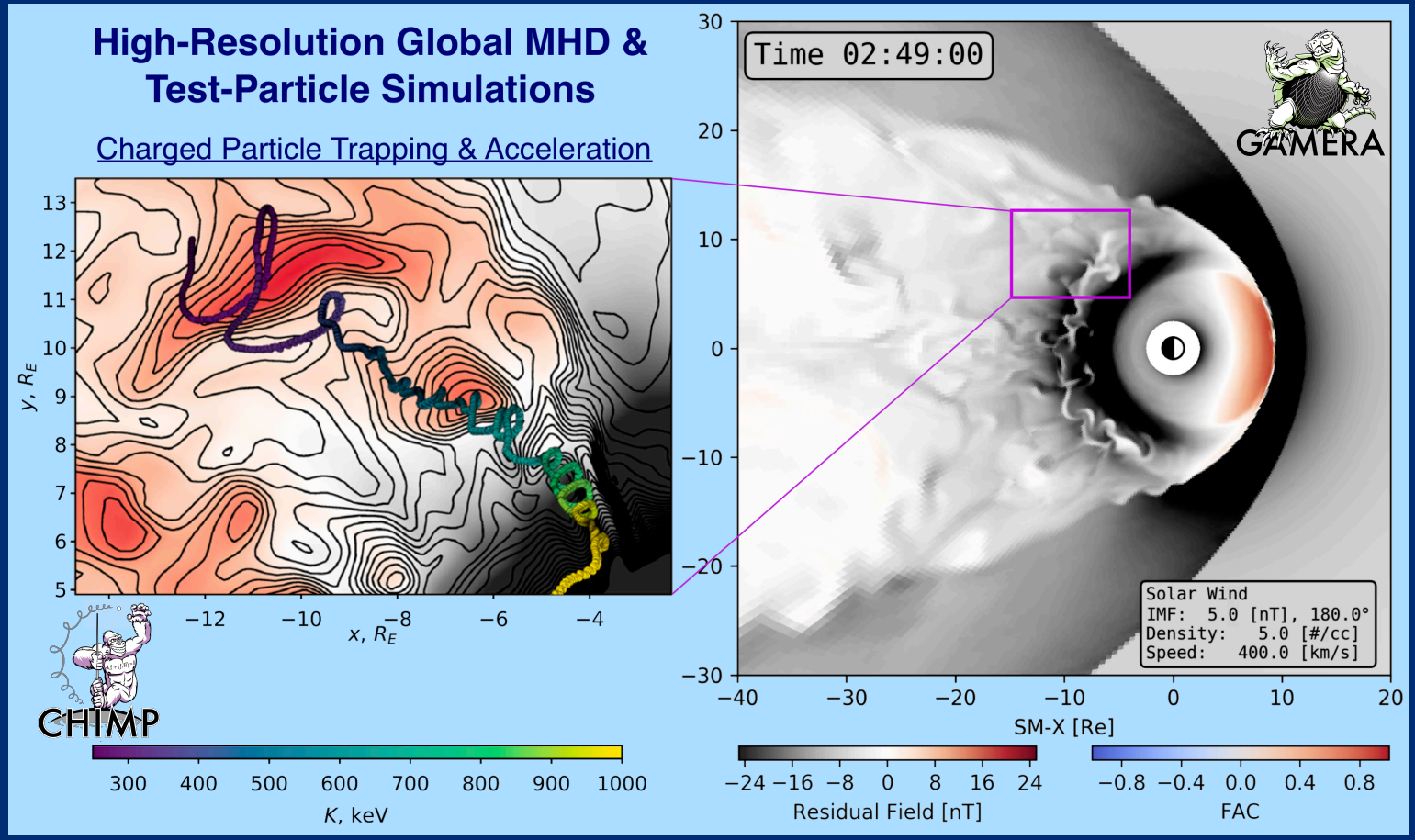
High-Energy Particle Transport and Acceleration at Earth

- Plasma convection from the magnetotail into the inner magnetosphere occurs in the form of localized flows associated with increases in magnetic field (dipolarizations)
- While it has long been known from spacecraft observations that dipolarization flows increase intensities of energetic ions and relativistic electrons, the mechanisms of particle acceleration had been a mystery
- New high-resolution global magnetohydrodynamic (MHD) and test-particle simulations revealed that dipolarization flows are associated with “magnetic islands” that can stably trap charged particles and transport them over >10 Earth radii into the inner magnetosphere accelerating them by a factor of 10 and thus directly feeding into the energetic ion and relativistic electron populations around Earth



Magnetic trapping at localized dipolarization flows enables transport and energization of energetic ions and relativistic electrons from the magnetotail deep into the near-Earth space