

## **Bilateral $q$ -ultraspherical functions**

MICHAEL J. SCHLOSSER

Department of Mathematics, University of Vienna, Austria

*Email:* michael.schlosser@univie.ac.at

---

We introduce a bilateral extension of the continuous  $q$ -ultraspherical polynomials which we call bilateral  $q$ -ultraspherical functions. These functions are given as specific bilateral basic hypergeometric  ${}_2\psi_2$  series, they are analytic in a variable  $x = \cos \theta$  and depend on two parameters  $\beta$  and  $\gamma$  and on a base  $q$ . For these bilateral  $q$ -ultraspherical functions we derive a bilateral generating function, find their three-term recurrence relation, work out a linearization formula, show how they behave under the action of the Askey–Wilson divided difference operator and its inverse, and show that they satisfy a type of shifted orthogonality.