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Multi-wavelength observations of a rich galaxy cluster at z ∼ 1: the HST/ACS colour-magnitude diagram

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XMMU J1229+0151 is a rich galaxy cluster with redshift z=0.975, that was serendipitously detected in X-rays within the scope of the XMM-Newton Distant Cluster Project. HST/ACS observations in the i_{775} and z_{850} passbands, as well as VLT/FORS2 spectroscopy were further obtained, in addition to follow-up Near-Infrared (NIR) imaging in J- and Ks-bands with NTT/SOFI. We investigate the photometric, structural and spectral properties of the early-type galaxies in the high-redshift cluster XMMU J1229+0151. Source detection and aperture photometry are performed in the optical and NIR imaging. Galaxy morphology is inspected visually and by means of Sersic profile fitting to the 21 spectroscopically confirmed cluster members in the ACS field of view. The i_{775}-z_{850} colour-magnitude relation (CMR) is derived with a method based on galaxy magnitudes obtained by fitting the surface brightness of the galaxies with Sersic models. Stellar masses and formation ages of the cluster galaxies are derived by fitting the observed spectral energy distributions (SED) with models based on Bruzual & Charlot 2003. Star formation histories of the early-type galaxies are constrained through the analysis of the stacked spectrophotometric data. The structural Sersic index n obtained with the model fitting is in agreement with the visual morphological classification of the confirmed members, indicating a clear predominance of elliptical galaxies (15/21). The i_{775}-z_{850} colour-magnitude relation of the spectroscopic members shows a very tight red-sequence with a zero point of 0.86±0.04 mag and intrinsic scatter equal to 0.039 mag. The CMR obtained with the galaxy models has similar parameters. By fitting both the spectra and SED of the early-type population we obtain a star formation weighted age of 4.3 Gyr for a median mass of 7.4 $\times 10^{10}$ Msun. Instead of an unambiguous brightest cluster galaxy (BCG), we find three bright galaxies with a similar z_{850} magnitude, which are, in addition, the most massive cluster members, with $\sim$2 $\times 10^{11}$ Msun. Our results strengthen the current evidence for a lack of significant evolution of the scatter and slope of the red-sequence out to z ∼ 1.

Accepted by: Astronomy and Astrophysics

Time-dependent hydrodynamical simulations of slow solar wind, coronal inflows, and polar plumes

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Aims. We explore the effects of varying the areal expansion rate and coronal heating function on the solar wind flow.

Methods. We use a one-dimensional, time-dependent hydrodynamical code. The computational domain extends from near the photosphere, where nonreflecting boundary conditions are applied, to 30 $R_\odot$, and includes a transition

region where heat conduction and radiative losses dominate.

Results. We confirm that the observed inverse relationship between asymptotic wind speed and expansion factor is obtained if the coronal heating rate is a function of the local magnetic field strength. We show that inflows can be generated by suddenly increasing the rate of flux-tube expansion and suggest that this process may be involved in the closing-down of flux at coronal hole boundaries. We also simulate the formation and decay of a polar plume, by including an additional, time-dependent heating source near the base of the flux tube.

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http://www.aanda.org/articles/aa/pdf/forth/aa11183-08.pdf

Galaxy evolution in Abell 85. I. Cluster substructure and environmental effects on the blue galaxy population

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In this series of papers we explore the evolution of late-type galaxies in the rich cluster Abell 85. In this first paper we revisit the complex dynamical state of A 85 by using independent methods. First, we analyze the galaxy redshift distribution towards A 85 in the whole range 0-40 000 km s^{-1}, and determine the mean redshifts of the background clusters A 87 and A 89, very close in projection to A 85. Then we search for substructures in A 85 by considering the 2D galaxy distribution of its members (13 000-20 000 km s^{-1}) and by applying the kinematical 3D Δ-test to both projected positions and radial velocities. This clearly reveals several substructures: one close to the cluster core and three more projected towards the southeast, along the region where an X-ray filament has been extensively studied. We also analyse the distribution of the brightest blue galaxies across a major fraction of the cluster volume, considering if they are gas-rich or poor. We report a very asymmetric distribution of the blue member galaxies, with most of them to the east and southeast, namely in the region joining the core of A 85 to its farthest substructure in this direction - dubbed the SE clump. By matching our sample of bright blue member galaxies with H I detections reported in the literature, we identify gas-rich and gas-poor ones. As expected, the H I-rich blue galaxies follow the same trend as the parent sample, with most of them projected on the eastern side of the cluster as well. Interestingly no blue objects have been detected in H I up to a projected radius of 2 Mpc in this zone. We finally estimate the ram pressure stripping exerted by the intra-cluster medium as a function of the projected distance from A 85, in order to quantify how important this mechanism might be in sweeping the gas out of the infalling spirals.

