

Dark Energy in the Universe

6 contributions

Chairperson:

MATTHIAS BARTELMANN, Heidelberg

Studying the Nature of Dark Energy with Galaxy Clusters

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I'll present the latest results from our Chandra and XMM-Newton (and Suzaku) follow-up of a complete sample of the 60 X-ray brightest clusters in the sky (HIFLUGCS). Furthermore, I'll report on the status of the weak lensing follow-up of the luminous and high- z subsample of 40 clusters from the 400 square degree survey. The combination of both samples will be used to constrain the nature of dark energy through the evolution of the cluster mass function and merger frequency. Moreover, these high quality observations will be vital to constrain the observable–mass relations required for future large X-ray surveys.

Constraining Dark Energy via Baryon Acoustic Oscillations

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The scale of the baryon acoustic oscillations (BAO) in the galaxy power spectrum can be used as a standard ruler to measure the expansion history of the universe. Since the expansion of the universe depends on the dark energy equation of state w , measurements of the apparent scale of the BAO at different redshifts will provide constraints for the dark energy.

In order to measure precisely the scale of the BAO a huge volume has to be surveyed. Using mock catalogs obtained with N-body simulations we tested whether light-cone effects play a role and whether the scaling relations used to compensate for a wrong reference cosmology are accurate enough in this case. We compared two different fitting methods to extract the scale of the BAO. Further, we analyzed the advantage of using the two-dimensional anisotropic power spectrum. Finally, we estimated the uncertainty with which an effectively constant w can be measured with proposed galaxy redshift surveys as HETDEX and WFMOS.

We find that light-cone effects for the simulated surveys are negligible and that the simple scaling relations used to correct for the cosmological distortions work well even for such large survey volumes. The analysis of the

two-dimensional anisotropic power spectra allows independent determination of the apparent scale of BAO perpendicular and parallel to the line of sight but it does not significantly lower the uncertainty of an effectively constant w . We estimate that with planned surveys around $z = 3$ and $z = 1$ one will be able to measure an effectively constant w with $\sigma_w \sim 4\%$ in both cases.

Constraining Dark Energy with Redshift Surveys

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I will give an overview of several planned redshift surveys (BOSS, HETDEX) designed to measure the cosmic equation of state as a function of redshift

Dark Energy: Necessity, Models and Expectations

I 103 JENS NIEMEYER¹

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I will present an incomplete overview of the reasons for invoking dark energy and a small selection of current attempts to explain it.

Searching for galaxy clusters through weak lensing, X-rays and the SZ observations

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The study of galaxy clusters provides a unique source of information for cosmology. Their abundance at different redshifts and their matter content allow us to place constraints on the cosmological model and dark energy. These objects can be detected in weak lensing, X-rays and Sunyaev-Zeldovich observations. We developed and tested, through large cosmological simulations, a linear matched filter capable of optimally combining these very different signals to obtain reliable detections samples.

SNIa and Dark Energy

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Type Ia supernovae (SNIa) represent the most direct probe for the acceleration of the universe. I will talk about what can be learned from the SNIa data sets that have recently improved significantly with the new data available from of the SNLS and the ESSENCE projects.