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Globalizing Space Weather Data Infrastructure: The IMCP Framework for Collaborative Data Sharing and Utilization

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The International Meridian Circle Program (IMCP) represents a pivotal international initiative aimed at advancing coordinated space weather observations to address critical global scientific challenges and enhance operational applications. Effective data governance, sharing, and utilization form the cornerstone for transforming multi-national observational synergies into scientific breakthroughs and downstream services.

To realize this vision, the NSSDC team has developed a comprehensive architecture for IMCP Data Facilities, featuring:

1. Establishment of standardized space weather data protocols, specifications, and Data Management Plans (DMPs) tailored for global mega-projects;
2. Deployment of a dedicated data transmission and exchange network connecting IMCP instruments and worldwide ground-based observatories;
3. Implementation of a hybrid centralized-distributed mirrored database system for space weather data;
4. Development of community-driven open-access services with machine-actionable interfaces to support diverse research and operational needs;
5. Strategic integration of big data analytics and AI technologies to enable next-generation monitoring capabilities and research innovation.

Through this infrastructure, IMCP seeks to establish an open, trusted, and interoperable space weather data ecosystem that significantly enhances the FAIRness (Findable, Accessible, Interoperable, Reusable) and AI-readiness of observational data on a global scale. This concerted effort will provide the foundational data framework required to tackle key space weather science and application challenges worldwide.

Primary authors: XU, QI (中国科学院国家空间科学中心); Ms HU, XiaoYan (National Space Science Center, Chinese Academy of Sciences); Prof. ZOU, Ziming (National Space Science Center, Chinese Academy of Sciences)

Presenter: Ms HU, XiaoYan (National Space Science Center, Chinese Academy of Sciences)

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