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**William Wylie\*** (wwylie@syr.edu) and **Peter Petersen** (petersen@math.ucla.edu). *Rigidity of Homogeneous Gradient Soliton Metrics and Related Equations.*

We call a self-similar solution to a geometric flow a soliton. The soliton equation depends on a Riemannian metric and a vector field. In previous work we showed for the Ricci flow that if the metric is homogeneous and the vector field is gradient then the only examples are rigid and thus all “interesting” homogeneous Ricci solitons must be non-gradient. In this talk we’ll investigate generalizing this result to other invariant flows. Our methods do not use flows at all and in fact we accomplish this by understanding the general problem of when a non-constant function on a homogeneous space can have an invariant Hessian. Similar ideas also yield results for other equations on homogeneous manifolds that involve the Hessian of a function. (Received January 14, 2021)