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Solitary waves on a ferrofluid jet MARK BLYTH, EMILIAN PARAU, University of East Anglia — The propagation of axisymmetric solitary waves on the surface of an otherwise cylindrical ferrofluid jet subjected to a magnetic field is investigated. An azimuthal magnetic field is generated by an electric current flowing along a stationary metal rod which is mounted along the axis of the moving jet. A numerical method is used to compute fully-nonlinear travelling solitary waves and predictions of elevation waves and depression waves by Rannacher & Engel (2006) using a weakly-nonlinear theory are confirmed in the appropriate ranges of the magnetic Bond number. New nonlinear branches of solitary wave solutions are identified. As the Bond number is varied, the solitary wave profiles may approach a limiting configuration with a trapped toroidal-shaped bubble, or they may approach a static wave (i.e. one with zero phase speed). For a sufficiently large axial rod, the limiting profile may exhibit a cusp.

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