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**Nils Ackermann\*** ([nils@ackermath.info](mailto:nils@ackermath.info)), Instituto de Matematicas, Circuito Exterior, CU, 04510 Mexico, DF, Mexico, and **Norman Dancer**. *The impact of real analyticity of the nonlinearity on the structure of the solution set of semilinear elliptic problems*. Preliminary report.

If the nonlinearity of the semilinear stationary Schrödinger equation is real analytic on the positive half line, in general the Euler-Lagrange functional is not real analytic in any open subset of the natural Sobolev space. We use a new result on the exact decay at infinity of solutions of the stationary Schrödinger equation to show that the gradient of this functional is analytic in a neighborhood of the set of positive solutions, at least if one works in a carefully chosen weighted Banach space instead of the natural Sobolev space. Here the gradient retains its structure I-K, where K has compact derivative at every point.

To illustrate the usefulness of this result we apply it to an equation on the whole space with periodic potential and superlinear nonlinearity, real analytic on the positive half line. The set of positive solutions is then locally path connected by piecewise differentiable arcs. As a consequence, the set of critical levels of the functional is discrete at low values. This fact can be important in the application of variational principles. (Received March 17, 2010)