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# Cosmic rays and the multi-phase gas in clusters

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## Abstract

Massive galaxy clusters frequently show complex multi-phase gas in their centre, with gas phases ranging from cold, dense gas that could be star forming via warm, diffuse gas to the hot ionized background medium. This multi-phase gas hints at a complex cooling cycle and understanding its properties might hold the key to understanding why massive galaxy clusters form far less stars than expected and avoid strong cooling flows. Many studies into the formation and evolution of multi-phase gas in galaxy clusters have been limited to hydrodynamics only. In the simulations presents in this talk, I will take a much wider range of physical processes into account, from magnetic fields and anisotropic thermal conduction to cosmic rays, to understand how the shifting energy balances in the cluster influence the properties of the multi-phase gas over time for a Perseus-like cluster.

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