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Magnetic conjugacy of northern and southern auroral beads

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Auroral beads, i.e. azimuthally arrayed small-scale bright spots resembling a pearl necklace, have recently drawn the attention of researchers as a possible precursor of explosive activation of the aurora. Here we used simultaneous, ground-based, all-sky camera observations from a geomagnetically conjugate Iceland-Syowa Station pair to demonstrate that small-scale auroral beads evolve synchronously in the northern and southern hemispheres and have good magnetic conjugacy for $\sim$7 min before an auroral breakup. The synchronous conjugate auroral beads undergo a two-step evolution: in the first $\sim$4 minutes, well-organized bead structures move eastward with an almost constant speed of 1 km/s or less, and subsequently they develop dramatically into brighter and larger auroral forms with faster propagation speed of 2$-$6 km/s. Our observations strongly suggest that, for the auroral beads, the magnetosphere plays a fundamental role in the determining their temporal evolution, while the ionospheric contribution that can induce asymmetric auroral behavior in the two hemispheres is minor or not significant.