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## Integrated Science Operations of CASSIOPE e-POP with the Swarm Constellation for New Studies of Magnetosphere-Ionosphere Coupling

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The CASSIOPE Enhanced Polar Outflow Probe (e-POP) was originally envisioned as a low-cost, short-lifetime (18-month) small-satellite mission for investigating polar ion outflows and related magnetosphere-ionosphere coupling phenomena. However, e-POP is currently in its seventh year of continuing operation, as an addition to and as the fourth component of the Swarm constellation of satellites, under the European Space Agency Third Party Mission Programme.

Since 2017, the increased operation duty-cycle of e-POP has enabled the routine extension of its science operations to its full altitude range and to all latitudes, and made possible several new studies of important mid- and low-latitude topside ionospheric phenomena. In addition, the integrated e-POP and Swarm operation takes advantage of the synergy between the orbit characteristics and unique instrument capabilities between e-POP and Swarm, to enable or enhance a host of coordinated studies of magnetosphere-ionosphere coupling: including the Earth's magnetic field and related current systems, auroral and upper atmospheric dynamics, and ionosphere-thermosphere and ionosphere-plasmasphere coupling processes. We present an overview of these new studies, focusing on their results on the effects of space weather in the ionosphere and upper atmosphere such as anomalous satellite orbit drag and ionospheric scintillation.