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Magnetic Geodesics in two-step Nilmanifolds. Preliminary report.

A magnetic structure on a Riemannian manifold (M, g) is a pair (g, Ω) , where Ω denotes a closed 2-form on M . Let ω_g denote the symplectic form on TM obtained by pulling back the canonical symplectic form on T^*M via the metric g . The magnetic flow on M corresponding to Ω is the Hamiltonian flow determined by the energy function $E(v) = \frac{1}{2}g(v, v)$ with respect to the symplectic structure $\omega_{mag} = \omega_g + \pi^*\Omega$, where $\pi : TM \rightarrow M$ is canonical projection. A magnetic geodesic in M corresponds to an orbit of the magnetic flow. We study these geodesics in two-step nilpotent Lie nilmanifolds, with a particular focus on magnetic geodesic behavior in the Heisenberg groups. (Received September 15, 2010)