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An analytic study of wave generation due to plasma anisotropies at perpendicular MHD shocks

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We develop a kinetic model to describe the termination shock transition of anisotropic plasmas, which compliments the classical MHD approach to this problem. Using this model, we derive a condition under which upstream conditions wave generation is triggered, and how much classical MHD energy is transfered into the wave field degrees of freedom. As it turns out, most downstream plasma streams are inherently unstable with respect to shock-induced firehose- or mirror-driven plasma instabilities. This includies the solar wind termination shock encountered by Voyager-1/2, while only the weakest shocks lead to a stable, wave-quiet state on the downstream side without onset of wave-generating processes. This result implies that the classical MHD description is in general insufficient to describe the shock transition layer, and must be modified to include non-classical terms.