THE MAGELLANIC CLOUDS NEWSLETTER
An electronic exchange on Magellanic Clouds research

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Note from the editors: We apologize that due to time constraints (travels, proposals, and teaching duties) we were unable to send out a call for abstracts before this newsletter was compiled. Calls for abstracts will resume for future editions.

Abstracts of Refereed Papers

HST Spectroscopy of Spot 1
on the Circumstellar Ring of SN 1987A

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We present ultraviolet and optical spectra of the first bright spot (PA = 29°) on Supernova 1987A’s equatorial circumstellar ring taken with the Space Telescope Imaging Spectrograph. We interpret this spot as the emission produced by radiative shocks that occur where the supernova blast wave strikes an inward protrusion of the ring. The observed line widths and intensity ratios indicate the presence of radiative shocks with velocities ranging from 100 to 250 km s⁻¹ entering dense (≥ 10⁴ cm⁻³) gas. These observations, and future observations of the development of the spectra and line profiles, provide a unique opportunity to study the hydrodynamics of radiative shocks.

Accepted by: Astrophysical Journal Letters
For preprints, contact: michael@colorado.edu
Also available from the URL: http://xxx.lanl.gov/abs/astro-ph/0008130

The Supergiant Shell LMC2:
II. Physical Properties of the 10⁶ K Gas

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LMC2 has the highest X-ray surface brightness of all known supergiant shells in the Large Magellanic Cloud (LMC). The X-ray emission peaks within the ionized filaments that define the shell boundary, but also extends beyond the southern border of LMC2 as an X-ray bright spur. ROSAT HRI images reveal the X-ray emission from LMC2 and the spur to be truly diffuse, indicating a hot plasma origin. We have obtained ROSAT PSPC and ASCA SIS spectra to study the physical conditions of the hot gas interior to LMC2 and the spur. Raymond-Smith thermal plasma model fits to the X-ray spectra, constrained by HI 21-cm emission-line measurements of the column density, show the plasma temperature of the hot gas interior of LMC2 to be kT = 0.1 - 0.7 keV and of the spur to be kT = 0.1 - 0.5 keV. We have compared the physical conditions of the hot gas interior to LMC2 with those of other supergiant shells, superbubbles, and supernova remnants (SNRs) in the LMC. We find that our derived electron densities for the hot gas inside LMC2 is higher than the value determined for the supergiant shell LMC4, comparable to the value determined for the superbubble N11, and lower than the values determined for the superbubble N44 and a number of SNRs.

Accepted by: The Astrophysical Journal, 2001 Jan 1 issue
For preprints, contact points@astro.uiuc.edu
Also available from the URL http://xxx.lanl.gov/abs/astro-ph/0008440
The Antarctic Submillimeter Telescope and Remote Observatory (AST/RO)

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AST/RO, a 1.7 m diameter telescope for astronomy and aeronomy studies at wavelengths between 200 and 2000 μm, was installed at the South Pole during the 1994-95 Austral summer. The telescope operates continuously through the Austral winter, and is being used primarily for spectroscopic studies of neutral atomic carbon and carbon monoxide in the interstellar medium of the Milky Way and the Magellanic Clouds. The South Pole environment is unique among observatory sites for unusually low wind speeds, low absolute humidity, and the consistent clarity of the submillimeter sky. Four heterodyne receivers and three acousto-optical spectrometers are installed. Telescope pointing, focus, and calibration methods as well as the unique working environment and logistical requirements of the South Pole are described.

Submitted to: The Astrophysical Journal

For preprints, contact aas@cfa.harvard.edu
ISO Observations of the Planetary Nebula Lindsay 305 in the Small Magellanic Cloud

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We present ISO (Infrared Space Observatory) observations of the planetary nebula Lindsay 305 (L 305) in the Small Magellanic Cloud. L 305 is well prominent in the ISOCAM frames at 6.75 and 11.5 $\mu$m, although it is under the detection limit at 4.5 $\mu$m. The obtained spectral energy distribution shows a strong mid-IR excess, which, depending on the amount of energy radiated at wavelengths longer than 11.5 $\mu$m, may be as large as $\sim 1500L_\odot$. However, since an accurate estimate of the total nebular luminosity is not available to date, the evolutionary status of L 305 can not yet be constrained precisely.

