As part of the UK National Centre for Earth Observation (NCEO), we report on the initial progress of a project designed to develop new methods for enhancing satellite magnetic measurements for the magnetic field. The project is divided into five parts:

1) Data selection and weighting using magnetic indices and ground-based observations.
2) Parameterisation of external field sources, particularly relating to different component parts of both the ionosphere and magnetosphere.
3) Along-track filtering – unification of modelling with and without.
4) Modelling of error covariance, particularly due to unmodelled external field and the field induced by it.
5) Calibration and validation of data through scientific applications, particularly modelling of lithospheric field and core surface flow.

A particular aim is to overcome the current “stripy” appearance of the residuals of data to models. Such stripes are a clear indication of unmodelled external field and its associated inductive signature, and limit the accuracy to which high-degree field models can be determined, either by contributions to as noise spectrum, or by requiring along-track filtering which reduces model power. Study will focus on data from CHAMP and Ørsted, but is designed to produce new tools and methodology for use with data to be obtained by the upcoming ESA Swarm mission.