In the same way, it is to expect that the effect of energy dissipation that involves gravitational waves emission, as occurs in binary systems, needs to be corrected.

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ANISOTROPIC HALO MODEL

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We present an extended version of the classic halo model for the large-scale matter distribution which includes a triaxial model for the halo density profiles, a probabilistic distribution of the halo shape and a probabilistic law describing the alignment of the surrounding structure. In particular, we derive general expressions for the halo-matter cross-correlation function. Using a Monte Carlo integration method we obtain instances of the cross-correlation function depending on the directions given by halo shape axes. These functions are called anisotropic cross-correlations. We have found that our model is able to reproduce the numerical measurements of those functions over a wide range of scales, particularly in the 2-halo regime. The parameters of the model obtained by fitting numerical results recover the well known mass dependence of halo shapes and the alignment of dark matter halos with the surrounding structure. In this sense, most massive halos tend to have a less spherical shape and more prolate mass profile. In addition, we have found that taking the triaxial nature of dark matter halos into account improves at least %15 the predictions of the standard halo model (as noted by others authors before).
Finally, we are working on the development of a similar model in order to compare theoretical predictions with anisotropic correlation functions measured on galaxy group catalogues. These results will appear in a forthcoming paper.

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THE TYPE IA SUPERNOVA PIPELINE FOR THE JAVALAMBRE PHYSICS OF THE ACCELERATING UNIVERSE ASTROPHYSICAL SURVEY (J-PAS)

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The Javalambre Physics of the Accelerating Universe Astrophysical Survey (J-PAS) is an astronomical facility being built in Sierra de Javalambre, Spain. The main goal is to study the expansion of the Universe through different cosmological observables such as baryonic acoustic oscillations, type Ia supernovae and galaxy clusters. The main instrument will be a 2.5 m telescope equipped with a system of 56 narrow band filters in the optical. Here we present a sketch of the pipeline we are developing to detect type Ia supernovae with J-PAS. First we describe each individual step of the pipeline, such as image subtraction and source selection. Then we show some results we obtained when applying our pipeline to images from the Sloan Digital Sky Survey and the ALHAMBRA survey, which had a set of narrow band filters similar to the ones that will be used by J-PAS.

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THE RED SEQUENCE OF AXU CLUSTERS

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We present an analysis of the colour-magnitude relation for a sample of 54 Abell X-ray underluminous (AXU) clusters aiming at unveiling properties that may elucidate the evolutionary stages of the galaxy populations which compose such systems. We compared the parameters of their colour-magnitude relations with the ones found for another sample of 50 Abell X-ray "normal" (AXN) emitting clusters. The g and r magnitudes from the SDSS-DR7 were used for constructing the colour-magnitude relations.

We found that both samples show the same trend: the red sequence slopes change with redshift, but the slopes for AXU clusters are always flatter than AXN clusters, by a difference of about 42% along the surveyed redshift range of $0.05 \leq z < 0.20$. Also, the intrinsic scatter of the colour-magnitude relation was found to grow with redshift for both samples, but for the AXU clusters, this is systematically

larger by about 31%. When we subdivide the AXU clusters in two subsamples, one with significant and the other with little or no substructure, we find that the former shows red-sequence slopes that are significantly flatter than those for the latter. This points to AXU clusters being younger systems than normal clusters, possibly accreting groups of galaxies, individual galaxies and gas.

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PROPERTIES OF TYPE IA SUPERNOVAE INSIDE RICH GALAXY CLUSTERS

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We used the GMBCG galaxy cluster catalogue and SDSS–II supernovae data with redshifts measured by the BOSS project to identify 48 SNe Ia residing in rich galaxy clusters and compare their properties with 1015 SNe Ia in the field. Their light curves were parametrised by the SALT2 model and the significance of the observed differences was assessed by a resampling technique. To test our samples and methods, we first looked for known differences between SNe Ia residing in active and passive galaxies. We confirm that passive galaxies host SNe Ia with smaller stretch, weaker colour–luminosity relation [β of 2.54(22) against 3.35(14)], and that are ~ 0.1 mag more luminous after stretch and colour corrections. We show that only 0.02 per cent of random samples drawn from our set of SNe Ia in active galaxies can reach these values. Reported differences in the Hubble residuals scatter could not be detected, possibly due to the exclusion of outliers. We then show that, while most field and cluster SNe Ia properties are compatible at the current level, their stretch distributions are different ($\sim 3\sigma$): besides having a higher concentration of passive galaxies than the field, the cluster's passive galaxies host SNe Ia with an average stretch even smaller than those in field passive galaxies (at 95 per cent confidence). We argue that the older age of passive galaxies in clusters is responsible for this effect since, as we show, old passive galaxies host SNe Ia with smaller stretch than young passive galaxies ($\sim 4\sigma$).

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INSTRUMENTATION

BOMBOLO: A MULTI-BAND, WIDE-FIELD, NEAR UV/OPTICAL IMAGER FOR THE SOAR 4M TELESCOPE

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BOMBOLO is a new multi-passband visitor instrument for SOAR observatory. The first fully Chilean instrument of its kind, it is a three-arms imager covering the near-UV and optical wavelengths. The three arms work simultaneously and independently, providing synchronized imaging capability for rapid astronomical events. BOMBOLO will be able to address largely unexplored events in the minute-to-second timescales, with the following leading science cases: 1) Simultaneous Multiband Flickering Studies of Accretion Phenomena; 2) Near UV/Optical Diagnostics of Stellar Evolutionary Phases; 3) Exoplanetary Transits and 4) Microlensing Follow-Up. BOMBOLO optical design consists of a wide field collimator feeding two dychroics at 390 and 550 nm. Each arm encompasses a camera, filter wheel and a science CCD230-42, imaging a 7 x 7 arcmin field of view onto a 2k x 2k image. The three CCDs will have different coatings to optimise the efficiencies of each camera. The detector controller to run the three cameras will be Torrent (the NOAO open-source system) and a PanView application will run the instrument and produce the data-cubes. The instrument is at Conceptual Design stage, having been approved by the SOAR Board of Directors as a visitor instrument in 2012 and having been granted full funding from CONICYT, the Chilean State Agency of Research, in 2013. The Design Phase is starting now and will be completed in late 2014, followed by a construction phase in 2015 and 2016A, with expected Commissioning in 2016B and 2017A.

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