Rippling in the granular jet: hydrodynamic instability or memory?

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When a dense granular jet impacts upon a target, the outflow is highly collimated even in the absence of attractive interactions. At long distances from the target, however, this collimated flow breaks up in the form of long-wavelength ripples. These ripples are a memory of transverse fluctuations induced by buckling above the target, amplified by ballistic motion. The response of the system to upstream fluctuations is examined by perturbing the flow with an external sinusoidal forcing. Beyond the target there are few interactions, and so the fluctuations are either retained or destroyed in the diverging flow right above the target. As such, the ripple spectrum and more generally the transfer function tell us about the behavior of this dense granular flow in the collision region.