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Advancing Earth Monitoring: China's hyperspectral Operational Satellite Constellation

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China's first hyperspectral operational satellite constellation, launched in 2023, has significantly enhanced comprehensive Earth observation capabilities by integrating extensive quantitative data from space and ground sources. The constellation comprises the GF5-02, GF5-01A and ZY1-02D and ZY1-02E satellites. Operating in a sun-synchronous orbit, these satellites constitute a medium-resolution Earth observation system. Each satellite, GF5-02, GF5-01A, ZY1-02D and ZY1-02E, is equipped with visible and near-infrared as well as hyperspectral imager, enabling them to perform wide swath observations and acquire intricate spectral data. Significantly, ZY1-02E has been additionally equipped with a thermal infrared camera, thereby broadening its detection scope. The satellite team, collaborating with specialists across various fields, conducted 32 business tests in areas like land resources, geology, mapping, and marine monitoring, adhering to standards for natural resources survey and monitoring. After a year of operation, the constellation has shown robust functionality, stability, and data quality, meeting requirements for diverse applications such as resource enforcement, geological surveys, ecological restoration, geospatial updates, coastal surveillance, and industrial capacity reduction. The success in quantitative application tests of hyperspectral and thermal infrared payloads demonstrates the satellite's potential in providing critical insights for global users in the hyperspectral domain.