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Ionospheric magnetic field modelling from ground-based and satellite data

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The ionospheric magnetic field is generated by electrical currents flowing within the conducting layers of the Earth's atmosphere, at about 110 km altitude. These currents vary by day, by season, by solar activity, and also with the main magnetic field of internal origin. The aim of this project is to develop a spherical harmonics model of the ionospheric magnetic field below and above the ionosphere, using magnetic data from low-Earth orbiting satellites such as Ørsted and CHAMP, and magnetic observatory data. We focus on quiet-days (Kp < 2o) magnetic field variations at mid-latitudes ($5^\circ < \theta < 60^\circ$ in quasi-dipole coordinates), assumed to be generated by the ionospheric wind dynamo (Sq field). These variations are extracted from CHAMP data by subtracting the internal and magnetospheric fields predicted by the POMME 3 model. The inverse problem is then solved in quasi-dipole coordinates, in order to accurately describe the Sq field near the geomagnetic equator and outside the equatorial electrojet area. Various parameterisations are tested and different cases are investigated : with and without observatory data, in different seasons, for different solar activity levels.