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Field-aligned currents associated with Sun-aligned auroral arcs in the morning sector

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Electric fields and currents associated with Sun-aligned auroral arcs have been calculated from the EISCAT Svalbard radar measurements combined with optical observations. The auroral arcs were observed in the morning sector (at about 8 MLT) during about 1.5 hours after the IMF Bz component had turned to strongly northward (+10 nT). The arcs appeared periodically (6.7 min) and moved poleward at a velocity of about 700 m/s. The arcs were associated with periodic spatial structures of 270 km in latitudinal width. Each of the 270-km wide structure consists of four specific FAC regions: the upward FAC region 75-km wide containing the optical arc, the return downward FAC region 100-km wide poleward of the arc; and a secondary weaker arc equatorward of the main arc with a pair of FACs similar to the main arc, but narrower in width. Thus, the morningside Sun-aligned auroral arcs show a double-arc fine structure. The interchange instability with the ionospheric feedback can be suggested as a suitable generation mechanism for such kind arcs.