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Editorial

The CubeSat revolution: Bridging innovation, science, and global capacity building

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The aerospace landscape is undergoing a profound transformation, driven by the democratization of space access. In this Special Issue of Metasciences, we focus on the heart of this evolution: CubeSat Application, Science, and Technology. What began as a pedagogical tool has matured into a robust platform for cutting-edge research and mission-critical operations.

The convergence of miniaturization, complexity reduction, and lower launch costs has shifted the paradigm. Today, Distributed Space Systems (DSS) and innovations in miniature propulsion, MEMS-based sensors, and AI/ML-driven autonomy enable small platforms to tackle challenges once reserved for large-scale missions. This includes the growing field of biological experiments, where CubeSats serve as automated micro-laboratories to study life sciences in microgravity.

Furthermore, the strategic utility of these platforms is expanding through satellite constellations and formations. By leveraging synchronized clusters, CubeSats are being deployed for sophisticated Signal Intelligence (SIGINT) and the geolocalization of dark vessels, providing critical domain awareness and maritime security. From Earth observation and helio-physics to disaster monitoring and IoT relay, CubeSats are proving their broad scientific and operational utility.

Beyond technical prowess, CubeSats serve as a vital catalyst for capacity building. They represent the first step for non-spacefaring nations, a sandbox for New Space startups, and a cornerstone for modern STEM education. However, as the field matures, there is an urgent need to critically assess mission architectures and the evolving landscape of space policy. We invite the community to

document these advancements, ensuring that the lessons learned today pave the way for a sustainable and innovative future in orbit.

Use of AI tools declaration

The authors declare they have not used Artificial Intelligence (AI) tools in the creation of this article.

Conflict of interest

The authors declare no conflict of interest.