

Figure 1: Electron (a) and proton (b) auroras observed by the high-resolution ASI at the Athabasca at onset. The magnetic perturbation vectors are overlapped with the proton aurora image.

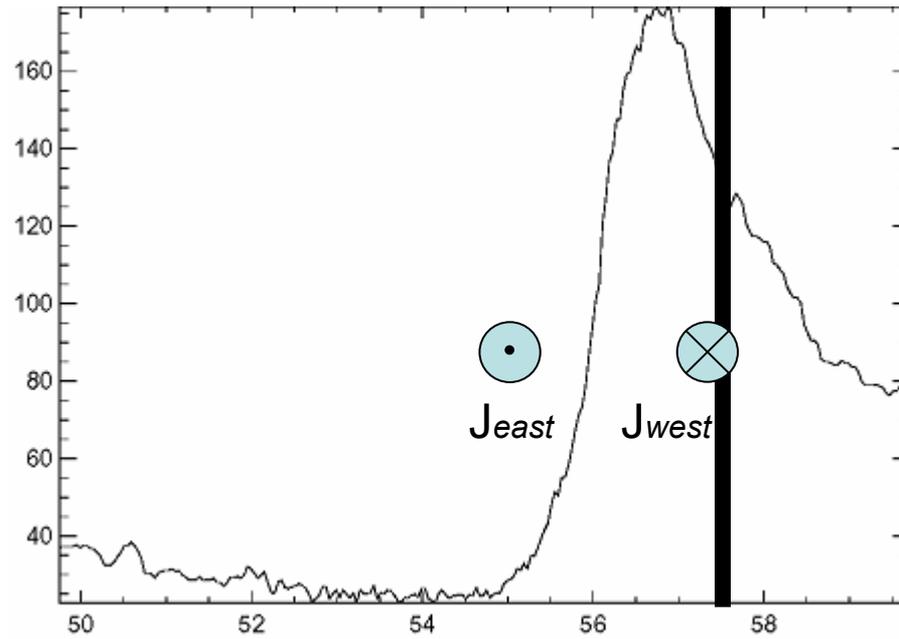


Figure 2: The proton aurora profile along the Athabasca meridian. The arc position is shown as a bold vertical line. Direction of electrojets are also schematically sketched.

