteorological satellites is not yet precise enough to meet the requirements for better detection.

To address this issue, researchers from the National Satellite Meteorological Center in China have proposed a new fusion method in which the high-resolution texture information provided by Gaofen-4 (GF-4), an Earth observation satellite, is combined with the multispectral data of Fengyun-4A (FY-4A), a geostationary meteorological satellite. This approach retains the detection advantages of each satellite, ensuring the accuracy of spectral information, while fully considering the early growth patterns of [convective clouds](#), thereby significantly enhancing the capability to detect CI.

The results have recently been published in [Atmospheric and Oceanic Science Letters](#).

The fused data revealed a notable improvement in the detection of smaller-scale convective clouds, which often develop rapidly and can be difficult to capture using traditional observation methods. By leveraging high-resolution Earth observation satellites, forecasters gain the ability to identify these clouds much earlier in their formation.

"This early detection is particularly important as small convective clouds can quickly evolve into severe weather systems, such as thunderstorms or localized [heavy rainfall](#)," says the corresponding author, Prof. Xin Wang. "The integration of these detailed satellite data helps improve the timing of forecasts, allowing meteorologists to track cloud development with greater accuracy and issue earlier, more reliable warnings."

Beyond simply detecting clouds earlier, the integration of high-resolution satellite data enhances the precision of identifying where these clouds will form and intensify. This added spatial accuracy is crucial in understanding localized [weather patterns](#), which may have been previously overlooked.

"For decision-makers, this means not only having a more detailed picture of the early stages of convective cloud development, but also having access to data that informs strategic responses," says Yang Gao, the first author of the paper.

By pinpointing the exact locations of potential severe weather systems, this advanced detection method enables more targeted and efficient disaster preparedness and mitigation efforts.

"Ultimately, it improves our ability to safeguard communities from the impacts of extreme weather," Professor Wang concludes.

More information: Yang Gao et al, GF-4 high-resolution texture and FY-4A multispectral data fusion: Two case studies for enhancing early convective cloud detection, *Atmospheric and Oceanic Science Letters* (2024). [DOI: 10.1016/j.aosl.2024.100551](https://doi.org/10.1016/j.aosl.2024.100551)

Provided by Chinese Academy of Sciences

Citation: Satellite data fusion enhances the early detection of convective clouds (2024, September 26) retrieved 27 September 2024 from <https://phys.org/news/2024-09-satellite-fusion-early-convective-clouds.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.
