

On The Sonic Point Glitch

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This talk presents theoretical and numerical analyses of the sonic point glitch based on some numerical schemes for the Burgers' equation and the Euler equations in fluid mechanics. The sonic glitch is formed in the sonic rarefaction fan. It has no any direct connection with the violation of the entropy condition or the size of numerical viscosity of a finite-difference scheme. Our results show that it is mainly coming from a disparity in wave speeds across the sonic point. If numerical viscosity depends on the characteristic direction, then the disparity may be formed between the numerical and physical wave speeds around the sonic point, and triggers the sonic wiggle in the numerical solution. We also find that the initial data reconstruction technique of van Leer can effectively eliminate the flaw around the sonic point for the Burgers' equation. Some other possible cures are also suggested.