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Modeling the Earth's magneticl field by local multiscale methods

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Local methods become more and more important to resolve strongly localized structures of the Earth's magnetic field. We introduce multiscale techniques for different aspects of geomagnetic modeling. In particular, we construct locally supported wavelets for the reconstruction of field-aligned currents from satellite magnetic field measurements and for the separation of the magnetic field with respect to sources in the interior of the satellite's orbit and sources in the exterior. The crucial step for the construction of the wavelets is the regularization of the convolution kernels appearing in integral representations of the modeled quantities. These techniques are applied to CHAMP data that has been pre-processed for crustal field modeling, as well as to a long term study of field-aligned-currents from 7 years of CHAMP data (this study involves a separate treatment of the measured magnetic field in terms of the season and the ambient interplanetry magnetic field).