

Supplementary Information for

Observational and Simulation Evidence for a Mid-latitude Ring Current Wedge during Substorms

Xiyu Liu^{1,2}, Yiqun Yu^{1,2*}, Jiaojiao Zhang^{3*}, Longxing Ma^{1,2}, Depeng An^{1,2}, Tao Yan⁴, Longhui Liu^{1,2}, Jinbin
Cao^{1,2}, Chi Wang³

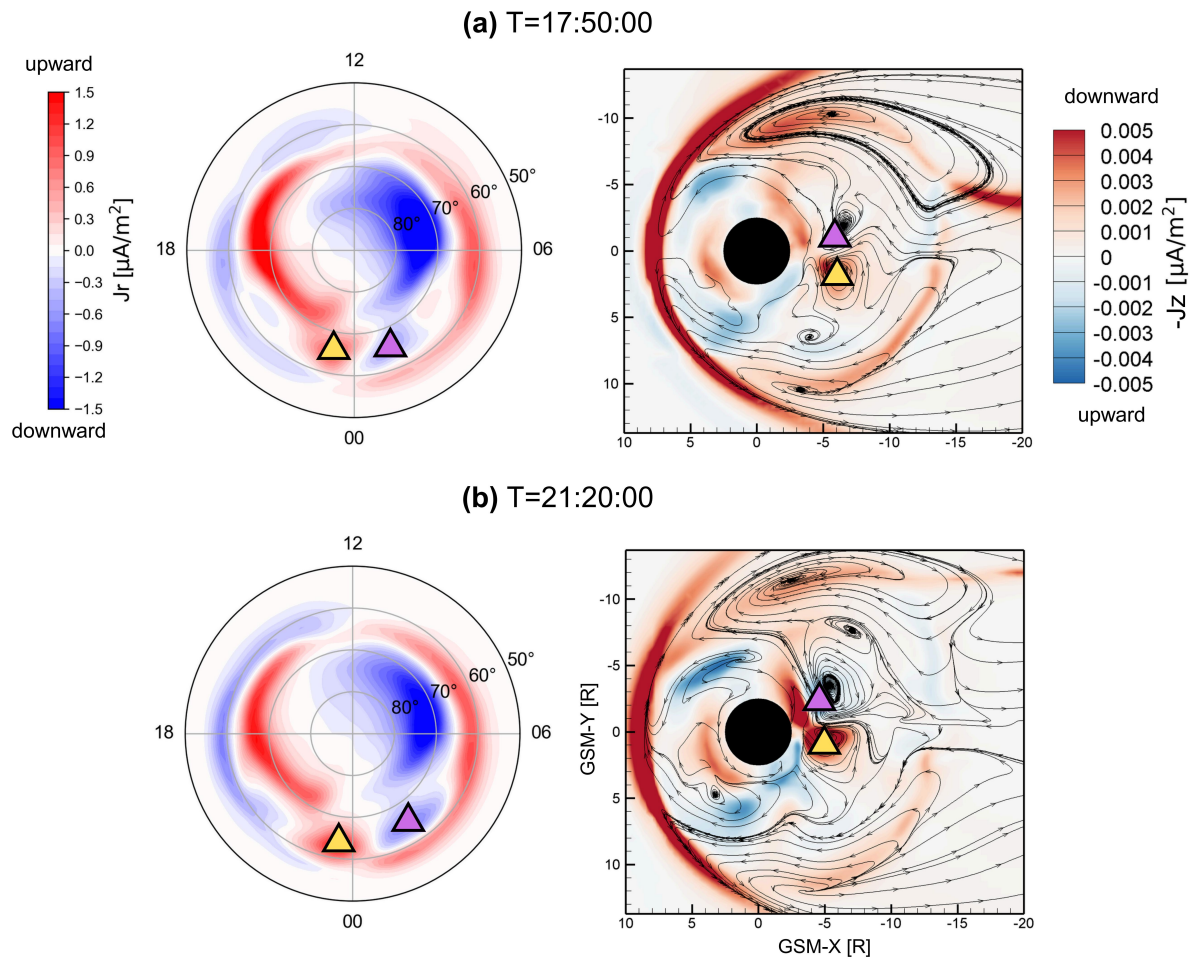
¹ School of Space and Earth Sciences, Beihang University, Beijing, China

² Key Laboratory of Space Environment Monitoring and Information Processing, Ministry of Industry and
Information Technology, Beihang University, Beijing, China

³ State Key Laboratory of Space Weather, National Space Science Center, Chinese Academy of Sciences,
Beijing, China

⁴ Planetary Environmental and Astrobiological Research Laboratory (PEARL), School of Atmospheric
Sciences, Sun Yat-sen University, Zhuhai, People's Republic of China

Corresponding authors: yiqunyul7@gmail.com, jjzhang@spaceweather.ac.cn



20
 21 Fig. S1. FACs in the ionosphere and magnetosphere equatorial plane at (a) 17:50 UT and (b) 21:20 UT in
 22 the same format as Fig. 4. The RCW-associated FACs are located around 60°-70° MLAT, denoted by the
 23 triangles.
 24

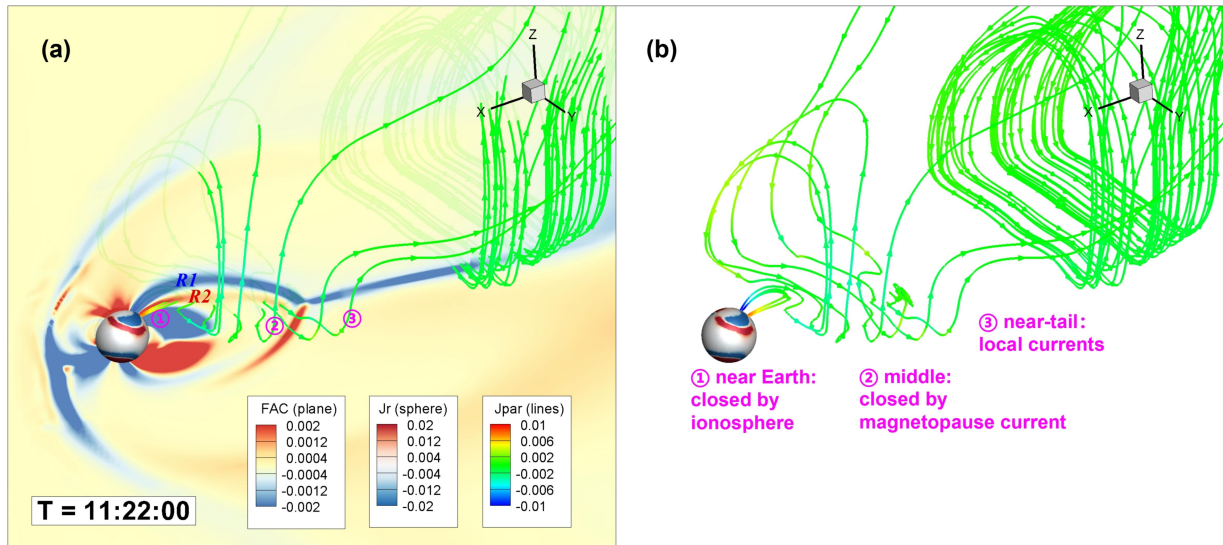


Fig. S2. Three-dimensional illustrations of current loops (curves) in the magnetosphere at 11:22 UT. The background plane in (a) shows 23 MLT meridian slice with FACs contours in the GSM coordinate. The contours on the sphere and lines are in the same format as Fig. 5.