

Ballooning Instability in the Earth's Magnetotail

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Ballooning instability is presently considered by many researchers as a possible substorm-triggering mechanism. It has been known that the instability can develop near the plasma region where the plasma pressure and the field line curvature are in the same direction, which the Earth's magnetotail frequently satisfies. Here we present the results of an analysis of the ballooning instability within the context of Ideal MHD in the magnetotail. We find that, owing to the strong compressibility of the tail plasma, most "standard" magnetotail configurations that are stable against standard interchange mode are also stable against ballooning mode. We also suggest that any ballooning instability that relies on plasma exchange with the ionosphere will be suppressed at a very small amplitude that it will not have any great global consequences in the magnetotail. Since the Ideal MHD conditions are often expected to break down near the center of the tail current sheet, we will briefly discuss possibilities of ballooning instability beyond the context of Ideal MHD and the current status of the ballooning research.