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http://de.arxiv.org/abs/0811.2686

Alternative data reduction procedures for UVES: Wavelength calibration and spectrum addition

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This paper addresses alternative procedures to the ESO supplied pipeline procedures for the reduction of UVES spectra of two quasar spectra to determine the value of the fundamental constant μ=Mp/Me at early times in the universe. The procedures utilize intermediate product images and spectra produced by the pipeline with alternative wavelength calibration and spectrum addition methods. Spectroscopic studies that require extreme wavelength precision need customized wavelength calibration procedures beyond that usually supplied by the standard data reduction pipelines. An example of such studies is the measurement of the values of the fundamental constants at early times in the universe. This article describes a wavelength calibration procedure for the UV visual Echelle spectrometer on the very large telescope, however, it can be extended to other spectrometers as well. The procedure described here provides relative wavelength precision of better than 3×10 for the long-slit Thorium Argon calibration lamp exposures. The gain in precision over the pipeline wavelength calibration is almost entirely due to a more exclusive selection of Th/Ar calibration lines.

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The Inevitable Future of the Starless Core Barnard 68

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Dense, small molecular cloud cores have been identified as the direct progenitors of stars. One of the best studied examples is Barnard 68 which is considered a prototype stable, spherical gas core, confined by a diffuse high-pressure environment. Observations of its radial density structure, however, indicate that Barnard 68 should be gravitationally unstable and collapsing, which appears to be inconsistent with its inferred long lifetime and stability. We argue that Barnard 68 is currently experiencing a fatal collision with another small core which will lead to gravitational collapse. Despite the fact that this system is still in an early phase of interaction, our numerical simulations imply that the future gravitational collapse is already detectable in the outer surface density structure of the globule which mimics the profile of a gravitationally unstable Bonnor-Ebert sphere. Within the next 2×10^5 years, Barnard 68 will condense into a low-mass solar-type star(s), formed in isolation, and surrounded by diffuse, hot interstellar gas. As witnessed in situ for Barnard 68, core mergers might in general play an important role in triggering star formation and shaping the molecular core mass distribution and by that also the stellar initial mass function.

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Simplified quartessence cosmology

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We propose a new class of accelerating world models unifying the cosmological dark sector (dark matter and dark energy). All the models are described by a simplified version of the Chaplygin gas quartessence cosmology. It is found that even for $\Omega_k \neq 0$, this quartessence scenario depends only on a pair of parameters which can severely be constrained by the cosmological tests. As an example we perform a joint analysis involving the latest SNe type Ia data and the recent Sloan Digital Sky Survey measurement of baryon acoustic oscillations. In our analysis we have considered the SNe type Ia Union sample compiled by Kowalski et al. [M. Kowalski et al., Astrophys. J. 686 (2008) 749, arXiv:0804.4142]. At 95.4% (c.l.), we find for BAO + Union sample, α=0.81-0.04+0.04 and Ω=1.15-0.17+0.16. The best-fit for this simplified quartessence scenario is a spatially closed Universe and its reduced χ is exactly the same of the flat concordance model .

