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A multi-satellite, multipoint case study of the cold dense plasma sheet

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The source of the cold dense plasma sheet (CDPS) is of great interest, in particular, whether it is transferred to the magnetosphere via poleward-of-cusp, lobe reconnection or via mechanisms at the flank magnetopause. This paper presents a case study on the formation of the CDPS utilizing a wide variety of spacecraft observations, including Double Star (TC-1 and TC-2), Polar, LANL GEO and IMAGE, in addition to ground-based observation by SuperDARN on the 5th December 2004. The pertinent observations can be summarized thus: TC-1 observes quasi-periodic (˜ 2 minute period) cold dense plasma sheet boundary layer (compared to a hot tenuous plasma sheet) signatures interspersed with magnetosheath plasma at the dusk flank magnetopause near the dawn dusk terminator. At the same time, the IMAGE spacecraft observes a prolonged (˜ hours) signature consistent with reconnection in the southern hemisphere lobe, with simultaneous ground based measurements made by superDARN showing evidence of reconnection ongoing in the northern hemisphere lobe region. The Polar spacecraft, located in the southern hemisphere afternoon sector, sunward of TC-1, observes a persistent boundary layer with a bi-directional electron pitch angle. The correlation of velocity and density (Hasegawa et al., 2005) observed by TC-1 either side of the magnetopause is consistent with transport across the boundary, suggesting the cold dense plasma sheet may be created by such transport. However, the IMAGE and SuperDARN data, along with the Polar observations sunward of TC-1, suggest that double lobe reconnection is facilitating plasma transport into the magnetosphere, sunward of

the position of TC-1. These observations suggest that although the large-scale boundary waves may facilitate plasma-transfer at the flanks, double poleward-of-the-cusp reconnection may be a sufficient CDPS source, albeit more dominant on the dayside.