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Tracing In- & Outflows of Galaxies in the Magneticum Pathfinder Simulations

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The process of gas accreting from the cosmic web onto galaxies is a fundamental aspect of galaxy formation. Simulations provide the tools to directly trace gas flows over time and are therefore crucial to test models and assumptions about accretion modes and geometry, which can then be used to interpret observational results. Using the Magneticum Pathfinder simulation box 4 (uhr), I trace gas particles flowing in and out of galaxies to relate modes of accretion to the evolution of galaxy features with respect to scaling relations. By the virtue of gas particles in this simulation suite being able to convert only a fraction of their mass into stars, each particle can undergo the process of being accreted, form stars, absorb stellar feedback and flow out of the ISM. I retrieve accretion rates between the galaxies and their virial radii from particle positions, phase space extrapolation, shell volumes and mass evolution and test the prediction of corresponding star formation rates to compare different methods of mass flow measurements in a Lagrangian simulation. By using the built-in two-phase gas model as well as a simple temperature criterion, I present how the cold and hot accretion modes relate to the formation histories and the connection between environment, circum-galactic medium and interstellar medium as well as the prevalence of the galactic fountain concept.

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