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Origin of the Local Bubble

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We present a new unbiased search for OB associations in the Solar neighbourhood which have hosted the progenitor stars of the core collapse supernovae responsible for the Local Bubble in the interstellar gas. For this purpose we have analyzed a volume complete set (with a diameter of 400 pc) of B stars drawn from the Hipparcos catalogue and the Arivel data base, from which candidate members were selected by a kinematical criterion. After careful dereddening the star colours we have constructed a colour-magnitude diagram and confirmed that the Upper Scorpius, Upper Centaurus Lupus, and Lower Centaurus Crux subgroups of the Sco OB2 association are the youngest nearby OB associations. We dated their ages with theoretical isochrones in the range of 20–30 Myr, in agreement with previous work. We have traced backwards in time the paths of the stars and found that they entered the volume of the present bubble at 10 to 15 Myr ago. We argue that the Local Bubble began to form then and estimate that 14 to 20 supernovae have exploded since. The implied energy input into the ambient medium can be shown to be sufficient to excavate a bubble of the presently observed size.

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Dyonic AdS black holes from magnetohydrodynamics

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We use the AdS/CFT correspondence to argue that large dyonic black holes in anti-de Sitter spacetime are dual to stationary solutions of the equations of relativistic magnetohydrodynamics on the conformal boundary of AdS. The dyonic Kerr-Newman-AdS_4 solution corresponds to a charged diamagnetic fluid not subject to any net Lorentz force, due to orthogonal magnetic and electric fields compensating each other. The conserved charges, stress tensor and R-current of the fluid are shown to be in exact agreement with the corresponding quantities of the black hole. Furthermore, we obtain stationary solutions of the Navier-Stokes equations in four dimensions, which yield predictions for (yet to be constructed) charged rotating black strings in AdS_5 carrying nonvanishing momentum along the string. Finally, we consider Scherk-Schwarz reduced AdS gravity on a circle. In this theory, large black holes and black strings are dual to lumps of deconfined plasma of the associated CFT. We analyze the effects that a magnetic field introduces

in the Rayleigh-Plateau instability of a plasma tube, which is holographically dual to the Gregory-Laflamme instability of a magnetically charged black string.

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http://de.arxiv.org/abs/0812.0801

Powerful H2 Emission and Star Formation on the Interacting Galaxy System Arp 143: Observations with Spitzer and Galex

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We present new mid-infrared (IR; 5-35 μm) and ultraviolet (1539-2316 å) observations of the interacting galaxy system Arp 143 (NGC 2444/2445) from the Spitzer Space Telescope and Galaxy Evolution Explorer. In this system, the central nucleus of NGC 2445 is surrounded by knots of massive star formation in a ringlike structure. We find unusually strong emission from warm H_2 associated with an expanding shock wave between the nucleus and the western knots. At this ridge, the flux ratio between H2 and polycyclic aromatic hydrocarbon (PAH) emission is nearly ten times higher than in the nucleus. Arp 143 is one of the most extreme cases known in that regard. From our multiwavelength data, we derive a narrow age range of the star forming knots between 2 Myr and 7.5 Myr, suggesting that the ring of knots was formed almost simultaneously in response to the shock wave traced by the H_2 emission. However, the knots can be further subdivided into two age groups: those with an age of 2-4 Myr (knots A, C, E, and F), which are associated with 8 μm emission from PAHs, and those with an age of 7-8 Myr (knots D and G), which show little or no 8 μm emission shells surrounding them. We attribute this finding to an aging effect of the massive clusters which, after about 6 Myr, no longer excite the PAHs surrounding the knots.

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Stellar activity of planetary host star HD 189 733

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Aims. Extra-solar planet search programs require high-precision velocity measurements. They need to determine how to differentiate between radial-velocity variations due to Doppler motion and the noise induced by stellar activity. Methods: We monitored the active K2V star HD 189 733 and its transiting planetary companion, which has a 2.2-day orbital period. We used the high-resolution spectograph SOPHIE mounted on the 1.93-m telescope at the Observatoire de Haute-Provence to obtain 55 spectra of HD 189 733 over nearly two months. We refined the HD 189

733b orbit parameters and placed limits on both the eccentricity and long-term velocity gradient. After subtracting the orbital motion of the planet, we compared the variability in spectroscopic activity indices with the evolution in the radial-velocity residuals and the shape of spectral lines. Results: The radial velocity, the spectral-line profile, and the activity indices measured in He I (5875.62 å), Hα (6562.81 å), and both of the Ca II H&K lines (3968.47 å and 3933.66 å, respectively) exhibit a periodicity close to the stellar-rotation period and the correlations between them are consistent with a spotted stellar surface in rotation. We used these correlations to correct for the radial-velocity jitter due to stellar activity. This results in achieving high precision in measuring the orbital parameters, with a semi-amplitude K=200.56 ± 0.88 m s^{-1} and a derived planet mass of MP=1.13 ± 0.03 M$_{Jup}$.

