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# Small Satellites for Space Weather Research and Monitoring

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There is growing recognition that the space environment can have substantial, deleterious, impacts on society. Consequently, research enabling specification and forecasting of hazardous space effects has become of great importance and urgency. This research requires studying the entire Sun-Earth system to understand the coupling of regions all the way from the source of disturbances in the solar atmosphere to the Earth's upper atmosphere. On the observational side, dense, distributed networks of observations are required to capture the full large-scale dynamics of the space environment. However, the cost of implementing these is typically prohibitive, especially for measurements in space. Thus, by necessity, the implementation of such new capabilities needs to build on creative and unconventional solutions. The utilization of small satellites for scientific exploration and research as well as for monitoring applications has only just begun but holds an incredible potential. With this tool we can get simple but crucial measurements in and from space faster, and more often; we can use CubeSats as short-lived probes in the upper atmosphere of Earth and other planets; we can fly constellations of satellites either in tight formation to provide multi-point measurements of regional and small scale structure or in distributed configurations to provide global coverage and continuous monitoring; and we can use constellations also to explore new measurement techniques such as interferometry and tomography. For monitoring as well as for constellations, the limited robustness of CubeSats can be mitigated by the ease and low cost of replenishing the constellation as needed. CubeSats have the potential to transform the way we think about and implement space missions. This talk will look at recent developments in the utilization of CubeSats for science and monitoring and discuss how best to utilize CubeSats for science, exploration, and monitoring of the space environment.