



The ENIGMA project: a ground-based magnetic array for space research

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National Observatory of Athens (NOA) currently operates ENIGMA (HellENic GeoMagnetic Array), an array of 4 ground-based magnetometer stations in the area of south-eastern Europe (central and southern Greece). The current stations are latitudinally equi-spaced between 30° and 33° corrected geomagnetic latitude. In the near future another station will be installed in Macedonia or Thrace, and there are plans for the installation of an additional station in Crete by mid-2010. One of the primary research objectives assigned to ENIGMA is the study of geomagnetic field line resonances (FLRs). The latter is a well-established phenomenon taking place in the Earth's magnetosphere. It can be pictured as the formation of standing magnetohydrodynamic waves on magnetic field lines with fixed ends at the conjugate ionospheres. An interesting option in this field of research would be to compare ultra-low-frequency (ULF) wave observations in space made by ESA's Cluster mission and on the ground acquired by these mid-to-low-latitude ground-based observation sites of the Earth's magnetic field. Cluster has a high inclination orbit; insofar studies at high latitudes are more justified for direct interactions along the magnetic field lines. So, for a Cluster-ENIGMA study one has to expect some indirect, somehow related reactions with propagations perpendicular to the B-field. The Cluster-ENIGMA study can serve as a pilot-study for the upcoming Swarm mission of ESA. The Swarm constellation of spacecraft will allow, for the first time, the unique determination of the near-Earth field aligned currents, which connect various regions of the magnetosphere with the ionosphere and can be regarded as a complement to the Cluster mission.