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Depletion of the outer radiation belt during low activity years.

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Abstract
During the years of high and moderate activity, the energetic flux of electrons at geostationary region increases compensated by the losses and as a result, the overall level of the population persists. The transitions from high to low intensity and back by 3-4 orders of magnitude are fast within hours and caused by the magnetic disturbances, storms and substorms.
During the years of the low activity, the balance of increases and losses is violated; the whole flux of electrons is reduced. Particularly noticeable was the devastation of the outer belt during the minimum of 2009-2010 years. The slow type of decreases became most active. The transition from the fast type to the slow type of decreases was created by the prolonged periods of the low substorm activity. The slow type of intensity decreases is mostly probable caused by the losses on the magnetopause.

1. INTRODUCTION

Energetic electron intensity, measured at the geostationary orbit, is extremely variable. Alternate fast or slow losses or increases create a complex picture that defies explanation by a simple scheme. The loss of electrons are usually compensated by increases, and the variable short-term structure of the outer radiation belt in the long-term scale (ten days or more) remains more or less constant in the years of maximum and moderate activity of the 11-year solar cycle.

The variability of the fluxes of energetic electrons is interesting not only for the understanding of the processes in the radiation belt of the Earth, but also important for the prediction of the functioning of the onboard equipment of the spacecraft. Therefore this problem is the subject of numerous studies (see Andronov and Trakhtengerts 1964, Kuznetsov et al. 2007, Friedel et al., 2002, Millan and Thorne, 2007, Shprits et al, 2008, 2008a, Jaynes et al, 2015, Ukhorskiy and Sitnov, 2012, Ying et al., 2015).
This paper is not a review with extended analysis of existing mechanisms of the variability of electron fluxes. There are several papers that relate this variability to the magnetic activity and to the solar wind parameters (Onsager et al., 2007, Yuan et al, 2015, Kanekal et al., 2015, Alves et al, 2016).
Our task is to investigate long-term variation of the energetic electron flux in the outer radiation belt, to show how the flux of electrons in the declination region of the outer belt is changing in the long term. Especially how the outer radiation belt becomes depleted in the years of the solar activity minimum because of the reduced level of the magnetic activity.
The 2009-year minimum attracts attention and several papers (Kataoka and Miyoshi, 2010, Li et al, 2011, Lee et al, 2013) analyze it. In our work, we will investigate how the electron population balance was violated by the prolonged periods of the low auroral activity accompanied by the slow type of electron decreases.

The magnetic activity over the past 25 years, the dynamics of the fluxes of the energetic electrons in the radiation belt slope and the conclusion will be presented in the second, third and