

The paper presents a study of the temporal and spatial geomagnetic variations during the CHAMP satellite era on some InterMagnet observatories.

The topic of the paper falls in the scope of "Solid Earth". It is well written even though I have many criticisms against the submitted work. This paper gives rise to many questions. It seems to me that the title does not reflect the content of the work. While it is restricted to crustal biases, the data processed and discussed are related to what one can consider as "residuals" in the general sense of difference between measured magnetic field and normal (mathematical model) one. These residuals are vectorial combination of magnetic field of external origin and lithospheric one. There is no clear separation of the two contributions throughout the paper.

The authors pointed out that measurements of some observatories (p.499 l.10-17) were processed to take into account the singularities caused by location changes and/or jump in the data. There is no quantification of any kind of possible effect on the measurements and its effect on the results and which observatories are concerned by these problems. In the same section (p. 499, l.18-20) the description of synthetic data is not sufficient. As far as a global spherical harmonic model is used (GRIMM3 in this case), then it is important to know which maximum degree and order the data are synthesized to? The spatial horizontal wavelength is related to these parameters. The data used for comparison are not homogeneous since GRIMM3 model is based on observatory data only for secular variation determination (Korte and Lesur, ANNALS OF GEOPHYSICS, 55, 6, 2012; doi: 10.4401/ag-5410). The static part of the model is mainly based on CHAMP data. What is the effect of "downward continuation" from CHAMP altitude to ground surface?

Did the authors plotted the pictogram of Figure 2 using magnetic coordinates of the observatories rather than geographic ones?

Minor corrections:

- Instead of "row data" change the word to "raw data" at the second line of the conclusion.
- Check the references.

Recommendation: I recommend its publication after revision.