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Multi-Instrumental Vector Magnetic Observations and Techniques for Investigating Auroral Dynamics

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Space based magnetometers in highly inclined low earth orbits are essential for characterizing the state of the auroral space environment and the dynamic processes within. This paper demonstrates the utility of data derived from multiple satellites including AMPERE (70 Iridium spacecraft), DMSP (4 spacecraft) and ST5 (3 spacecraft), and the AMIENext technique to investigate periods of interest in 2006 and 2010. A new satellite conjunction-finding technique magnetically maps in situ observations to a common altitude in the APEX coordinate system to assess the spatial and temporal stability and quality of vector magnetic measurements (Knipp et al., 2014). In March of 2006, the ST5 constellation was launched into a pearls-on-a-string configuration. Subsequent data processing produced superb, quality controlled magnetic observations from the 90-day mission (e.g. Slavin et al., 2008, Le et al., 2009; Wang et al., 2009). We present conjunction comparisons between the ST5 and DMSP spacecraft during the ST5 mission lifetime, which was dominated by a series of high-speed solar wind events. In May of 2010, a unipolar Magnetic Cloud passed Earth, providing an opportunity to investigate the magnetopshere-ionosphere coupling response to a slow moving transient followed by higher speed flow. This event included significant, long-lived disturbances in the asymmetric ring current and auroral electrojet (AE) index. Assimilation of space-based magnetic observations via the AMIENext procedure, reveal twisting in the dayside patterns, consistent with the sign changes in IMF By and a highly structured topology as IMF Bz turned northward. We present a detailed comparison between the magnetic observations from DMSP and AMPERE. To aid in investigating the local magnetic field and in providing data to assimilative models, we have also created new datasets in self-describing NASA CDF formats for the DMSP and ST5 vector magnetometers and for the DMSP precipitating ion and electron instruments and we will discuss their availability.