Geophysical Research Abstracts
Vol. 20, EGU2018-19034, 2018
EGU General Assembly 2018

Time variation of the lithospheric magnetic field between 2000 to 2017

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The lithospheric field that is one of the main objectives of the ESA's mission Swarm is slowly varying in time due to the induced component. This variation is known to be small (and it is usually neglected in the lithospheric modelling) but recent advances in processing strategies and still growing amount of satellite data (longer time series) raise questions whether such an effect should be considered in the development of the lithospheric models, i.e. when exploiting data from missions like CHAMP and Swarm. We estimate this effect over the period of 17 years (since the launch of CHAMP) and discuss how the satellite measurements (the observable part of the spectrum) can be referenced to a single epoch. For this purpose, we have first inverted the magnetic field vector from CHAOS-6, which includes also Swarm data, into a vertically-integrated susceptibility map (with a remanent model removed). With the susceptibility distribution the core fields taken from CHAOS-6 can generate time varying lithospheric signal. Of course, the effect depends on the time span and the altitude considered, e.g., an altitude of 400 km and the span of 17 years can produce more than 0.5 nT with a peak-to-peak variation nearly 1 nT. The vertically-integrated quantities are found to be useful means to parameterize lithospheric time variations because the objective is to end up with data corrections at the satellite altitude. Studied is also the effect of the choice of the core field (employed in the inversion) on the lithospheric time variation. We show this choice is less important even for the core fields 20 years apart - however it is logical to select a core field that falls into the data span of the magnetic lithospheric model used.