

# Solar Coronal Loops as Magnetically Confined Tori with Gravity

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- First consistent ideal MHD steady states for solar coronal loops: partial magnetic torus with small inverse aspect ratio  $\epsilon = a/R_0$ 
  - Loop has two fixed ends and solar gravity; often unstable to expansion in major radius
- Small non-axisymmetric gravity  $-\rho g(\hat{\mathbf{R}} \sin \phi + \hat{\phi} \cos \phi)$  has major effects on loop structure and radial expansion
- New gravitational steady states, parametrized by plasma  $\beta$  and gravity parameter  $\hat{G} = g a/v_A$ 
  - Good fit to common type of loop in solar active regions, another qualitatively
  - Agrees that many larger loops cannot be stabilized by gravity; most continue to expand
- Relation to small non-axisymmetric effects (RMP) in tokamaks?