The plasma pressure of the inner magnetosphere severely distorts the surrounding magnetic field and is responsible for an electrical current system known as the ring current, whose ionospheric footprint is a core part of the so-called Region-2 Current System. As plasma is heated and injected during storms and substorm, the resulting plasma pressure displays global variations on ~10 min time scales, making a global measurements of its dynamics a requirement to understand its evolution and impact on the magnetosphere and ionosphere. Here we present the 3D large-scale pressure-driven current system derived from the global HENA images on 20 April 2002 and discuss the global context of the local measurements of current density applying the curlometer technique to cluster magnetic field measurements [Vallat et al., Annales Geophysicae, 23, 1849–1865, 2005]. The results are compared to the “snapshots” of equatorial currents from the TS07d global empirical magnetic field model. We also present examples of how the dynamics and evolution of the pressure-driven currents relate to ionospheric flows, so-called sub-auroral polarization streams (SAPS), in the dusk/afternoon sector as observed by the mid-latitude SuperDARN chain.