Accepted by: Publications of the Astronomical Society of Japan

For preprints, contact arunaskc@cc.nao.ac.jp

Dust Grain Size Distributions and Extinction in the Milky Way, LMC, and SMC

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We construct size distributions for carbonaceous and silicate grain populations in different regions of the Milky Way, LMC, and SMC. The size distributions include sufficient very small carbonaceous grains (including polycyclic aromatic hydrocarbon molecules) to account for the observed infrared and microwave emission from the diffuse interstellar medium. Our distributions reproduce the observed extinction of starlight, which varies depending upon the interstellar environment through which the light travels. As shown by Cardelli, Clayton & Mathis in 1989, these variations can be roughly parameterized by the ratio of visual extinction to reddening, $R_V$. We adopt a fairly simple functional form for the size distribution, characterized by several parameters. We tabulate these parameters for various combinations of values for $R_V$ and $b_C$, the C abundance in very small grains. We also find size distributions for the line of sight to HD 210121, and for sightlines in the LMC and SMC. For several size distributions, we evaluate the albedo and scattering asymmetry parameter, and present model extinction curves extending beyond the Lyman limit.

Submitted to: The Astrophysical Journal

For preprints, contact weingart@cita.utoronto.ca
Also available from the URL http://xxx.lanl.gov/abs/astro-ph/0008146
Halo Lensing or LMC Self Lensing?
Insights from the HST CMD of MACHO Microlensing Source Stars

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The nature of Large Magellanic Cloud (LMC) microlensing is determined by the location of the microlensing source stars. If the source stars are in the LMC then LMC microlensing is predominantly halo-lensing, if the source stars are located behind the LMC, then LMC microlensing is dominated by self-lensing. We attempt to distinguish between source stars drawn from the average population of the LMC and source stars drawn from a population behind the LMC by examining the HST color-magnitude diagram (CMD) of microlensing source stars. We present WFPC2 HST photometry of eight MACHO microlensing source stars and the surrounding fields in the LMC. The microlensing source stars are identified by deriving accurate centroids in the ground-based MACHO images using difference image analysis (DIA) and then transforming the DIA coordinates to the HST frame. We consider in detail a model for the background population of source stars based on that presented by Zhao, Graff & Guhathakurta. In this model, the source stars have an additional reddening \( <E(B-V) > = 0.13 \) mag and a slightly larger distance modulus \( <\Delta\mu > \sim 0.3 \) mag than the average LMC population. We also investigate a series of source star models, varying the relative fraction of source stars drawn from the average and background populations and the displacement of the background population from the LMC. The data suggest that not all of the MACHO microlensing source stars are drawn from a background population.

Submitted to: The Astrophysical Journal
For preprints, contact caillin@llnl.gov
The So-Called “Bar” in the Large Magellanic Cloud

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We propose that the off-centered “bar” in the Large Magellanic Cloud (LMC) is an unvirialized structure slightly misaligned with, and offset from, the plane of the LMC disk. The small displacement and misalignment are consequences of recent tidal interactions with the SMC and the Galaxy. This proposal, though radical, is consistent with the kinematics of the LMC and near-infrared star count maps from the DENIS and 2MASS surveys. It does not violate any of the observational limits on the depth and structure of the LMC – in particular, the reported 25° – 50° inclination range of the LMC and the east-west gradient of distance moduli of standard candles. Contributions to LMC microlensing come mainly from the mutual lensing of stars in the disk and the “bar”. Predicted microlensing optical depth is at levels comparable to observation even without including contributions from MACHOs. Possible observations are suggested to discriminate between our misaligned, offset “bar” model and the conventional picture of an off-centered, planar bar.

Accepted by: The Astrophysical Journal (Letters)

Discovery of 172-s Pulsations from a Be/X-ray Binary Candidate AX J0051.6–7311 in the SMC with ASCA

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The results from three ASCA observations of AX J0051.6–7311 = RX J0051.9–7311 are reported. Coherent pulsations with a barycentric period of 172.40 ± 0.03 s were discovered in the third observation, with an exceptionally long exposure time of ∼ 177 ks. The X-ray spectrum was found to remain unchanged through these observations, with a photon index of ∼ 0.9. Energy-resolved pulse profiles in the third observation reveal that the pulsations are mostly due to photons with an energy above ∼ 2 keV. Archival data of ROSAT and Einstein indicate that AX J0051.6–7311 exhibits a flux variation having a factor > 20.

