

Science for Environment Policy

Internationally coordinated use of satellites needed for managing floods

Loss of satellites providing rainfall data could have a negative effect on global flood management, according to new research. However, this could be mitigated by improved international co-operation and the use of more modern satellite technology, the authors say. The study examined the consequences for flood management of the loss of four of the existing 10 dedicated rainfall measuring satellites.

Satellite-based measurements of real-time rainfall data are important for the monitoring, managing and forecasting of floods. Data from satellites are fed into sophisticated models to predict the timing and intensity of floods, allowing governments to take action to mitigate the impact of flooding.

Climate change is expected to increase both the frequency and severity of flooding across the globe; as a result, space-based rainfall monitoring is becoming increasingly important. There are currently 10 satellites orbiting the Earth whose sole purpose is to monitor rainfall. However, four of these have already been in space for far longer than intended — some by more than a decade — and others are reaching the end of their expected lives. As yet there are no plans to replace them, threatening the loss of data crucial for global flood management.

This study analysed the consequences of a diminishing number of rainfall satellites for flood monitoring. To begin, the researchers used computer models of the movement and distribution of **water** across the globe to estimate the minimum amount of satellite data needed to provide acceptable flood forecasts. They then simulated a range of different combinations of satellites, resulting in different patterns of data collected and different areas covered at different points in time.

They found that even with all 10 existing satellites — under circumstances optimised to perfectly co-ordinate them — there were still gaps in rainfall data collection for South America, Central and Eastern Africa and throughout Asia, all areas where populations are likely to be vulnerable to floods.

Removing the four end-of-life satellites increased deficits in collected rainfall data by between 200–400% across the globe, resulting in gaps in data collection of potentially longer than eight hours.

Finally, the researchers examined the effect of making better use of modern technology by adding two new satellites to the remaining six. The introduction of these satellites significantly improved rainfall data collection across the globe, even outperforming the 'full portfolio' of the original 10 satellites. This was in large part due to using the new satellites as part of a coordinated global portfolio of missions.

The authors note that this increase in performance was not solely due to technological improvements; it also assumed improved international co-operation and co-ordination between the space agencies (e.g. the European Space Agency, Japan Aerospace Exploration Agency and the US National Oceanic and Atmospheric Administration) running the satellites. Currently, the researchers say, co-ordination between space agencies is poor, with each mission working towards its own individual goals.

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Internationally coordinated multi-mission planning is now critical to sustain the space-based rainfall observations needed for managing floods globally. *Environmental Research Letters* 10(2), 024010. DOI: 10.1088/1748-9326/10/2/024010. This study is freely available at: <http://stacks.iop.org/1748-9326/10/i=2/a=024010?key=crossref.e176ce43e906b2c1670ccf0b4207cb6>.

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Space-based needs for managing floods (continued)

Overall, the results show that the current portfolio of rainfall satellites is insufficient to meet data needs for global flood management, and that further loss of satellites will lead to dramatically worse data coverage.

The research also highlights how global data on rainfall coverage can be improved. The authors make recommendations including the greater use of modern technology and improving international co-ordination in satellite infrastructure, which could increase the value of these important flood management tools.



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