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10 years of accurate core magnetic field modeling

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The German satellite CHAMP, launched in 2000, is still flying and is presently the only satellite providing low altitudes, high-quality magnetic vector data. This continuous consistent set of data, covering nearly 10 years, has lead to a remarkable series of core field models that have changed our understanding of the core magnetic field temporal evolution. In particular, sub-annual variations of the core field have been observed and modeled. Although the recently derived models are of unprecedented accuracy, some kind of regularization is still required for their derivation. We will compare different approaches and show the importance of a careful application of the regularization process. Understanding the effect of the applied regularization method on the core field model is fundamental to properly handle significant data gap. Such a gap is expected to appear between CHAMP and Swarm era.