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The Effect of a Weak Toroidal Field on the n=2 Rotational Instability in an FRC R.D. MILROY, L.C. STEINHAUER, A.I.D. MACNAB, C.C. KIM, University of Washington, C.R. SOVINEC, University of Wisconsin, Madison — The n=2 rotational instability has almost always been observed in dynamically formed FRCs. This instability is driven by centrifugal forces in the rotating plasma, but can be stabilized with multipole fields. Translated FRCs often do not exhibit this instability and a recent analysis [H.Y. Guo, et al., Phys. Rev. Lett. 95, 17001 (2005)] implies that a small toroidal field could stabilize it. We are investigating this effect numerically with the NIMROD code, and analytically using the energy principal. When modest toroidal magnetic field is added to an FRC with its high elongation and small aspect ratio, a spherical torus like configuration can be formed with a safety factor q exceeding 1 over the entire configuration. We have found that the addition of a relatively weak toroidal magnetic field to an FRC can stabilize the n=2 rotational instability, but for calculations that do not include the Hall term, a more complex n=2 mode remains unstable. Inclusion of the Hall term can dramatically reduce the growth rate, or stabilize this mode too.

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