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Baker-Akhiezer spinor and Bergman tau-function on moduli spaces of meromorphic differentials

We derive variational formulas of Rauch-Ahlfors type on moduli spaces of meromorphic differentials on Riemann surfaces. In particular, we show that the derivatives of the Szegö kernel with respect to homological coordinates on these spaces are expressed via Hirota derivative of that kernel. This formula is used to derive variational formulas for the Baker-Akhiezer kernel, which in particular encode the KP-type hierarchies, as well as dependence of the baker-Akhiezer kernel on the moduli of the Riemann surface. We also define Bergman tau-function on these spaces, compute it in several important special cases and describe it as a section of an appropriate line bundle; this allows to express the Hodge class on these moduli spaces in terms of the tautological class.