



Earth's transpolar arc originated simultaneously from dayside and nightside

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Transpolar arc/theta aurora have been observed and modeled for more than thirty years. Most of the proposed models (more than 10 in total) predict one continuous band for a transpolar arc. Eriksson et al., (2005) have suggested that a continuous transpolar arc of a theta aurora may be considered as two separate entities, one on the dayside and another on the nightside, which can be driven by high latitude reconnection at the dayside, and some other processes related to Harang discontinuity at the nightside, respectively. From one event observed by two different aurora imagers (IMAGE/WIC and TIMED/GUVI), Mailyan et al. (2015) showed that right after two solar wind entry events, polar cap arc started to form, and two arcs from both dayside and nightside can exist at the same time and may be connect to form a transpolar arc at some time. Because different sensitivity of two cameras may result in another interpretation, in the present work we will show one event from one single instrument (IMAGE/WIC), in which transpolar arcs can be originated simultaneously from dayside and nightside, forming a complete transpolar arc. We also find that sometimes this transpolar arc actually has two parallel branches, which should not be noticed before. This observation encourages us reconsider transpolar arc/polar cap arc formation models, and may also provide us some clues on the formation of polar cap arcs in other planets.