Finite-time blow-up of solutions of an aggregation equation

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Abstract: The aggregation equation $u_t + div(ugradG * u) = 0$ arises in a number of contexts of recent interest in the physics and biology literature. Depending on how regular the potential G is, we prove either local or global existence for the solutions. For example, we will see that for $G(x) = exp(-|x|)$ we have local existence whereas for $G(x) = exp(-|x|^2)$ we have global existence. For potential with a Lipschitz point at the origin, e.g. $G(x) = exp(-|x|)$, we prove finite-time blow-up of solutions from specific smooth initial data.