Based on observations collected with the SOPHIE spectrograph on the 1.93-m telescope at Observatoire de Haute-Provence (CNRS), France, by the SOPHIE Consortium (program 07A.PNP.CONS).

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TandEM: Titan and Enceladus mission

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TandEM was proposed as an L-class (large) mission in response to ESA's Cosmic Vision 2015–2025 Call, and accepted for further studies, with the goal of exploring Titan and Enceladus. The mission concept is to perform in

situ investigations of two worlds tied together by location and properties, whose remarkable natures have been partly revealed by the ongoing Cassini–Huygens mission. These bodies still hold mysteries requiring a complete exploration using a variety of vehicles and instruments. TandEM is an ambitious mission because its targets are two of the most exciting and challenging bodies in the Solar System. It is designed to build on but exceed the scientific and technological accomplishments of the Cassini–Huygens mission, exploring Titan and Enceladus in ways that are not currently possible (full close-up and in situ coverage over long periods of time). In the current mission architecture, TandEM proposes to deliver two medium-sized spacecraft to the Saturnian system. One spacecraft would be an orbiter with a large host of instruments which would perform several Enceladus flybys and deliver penetrators to its surface before going into a dedicated orbit around Titan alone, while the other spacecraft would carry the Titan in situ investigation components, i.e. a hot-air balloon (Montgolfière) and possibly several landing probes to be delivered through the atmosphere.

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http://www.springerlink.com/content/e0u4698345634860/

2 Abstracts of recent conference contributions
Resumos de trabalhos apresentados em conferências

Spectroscopic parameters for 451 stars in the HARPS GTO planet search program: Stellar [Fe/H] and the frequency of exo-Neptunes

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We present a catalogue with accurate stellar parameters for the 451 stars that compose the HARPS Guaranteed Time Observations (GTO) "high precision" sample. We use our results, together with the others found in the literature, to study the metallicity-planet correlation, namely for very low mass planets. The results presented here suggests that contrarily to their jovian couterparts, neptune-like planets do not form preferentially around metal-rich stars. The ratio of jupiter-to-neptunes is also an increasing function of stellar metallicity. These results are discussed in the context of the core-accretion model for planet formation.
COOL STARS, STELLAR SYSTEMS AND THE SUN: Proceedings of the 15th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun. AIP Conference Proceedings, Volume 1094, pp. 477-480 (2009)

Extended wind in jetless classical T Tauri star TW Hya

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We have conducted a spectro-astrometric (SA) analysis of high spectral resolution data of the near infrared HeI 10830å and Paγ lines in the nearby classical T Tauri star TW Hya. We find clear position offsets associated to the blueshifted absorption part of the HeI 10830å P Cygni profile. The derived spatial feature extend up to 50 mas (2.8

AU at TW Hya distance) in two opposite directions. By using simple exploratory models we show that this feature can not be produced by the same stellar wind which produces the P Cygni profile. Instead, we are able to reproduce the observed blueshifted SA profile with emission from a disk wind. The production of SA artifacts through instrumental effects was examined. Artifact models have difficulties in fitting both the PSF and the angular scale of the observed position spectra offsets, suggesting that the signal may be real. Based on originally published material in The Astrophysical Journal, Volume 670, Issue 2, pp. 1234-1239, 2007
COOL STARS, STELLAR SYSTEMS AND THE SUN: Proceedings of the 15th Cambridge Workshop on Cool Stars, Stellar Systems and the Sun. AIP Conference Proceedings, Volume 1094, pp. 345-348 (2009)