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Transition Parameter applied to boundaries at Venus

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We have used a transition parameter to characterise magnetospheric boundaries at Venus. The technique allows sparsely sampled data to be related to a variable and rapidly moving structure, such as the Bow shock, Magnetic Pile-up boundary or Ion Composition boundary. The solar minimum in 2009 was one of the lowest on record, and by 2006 minimum conditions were already in place. Utilising the ASPERA-4 Ion Mass Analyzer data and the paired magnetometers on board Venus Express the relation between the ions and flux ropes are investigated, in order to determine whether they a part of the replenishment or loss of the Venusian atmosphere. First, by using the magnetometer to identify the flux rope in the ionosphere Wei H.Y. (2006 -personal communication) and then by using the IMA to observe coincident composition changes. The altitude of ropes is dependent on the time spent in the ionosphere, with older ropes increasing weight and dropping weight. However, the occurrence of flux ropes and a mixed populations of ionospheric and solar wind ions is coincidental.
Venus boundaries are examined during 2007, and 2011 / 2012 going toward solar maximum. A new use of the transition parameter is put forward; to aid with boundary placement. The bow shock is located with an automatic algorithm and this is then compared with previous models, giving a sense of Venus reaction to solar activity. It is shown that the bow shock position is largely unchanged. The ion composition boundary and the magnetic pile-up boundary are also located. They coincide to within an ion sampling period, but transition parameter analysis reveals that they are not coincident, with the ion composition boundary inside the pileup boundary.