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Environment from cross-correlations: linking cause to effect in galaxy quenching (Egidius Kukstas)

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There is significant evidence suggesting that galaxies evolve differently depending on the environment they live in: dense regions of the universe host primarily red ellipticals, while blue spirals occupy the more underdense regions. These properties are found to be governed by the star formation activity which is, thus, influenced by environment.

Despite decades of research, little progress has been made in determining which processes are driving this evolution. We hypothesise that the reason for this is that, until recently, it has not been possible to directly measure the local physical conditions around galaxies. Instead, existing studies have focussed on optical proxies for local environment, from galaxy observations alone, and compared these with observed galaxy properties.

However, there has been a revolution in recent years; with large area, precise, and accurate galaxy surveys in addition to CMB and X-ray instruments, it is now possible to directly constrain the local hot gas and dark matter properties. The process can be carried out by employing map-based techniques, previously used exclusively in cosmology on CMB and lensing data. Cross-correlating these direct measures of ICM and halo properties with galaxy properties can effectively constrain the processes of environmental quenching.

In this talk I will outline the methods and present the first detection of a correlation between ICM gas properties and galaxy quenching, together with a preliminary comparison to state-of-the-art hydrodynamical simulations.

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