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**Sergey Grigorian\*** ([grigorians@utpa.edu](mailto:grigorians@utpa.edu)), Department of Mathematics, University of Texas - Pan American, Edinburg, TX 78539. *Flows of  $G_2$ -structures*.

$G_2$ -structures on 7-dimensional manifolds play a very important role in both geometry and physics. One of the ways of better understanding the relationships between different types of  $G_2$ -structures is to study their flows. In this talk, we will consider Laplacian flows of either closed or co-closed  $G_2$ -structures. Since the Laplacian is itself determined by the underlying  $G_2$ -structure, these flows give rise to non-linear partial differential equations. We will show that these flows share many similarities, such as the corresponding flow of the associated metric being equal to the Ricci flow to the leading order, but also some major differences. It turns out that unlike the flow of closed  $G_2$ -structures, the Laplacian flow of co-closed  $G_2$ -structures is not even weakly parabolic. We then show that this flow can be modified to make it weakly parabolic at least in certain directions and prove short-time existence and uniqueness of solutions for this new flow. (Received January 29, 2014)