The Atiyah-Patodi-Singer index on manifolds with non-compact boundary

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We study the index of the APS boundary value problem for a strongly Callias-type operator D on a complete Riemannian manifold M. We use this index to define the relative eta-invariant of two strongly Callias-type operators A and A', which are equal outside of a compact set. Even though in our situation the eta-invariants of A and A' are not defined, the relative eta-invariant behaves as if it were the difference of the eta-invariants of A and A'. We also define the spectral flow of a family of such operators and use it compute the variation of the relative eta-invariant. (Joint work with Pengshuai Shi)