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The Geometry of Static Spacetimes: Geometrostatics

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Geometrostatics is an important subdomain of Einstein's General Relativity. It describes the mathematical and physical properties of static isolated relativistic systems such as stars, galaxies or black holes. For example, geometrostatic systems have a well-defined ADM-mass (Chrusciel, Bartnik) and (if this is nonzero) also a center of mass (Huisken-Yau, Metzger) induced by a CMC-foliation at infinity. We will present localized surface integral formulas for these physical properties in general geometrostatic systems. Together with an asymptotic analysis, these can be used to prove that ADM-mass and center of mass 'converge' to the Newtonian mass and center of mass in the Newtonian limit $c \to \infty$ (using Ehler's frame theory). We will discuss geometric similarities of geometrostatic and classical static Newtonian systems along the way.