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IMF dependence of energetic oxygen and hydrogen ion distributions in the near-Earth plasma sheet

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Energetic ion distributions in the near-Earth plasma sheet can provide important information for understanding the entry of ions into the magnetosphere, and their transportation, acceleration, and losses in the near-Earth region. In this study, 11 years of energetic proton and oxygen observations ($> \sim 100$ keV) from Cluster/RAPID were used to statistically study the energetic ion distributions in the near-Earth region. The dawn-dusk asymmetries of the distributions in three different regions (dayside magnetosphere, near-Earth nightside plasma sheet, and tail plasma sheet) are examined in northern and southern hemispheres. The results show that the energetic ion distributions are influenced by the dawn-dusk IMF direction. The enhancement of intensity largely correlates with the location of the magnetic reconnection at the magnetopause and the consequent formation of a diamagnetic cavity in the same quadrant of the magnetosphere. The results imply that substorm-related processes in the magnetotail are not the only source of energetic ions in the dayside and the near-Earth plasma sheet. We propose that large–scale cusp diamagnetic cavities can be an additional source and can thus significantly affect the energetic ion population in the magnetosphere. We also believe that the influence of the dawn-dusk IMF direction should not be neglected in models of the particle population in the magnetosphere.