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Reassessing Solar Wind Stability using Nyquist's Method KRISTOPHER KLEIN, JUSTIN KASPER, BENJAMIN ALTERMAN, Univ of Michigan - Ann Arbor, MICHAEL STEVENS, KELLY KORRECK, Smithsonian Astrophysical Observatory — In nearly-collisionless plasmas, such as the solar wind, non-local thermodynamic equilibrium structures, including temperature anisotropies, beam populations with relative drifts, and agyrotropic features, are frequently observed to persist. These features can act as sources of free energy which may drive instabilities that move the plasma closer to LTE. Analysis techniques applied to solar wind observations for the presence of such instabilities typically consider only a single source of free energy, such the temperature anisotropy of the proton population. We have developed an efficient algorithm for general determination of linear stability considering all sources of free energy using Nyquist's Method. By applying this method to the dispersion relation associated with a particular solar wind observation, we rapidly determine if the plasma is linearly unstable, and if so, how many normal modes are driven. Our technique is verified against well-characterized theoretical and observational cases from the literature, and applied to in situ observations from the Wind spacecraft to determine how additional sources of free energy affect the plasma's stability and may govern the solar wind's evolution.

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