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Ring Current and Field Aligned Currents from Cluster-Swarm Observations

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We explore the capability of Swarm-Cluster coordination for probing the behavior of the field aligned currents (FAC) adjacent to the ring current (RC) at medium and low orbits and show statistical analysis of the local time variation of R1/R2 FACs. The RC and connecting R2 FACs influence the geomagnetic field at low Earth orbit (LEO) and are sampled in situ by the four Cluster spacecraft. Coordination of the configuration of three Swarm spacecraft configurations with the constellation of the four Cluster spacecraft is possible; providing a set of distributed, multi-point measurements covering this region. Particular events showing close coordination of all spacecraft are considered during the start of the Swarm operations. We report here preliminary results of joint signatures of R1 and R2 FACs and demonstrate the use and application of new analysis techniques derived from the calculation of curl B and magnetic gradients to compare estimates of the current distributions. Multi-spacecraft analysis can access perpendicular currents associated with the FAC signatures at the Swam locations. For context, we identify the associated auroral boundaries determine from FAC intensity gradients in order to help interpret and resolve the R1 and R2 FACs. We also show preliminary results of an extended survey of the ring current crossings for different years, using estimates of the local current density, field curvature and total current.