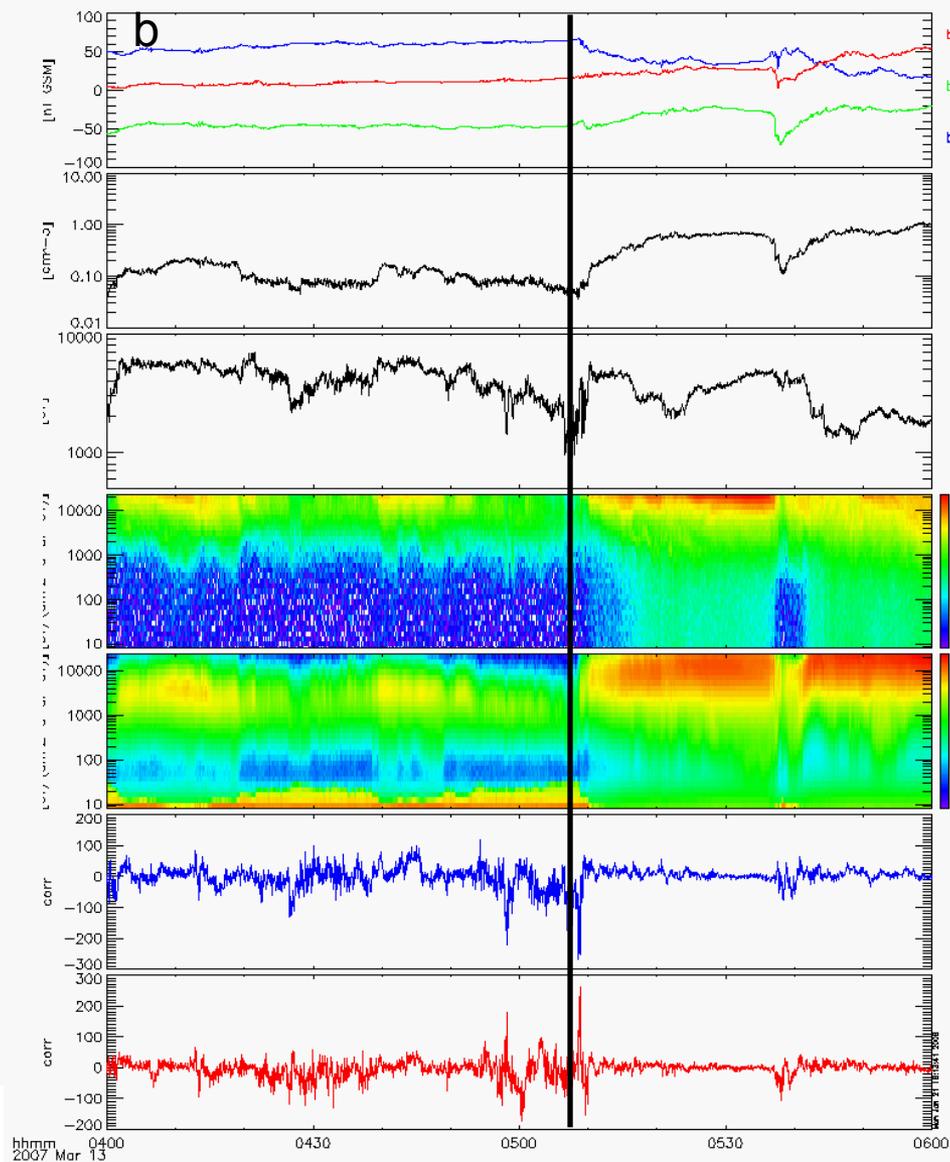
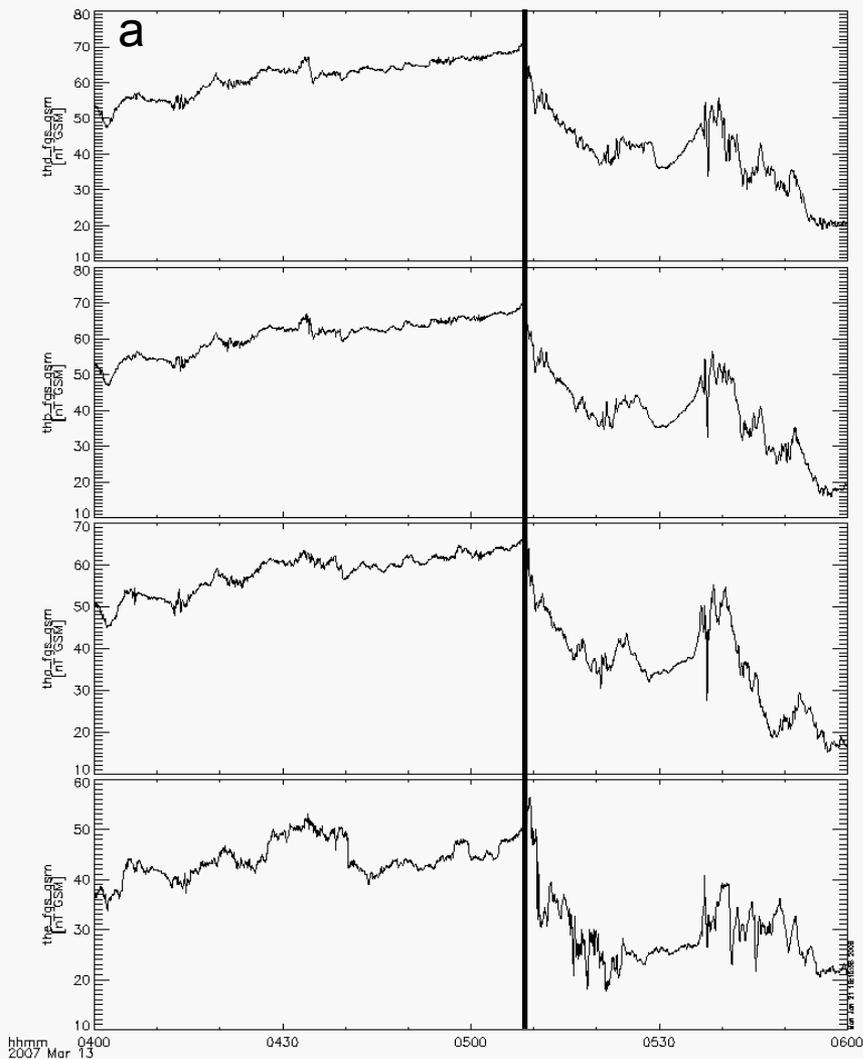


Figure 3: Bx component from the A, B, D, and E spacecraft (a) and plasma parameters from the THEMIS A (b).

