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Accurate Neutral Density specification is critical for orbit prediction in Low Earth Orbit due to the impact it has on satellite trajectory through drag. Data assimilation in a physics based model combines the predictive strength of a physics based models with an anchor in reality through observational data. We assimilate different combinations of Neutral Density measurements from CHAMP and GRACE satellites during several large geomagnetic storms to demonstrate that assimilating data from even a single accelerometer results in improved global specification. During the 2003 Halloween storm, orbit maximum Neutral Density increased by a factor of 2.5x within several hours. We reproduce along track Neutral Density specification during this extreme event with better than 22% NRMSD in all experimental setups.


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