Driving of outer belt electron loss by solar wind dynamic pressure structures: Analysis of balloon and satellite data

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We present observations of ~10-60 min solar wind dynamic pressure structures that drive large-scale coherent ~20-100 keV electron loss from the outer radiation belt. A combination of simultaneous satellite and Balloon Array for Radiation-belt Relativistic Electron Losses (BARREL) observations on Jan 11-12, 2014 show a close association between the pressure structures and precipitation as inferred from BARREL X-rays. Specifically, the structures drive radial ExB transport of electrons up to 1 Earth radii, modulating the free electron energy available for low frequency plasmaspheric hiss growth, and subsequent hiss-induced loss cone scattering. The dynamic pressure structures, originating near the Sun and commonly observed advecting with the solar wind, are thus able to switch on scattering loss of electrons by hiss over a large spatial scale. Our results provide a direct link between solar wind pressure fluctuations and modulation of electron loss from the outer radiation belt and may explain long-period modulations and large-scale coherence of X-rays commonly observed in the BARREL dataset.