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Volker Michel*, Geomathematics Group, Department of Mathematics, University of Siegen, 57068 Siegen, Germany, and **Sarah Orzlowski**, Geomathematics Group, Department of Mathematics, University of Siegen, 57068 Siegen, Germany. *Orthonormal basis systems on the ball and their role in inverse problems.*

In Earth sciences and in medical imaging, some tomographic inverse problems occur where the domain of the unknown function is a ball. Some of these inverse problems are represented by integral equations or at least include integral operators in their modelling. Since several regularization methods for such problems (including some more modern methods like a wavelet analysis or matching-pursuit-type greedy algorithms) profit from the knowledge of a singular value decomposition of the operator corresponding to the inverse problem, it is essential to study the possibility how orthonormal basis systems on the ball can be constructed.

There is, indeed, a notable variability in the construction of such systems, which opens the door to study different integral operators for functions on the ball. For this and other reasons, several authors have investigated orthogonal functions on the ball, from the early 20th century until present.

In this presentation, some of the known results on orthonormal bases on the ball are summarized and a recently published generalized concept for their use in the singular value decomposition of a class of integral operators is presented. The applications occur, for example, in the inversion of electric, gravitational, and magnetic field data. (Received September 14, 2016)