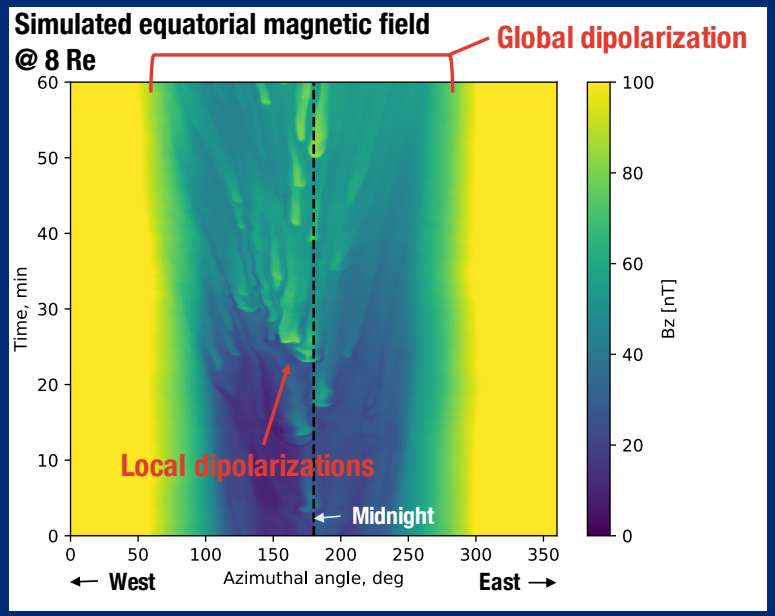
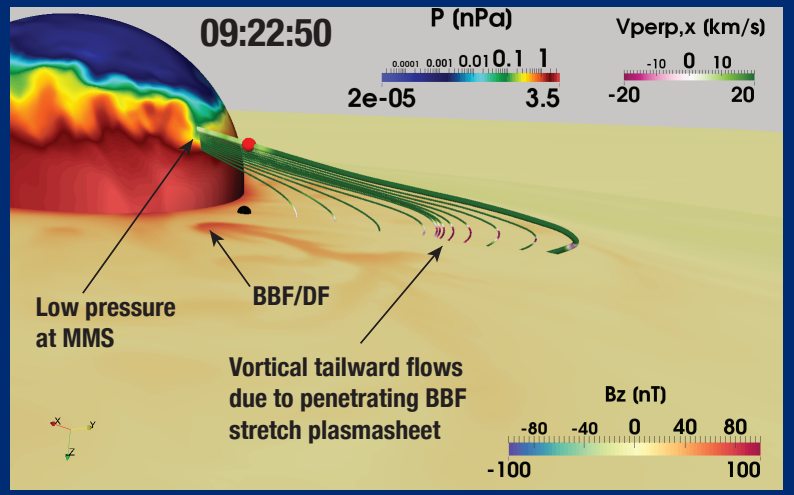
Contribution of bursty bulk flows to the global dipolarization of the magnetotail during an isolated substorm

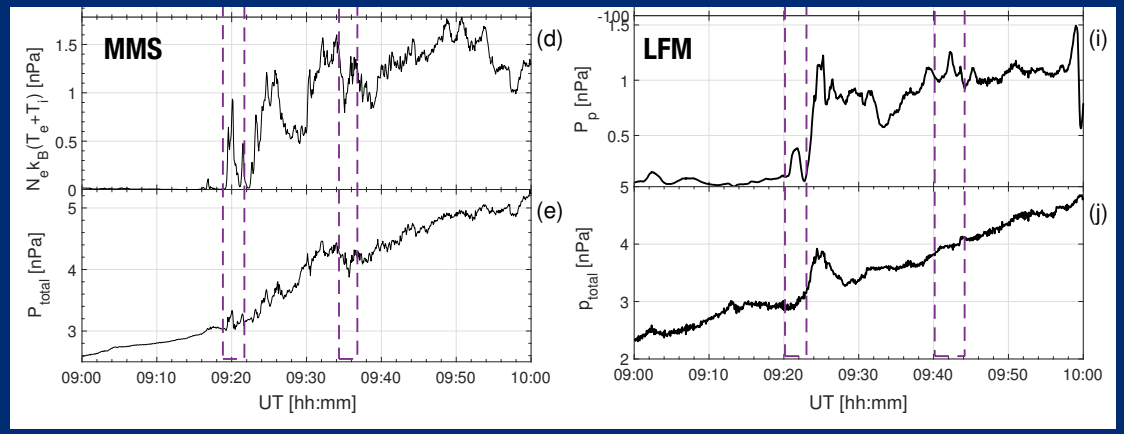
- High-resolution global simulations reveal for the first time that a global substorm dipolarization of the magnetosphere is made up of a large number of small ones, providing a dominant mechanism of magnetic flux transport in the nightside magnetosphere
- This suggests how the fundamental mode of magnetospheric convection, the so-called "Dungey cycle" posited in 1961, operates in reality



- The work is enabled by highly accurate numerical methods implemented and run on Cheyenne – one of the largest supercomputers in the world
- Simulations are consistent with in situ measurements by NASA MMS and NOAA GOES spacecraft



- First-principles simulations provide global context to in situ measurements and uncover the underlying physical processes



Dungey cycle at work: Global substorm dipolarization of the nightside magnetosphere is an accumulation of localized geomagnetic field enhancements carried by bursty plasma flows