Figure 2. (a) Electron pressure (p_e) distribution in Mercury's magnetic equatorial plane at z = 0.2 R$_M$. (b) X-Ray Spectrometer (XRS) observations of energetic electron-induced surface fluorescence at Mercury's nightside surface from *Lindsay et al.* [2016]. (c) Electron pressure (p_e) distribution at Mercury's nightside surface from the ten-moment model. (d) Contour plot of radial current density, J_{rS}, at Mercury's (northern hemisphere) surface displayed versus local time in hours from *Anderson et al.* [2014] based on MESSENGER magnetometer observations. (e) Calculated radial current density, J_{rS}, at Mercury's (northern hemisphere) surface from the ten-moment model.

In addition to the asymmetries, we also present the simulation results for the field-aligned currents (or Birkeland currents) at Mercury's northern hemisphere surface in Figure 2(e). The model predicts that the currents flow downward (in blue) at dawn and upward (in red) at dusk, which are consistent with MESSENGER observations shown in Figure 2(d) and analogous to Region 1 (R1) Birkeland currents at Earth. More importantly, our simulation results for the current density values at the planetary surface also agree well with MESSENGER observations. MESSENGER magnetic field data show that the maximum and minimum J_{rS} are $\pm 115 nA/m^2$ [*Anderson et al.*, 2014], and in comparison, the calculated maximum and minimum values from our model are 115 nA/m^2 and -150 nA/m^2, respectively.