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Title: Zeta invariants of Morse forms

Abstract: Given a closed real 1-form η on a closed Riemannian manifold (M, g), let d_z, δ_z and Δ_z be the induced Witten's perturbations of the differential, codifferential and the Laplacian operators on differential forms, parametrized by $z \in \mathbb{C}$. Then we consider the zeta function $\zeta(s, z)$, which is a meromorphic function of $s \in \mathbb{C}$ given by the supertrace of $\eta \wedge \delta_z \Delta_z^{-s}$ when $\Re s \gg 0$. For a class of Morse forms η, we prove that $\zeta(s, z)$ is smooth at $s = 1$ for $|\Re z| \gg 0$, and the zeta invariant $\zeta(1, z)$ converges to some $\mathbf{z} \in \mathbb{R}$ as $\Re z \to +\infty$, uniformly on $\Im z$. We describe $\mathbf{z}$ in terms of the instantons of an auxiliary Smale gradient-like vector field X and the Mathai-Quillen current on TM defined by g. Any real cohomology class has a representative η of this type. If M is of even dimension, we can prescribe any real value for $\mathbf{z}$ by perturbing g, η and X. If moreover M is oriented, we can also achieve the same limit as $\Re z \to -\infty$. This prescription is used in a trace formula for simple foliated flows on closed foliated manifolds, which gives a solution to a problem proposed by C. Deninger. This is joint work with Yuri A. Kordyukov and Eric Leichtnam.