Auroral electrodynamics---investigation by a dual sounding rocket experiment

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We present results from a 2017 sounding rocket experiment in which two NASA sounding rockets were simultaneously launched into the auroral ionosphere. The rockets included comprehensive instrumentation to measure DC and AC electric fields, magnetic fields, energetic particles, plasma density, and neutral winds, among other parameters, and achieved apogees of 190 and 330 km. This unprecedented collection of in-situ measurements obtained at two altitudes over an auroral arc, along with conjugate ground-based measurements by the Poker Flat incoherent scatter radar and all-sky cameras, enable us to investigate the behavior of an aurora arc and its associated electrodynamics. A prominent feature of our observations is the presence of localized, large-amplitude Alfvén wave structures observed in both the electric field and magnetometers at altitudes as low as 190 km in the vicinity of up- and down-ward current regions. The observations are discussed in the context of ionospheric feedback instability. The results are compared to predictions of previously published numerical studies and other sounding rocket observations.

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