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Interactive comment on "The mirror mode: A superconducting space plasma analogue" *by* Rudolf A. Treumann and Wolfgang Baumjohann

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The manuscript explores the similarity between mirror mode unstable space plasmas and superconductive metals. Based on this analogy, a parallel phenomenological formalism is constructed for the saturated mirror mode at thermodynamic equilibrium. In the proposed interpretation, the role of the quantum electron pairs in the Landau-Ginzburg theory of superconducting metals is taken in space plasmas by collectives of ions moving coherently over the correlation length. The Meissner effect in metals is paralleled by the onset of mirror instability which causes local depletions of the magnetic field in space plasmas. The critical parameter controlling the system is now the orthogonal temperature in the anisotropic space plasma.

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Discussion paper

A link to the experimental data is the prediction of the proposed theory that - if the relevant correlation length is the ion gyroradius - mirror mode chains form only when the Alfvén speed exceeds the perpendicular thermal speed.

A further development suggested by the authors is solving the equivalent nonlinear Schrödinger equation which would provide the solutions for the saturated mirror mode at thermodynamic equilibrium. Achieving this would be a significant result in the physics of mirror modes.

Minor points:

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- lines 9-11: One would expect the ambient density N_0 to be perturbed both ways (i.e. increase where the ambient field decreases, and decrease where the ambient field increases). Then the normalised density N_m would be negative in the higher field regions. In this case the inequality $N_m < 1$ should read $|N_m| < 1$.

- equation (8): Since ψ applies to a compound of correlated ions, what represents the mass m and charge q in eq. (8)? a single particle or the whole compound?

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- line 11: should the inequality be $<$ rather then $>$?

In the reviewer's opinion, the manuscript should accepted for publication.

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