The magnetic field of the Earth is affected by the dynamic conditions in the near-Earth space environment of the ionosphere and magnetosphere. Ground-based magnetometer measurements, such as those undertaken by the USGS Geomagnetism Program (http://geomag.usgs.gov), of the field’s complex time-dependence play a critical role, which is complimentary to space-based measurements, in monitoring and diagnosing the space environment. The Earth’s magnetic field converges at geomagnetic poles located near the north and south geographic poles. And it is there that the magnetic field is most active and where its affects, of both academic and practical importance, are most pronounced. This is especially true during magnetic storms, when aurora displays are caused by electrically charged particles accelerated by disturbances in the Earth’s magnetic field. The flow of these charged particles also form part of the larger ionospheric-magnetospheric electric circuit which can be monitored, in part, with ground-based magnetic observatories. Understanding these phenomena is important, since it is during magnetic storms that, over-the-horizon radio communication can be difficult or impossible, compass orientation (particularly at high latitude) and GPS location can be degraded, satellite electronics can be damaged, astronaut and high-altitude pilots can be subjected to enhanced levels of radiation, and ground currents can be induced which can damage high-voltage power grids. Most of these hazards occur, of course, near the Earth’s surface, since this is where the vast majority of the infrastructure exists, and related activities occur, in our modern, technologically-based civilization.

The USGS Geomagnetism Program, in its various historical forms within different Bureau’s of the Federal Government, has been an important contributor to the previous IPY’s and IGY’s. It is proposed that the USGS Geomagnetism continue with this tradition and make active participation in the 2007 IPY. In particular, the USGS proposes to work with academic and other governmental agencies, such as NASA and the Space Environment Center of NOAA, and with foreign geophysical concerns, to coordinate its ground-based operations with air-borne and space-craft measurements of the magnetic field and other geophysical quantities so that the dynamic nature of the ionosphere and magnetosphere can be better understood. There are significant obstacles that need to be overcome in order to perform these tasks, and this is especially true for high-frequency measurements where absolute temporal control is essential. As part of the 2007 IPY, the USGS Geomagnetism Program will work with other national geomagnetism programs, in particular those of Canada, Japan, Denmark, and possibly Russia, to monitor the magnetic field under the auroral oval encircling the north geomagnetic pole with a string of absolute, ground-based magnetic observatories. The Program also proposes to analyze these data with physics-based modeling techniques that will accommodate the dynamic dimensions of the auroral oval, something which is currently not possible with simplistic (AE) magnetic indices. The Program will also seek academic involvement on these matters of research.