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Will the Location of the Perturbation Boundary Affect the Growth Rate of the Kelvin-Helmholtz Instability?

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During the northward interplanetary magnetic field (IMF), Kelvin-Helmholtz (K-H) instability plays an important role in the mass transport at the flank magnetopause. Previous analytic study of K-H instability showed that, for a given subsonic Mach number, the growth rate varies with wavelength but is independent of the location of the perturbation boundary. In this study, we examine the growth rate of the K-H instability as a function of Mach number, the wavelength of the surface wave, and the location of the perturbation boundary. The main results are summarized as follows: (1) The growth rate of the most unstable mode of a given subsonic Mach number increases with increasing the location of the perturbation boundary. (2) No unstable mode can be found when the location of the perturbation boundary is much greater than half of the wavelength of the surface wave. (3) The growth rate of the K-H instability could remain constant if the wavelength of the surface wave increases with increasing the location of the perturbation boundary.