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A near-real-time precipitation product intercomparison and validation system for operational and research applications

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As part of the collaboration between the Institute of Atmospheric Sciences and Climate of the National Research Council (CNR-ISAC) and the Department of Civil Protection (DPC), a comprehensive system has been developed for the continuous, near-real-time (NRT) validation and comparison of multi-source precipitation products. The system is designed to address the growing need for systematic evaluation of satellite-based precipitation estimates, both in operational and research contexts. Building on the methodological heritage of the EUMETSAT H SAF project, the platform is designed to support a broad spectrum of temporal analyses, ranging from single-event assessments to daily, monthly, seasonal, and overall assessments. Currently, the system integrates approximately 30 precipitation products derived from satellite estimates, rain gauge networks and radar observations, generating over 60 comparisons. For each comparison, the framework provides a comprehensive suite of quantitative diagnostic tools, including categorical and continuous statistical scores, bias characterization, correlation analysis, and spatiotemporal distribution metrics. This structured approach enables the identification of systematic discrepancies, relative strengths, and complementarities between products. The system is fully automated, scalable, and modular, ensuring reproducibility and consistency across analyses. Beyond performance evaluation, the system provides a solid foundation for product calibration, algorithm refinement, and benchmarking, helping improve product development and support hydrometeorological risk management. Future improvements will focus on expanding the portfolio of integrated datasets and incorporating interactive visualization environments.