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Science opportunities from Cluster Swarm synergies
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The upcoming ESA Swarm mission, consisting of three spacecraft in the Earth's ionosphere of which two are kept close to each other, together with the four-spacecraft ESA Cluster mission in the magnetosphere, provides a number of exiting new science opportunities for ionospheric physics and magnetosphere-ionosphere coupling studies. The magnetic and electric field measurements from the Swarm mission will allow us to obtain spatial maps of ionospheric currents, convection, and conductances along a strip that envelopes the orbits of the two closeby traveling satellites. The novel technique for calculating these properties from the Swarm data is based on Spherical Elementary Current (Vector) Systems (SECS), and will be presented together with first synthetic application examples. Using these results together with Cluster measurements of field-aligned currents allows us to estimate the ionosphere-magnetosphere coupling factor K, as defined by the Knight relation, solely based on data. Further examples from the multitude of science opportunities from Cluster Swarm synergies, also additionally utilizing ground-based instruments, include amongst others studies of the Poynting flux between the magnetosphere and ionosphere, statistical comparisons between the plasma convection in both domains, and examination of the field-aligned current closure between ionospheric region 2 currents and the magnetospheric ring current.

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