



Boundary problems in combining terrestrial, airborne and spatial gravity field information: An optimized solution

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One of the challenges in Earth gravity field modeling in the near future will be the combination of heterogeneous gravity data that result not only from classical terrestrial measurements, but also from cutting-edge technologies and advanced measuring techniques. They often refer to some exceptional manifolds and can lead to interesting mathematical problems. In this paper, typical cases are considered where airborne gravimetry is combined with terrestrial gravity data, airborne measurements are collected at two flight levels, and finally, in view of the satellite mission GOCE and the so-called space-wise approach, satellite gradiometry is combined with terrestrial gravity data. As more data then become available, certain kinds of overdetermined problems have to be solved. The spectral representation based on spherical harmonics is used to express the disturbing potential explicitly. Subsequently, an optimum procedure is discussed in order to treat the overdetermined problems and to keep the typical regularity of harmonic functions at infinity. The optimization offers a natural concept for weighting the input data and in parallel issues related to the distant zones are considered within this concept. Some practical aspects are also discussed.