



## **A survey of multi-point observations of the open-closed field line boundary by the Van Allen Probes**

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We examine other encounters with the open/closed field line boundary (OCB) by the Van Allen Probes between September 2012 - September 2014. The work follows on from previous work investigating the November 14th 2012 lobe entry event (Dixon & MacDonald et al submitted 2014). Previous work using the CRRES and GOES spacecraft (e.g. Thomsen et al, 1994; Moldwin et al, 1994) found that spacecraft near geosynchronous orbit were more likely to encounter the lobe in the dawn region of the magnetosphere. During the period examined, the Van Allen Probes have had apogee which precessed through all MLTs, allowing a detailed investigation. These events are comparatively rare; we use Superposed Epoch Analysis of IMF data prior to each event to provide insight into the conditions required to make the lobe accessible to the Van Allen Probes. Large ionospheric outflows of low energy plasma, particularly oxygen ions, are associated with the lobe encounters and the amount of plasma present, its source region and composition are investigated. Supporting data from the LANL geosynchronous spacecraft are also used to map the global behaviour of the OCB during these highly disturbed periods. The study of Dixon & MacDonald et al found that the Nov 14 event was characterised by periodic disturbances on the OCB propagating from the tail. A larger sample enables us to address these mechanisms in more detail.