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An example of the combined use of satellite data and models for the analysis of extreme precipitation events in the Mediterranean: The September 2019 floods in Spain

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Extreme precipitation events pose significant challenges, especially in semi-arid regions where climate change has increased the frequency of such episodes, exacerbating the lack of adequate infrastructure to mitigate their impacts. The integration of satellite data with modeling techniques emerges as a crucial strategy for characterizing and predicting these events effectively. The Spain's floods in September 2019 serve as a poignant example, resultingin in 7 casualties and 19 million euro in damages. The more affected regions were the Valencian Community, the Region of Murcia, Castilla-La Mancha and Andalusia, with areas in the south of the Community of Madrid also experiencing significant impacts by the end of the episode.

An analysis comparing satellite data with outputs from Numerical Weather Prediction (NWP) and simple hydrological models, alongside direct observations such as METEOSAT data, rain gauges and ground Doppler radars, reinforces the critical role of satellites in managing hydrometeorological events effectively. The Global Precipitation Measurement (GPM) Core Observatory, operational since 2014, and merged satellite estimates have demonstrated remarkable improvements over previous technologies. Additionally, the timely availability of satellite estimates enables near-real-time monitoring of severe hydrometeorological episodes.

While future automation of models remains a goal, current reliance on satellite products such as Integrated Multi-satellitE Retrievals (IMERG) can significantly aid in addressing societal needs. The ultimate objective is to transition from observation-based responses to predictive capabilities, with satellite data playing a central role in this transformation.