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Gravitational potential wells and the cosmic bulk flow YUYU WANG, ABHINAV KUMAR, HUME FELDMAN, University of Kansas, RICHARD WATKINS, Willamette University — The bulk flow is a volume average of the peculiar velocities and a useful probe of the mass distribution on large scales. The gravitational instability model views the bulk flow as a potential flow that obeys a Maxwellian Distribution. We use two N-body simulations, the LasDamas Carmen and the Horizon Run, to calculate the bulk flows of various sized volumes in the simulation boxes. Once we have the bulk flow velocities as a function of scale, we investigate the mass and gravitational potential distribution around the volume. We found that matter densities can be asymmetrical and difficult to detect in real surveys, however, the gravitational potential and its gradient may provide better tools to investigate the underlying matter distribution. This study shows that bulk flows are indeed potential flows and thus provides information on the flow sources. We also show that bulk flow magnitudes follow a Maxwellian distribution on scales $> 10\ h^{-1}$ Mpc.

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