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Statistical correlations of field-aligned currents measured by Swarm

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We investigate the statistical, dual-spacecraft correlations of field-aligned currents (FACs) signatures between two Swarm spacecraft (A and C), flying side by side during 7 months from April-November 2014. For the first time we infer the orientations of the current sheets of FACs directly, using the maximum correlations, obtained from sliding data segments, which show clear trends in magnetic local time. By splitting the auroral zone into high and low latitude regions most likely to contain R1 and R2 currents respectively, we find that the R2 currents show the strongest correlations for a broad range of local time (MLT) centred on dawn and dusk, with higher correlation coefficient on the dusk-side and lower correlations near noon and midnight. This trend is stable for up to 20 seconds time difference ([U+F064]t) between Swarm A and C and reflects the predominantly large scale dominance of R2 FACs. In contrast, the R1 currents (actually all high latitude currents) peak during narrower ranges of MLT, and are maintained for a shorter range of [U+F064]t, consistent with the expectation that R1 currents are more temporally unstable. Evidence is found of the influence from other current systems such as R0, NBZ and the Harang discontinuity.