High-resolution Earth's gravity field modelling: contributions from the COST Action on High-Performance Modelling and Simulation for Big Data Applications (cHiPSet)

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Numerical methods like the boundary element method or method of fundamental solution can be applied for high-resolution modelling of the Earth's gravity field. In order to obtain numerical solutions of "cm-level" accuracy (desired in geodetic community) while processing huge amount of input data, such applications lead to large-scale parallel computations with enormous memory requirements. There exist several efficient numerical techniques that can significantly reduce the numerical complexity of such approaches. Our collaboration within the COST Action on High-Performance Modelling and Simulation for Big Data Applications (cHiPSet) gave us an opportunity to acquire new expertise from experts from other disciplines. Namely, the Hierarchical matrices as a compression technique often used in electromagnetic applications have been implemented into our geodetic application. This has considerably contributed to overcome problem of enormous memory requirements and thus improve efficiency of our approach.