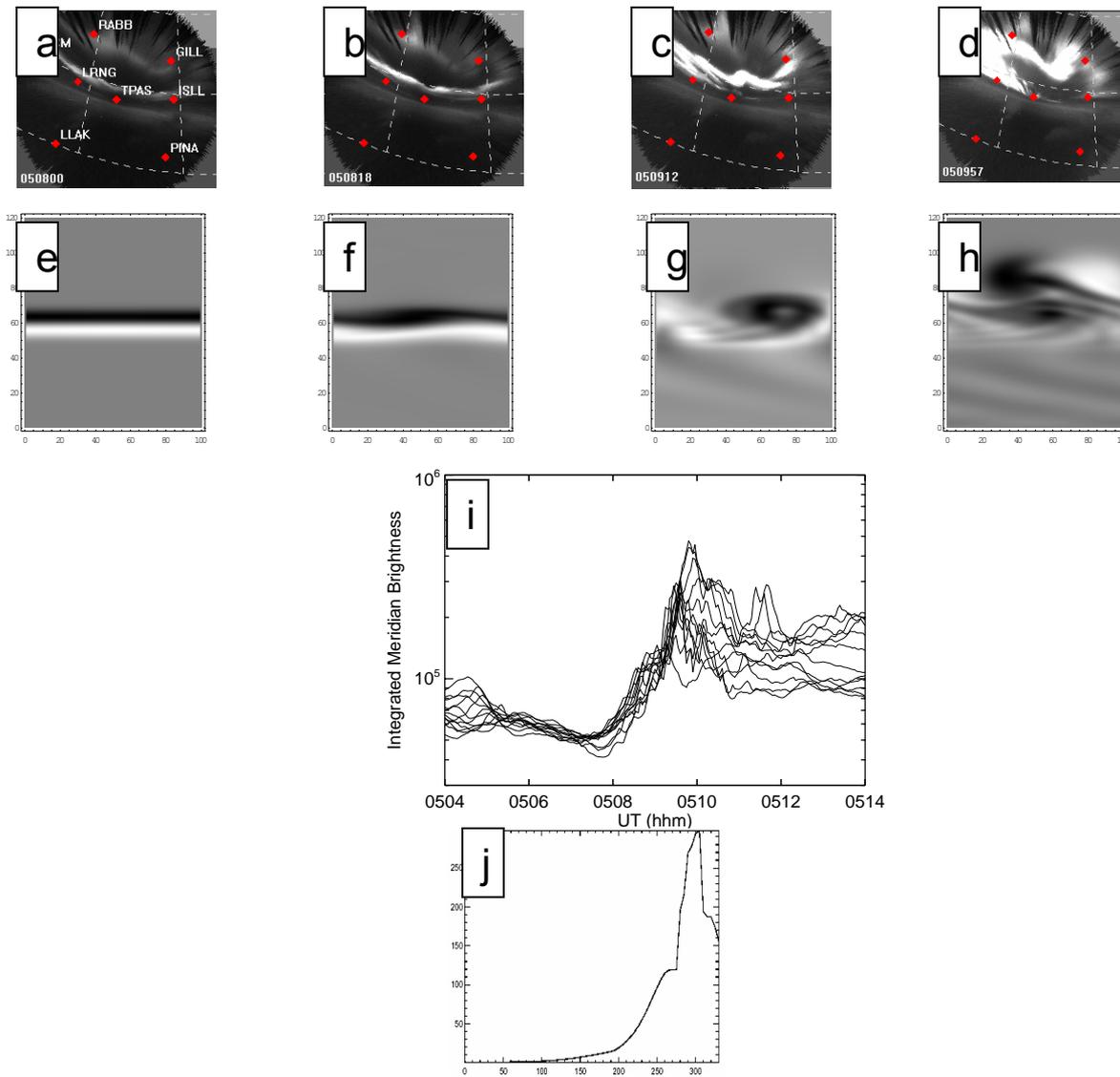


Figure 4: Observed ASI images for the main stages of the onset: arc intensification (a), ripples (b), vortex formation (c), and nonlinear vortex growth and expansion (d) compared to vortices produced by the SFBI (e-h) at corresponding stages of the auroral breakup. Time dependence of the auroral integral intensity at different meridians compared with the maximum vorticity as obtained in modeling.