Accepted by: PASJ
For preprints, contact jun@cr.scphys.kyoto-u.ac.jp
Also available from the URL http://www-cr.scphys.kyoto-u.ac.jp/member/jun/job/
Abstracts of Non-Refereed Papers

The great circle of the Magellanic Stream - the HI observations

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The RATAN-600 HI observations were made in the new Zone 2 on the Magellanic Stream’s great circle. This Zone is situated azimuthally opposed to the Zone 1 studied earlier. The coordinates of the Zones are: Zone 1: RA from 22 to 4 hours, DEC from -40 to +62.5 degrees. Zone 2: RA from 10 to 16 hours, DEC also from -40 to +62.5 deg. The preliminary reduction of observations made in 2000 allowed to determine the character of the HI emission in the Zone 2 in order to compare them with the behaviour of the Warps in the Galactic gaseous disk.

To appear in: Conference proceedings of the JENAM-2000, May 29 - June 3, 2000, Moscow, Russia: “European Astronomy at the Turn of the Millennium”.
For preprints, contact N.V. Bystrova bmv@fsao.spb.su
Also available from the URL http://www.inasam.rssi.ru

Some comparisons of the Galactic HI disk and the Magellanic Stream

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Some details of the Warps in the gaseous disk of our Galaxy are compared with the behaviour of the neutral Hydrogen in the Magellanic Stream. The 21 cm radioline observations made in St. Petersburg and Zelenchukskaja are in accordance. The drift curves received with the RATAN-600 radiotelescope lasted 6 or 7 hours and covered two extended Zones chosen azimuthally opposed on the Magellanic Stream’s great circle. The positions and velocities of the HI signals are described and some preliminary conclusions were made in the communication.

To appear in: Proceedings of the JENAM-2000, May 29 - June 3, 2000 Moscow, Russia “European Astronomy at the Turn of the Millennium”
For preprints, contact N.V. Bystrova bmv@fsao.spb.su
Also available from the URL http://www.inasam.rssi.ru
What is the behavior of the ISM in the SMC?

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We describe quantitatively the neutral hydrogen (HI) and dust content of the interstellar medium (ISM) in the Small Magellanic Cloud (SMC), using the spatial power spectrum. The velocity modification of the HI density power spectrum is investigated and discussed.


For preprints, contact sstanimi@naic.edu

Mid-infrared studies of the AGB star populations in Local Group galaxies: the Magellanic Clouds

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We present a brief summary of the ISO survey of AGB stars in 8 populous intermediate age clusters of the Magellanic Clouds. Totally, more than 100 AGB and RGB stars were observed at 4.5, 6.7 and 12 µm. We introduce a new method to estimate effective temperatures of oxygen-rich AGB stars, and derive precise estimates of \( M_{\text{bol}} \) and \( T_{\text{eff}} \) for a large population of AGB objects in both LMC and SMC. The derived stellar parameters are used to construct observed HR diagrams which are employed further to estimate cluster ages using the isochrone fitting. We show that proposed method gives a powerful tool to study AGB star populations within the Local Group galaxies, especially, when backed up with the observations from forthcoming mid-IR astronomical space facilities (IRIS, SIRTF) and large ground-based telescopes (SUBARU, VLT, etc.).

To appear in: Proceedings of ISAS International Workshop on Mid- & Far-Infrared Astronomy and Future Space Missions, April 17-18, 2000, ISAS, Japan

For preprints, contact arumaskc@cc.nao.ac.jp
The Local Group

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Local Group galaxies such as the Milky Way, the Magellanic Clouds, and M31 are being used by a number of international collaborations to search for microlensing events. Type and number of detections place constraints on dark matter and the stellar populations within and along the line of sight to these galaxies. In this review I briefly discuss the stellar populations, evolutionary histories, and other properties of different types of Local Group galaxies as well as constraints on the dark matter content of these galaxies. Particular emphasis is placed on the dwarf companions of the spiral galaxies in the Local Group.


For preprints, contact grebel@mpia-hd.mpg.de
**Job Opportunities**

**OPEN POSTDOCTORAL AND Ph.D. POSITIONS**

Several Postdoctoral and Ph.D. positions are being offered in an exciting new research group at the University of Goettingen, Germany. The positions will be offered for 3 years in the first instance with a possible extension of a further 2 years.

The group focuses on the kinematic and morphological evolution of field galaxies and their transformation in groups and clusters. The new 10m class telescopes will be used (partly in guaranteed time) to observe the Fundamental Plane and Tully Fischer relations of distant field and cluster galaxies. The spectroscopic picture of galaxy/cluster evolution will be enhanced by NIR, HST and XMM/Chandra observations. N-body/SPH simulations of the evolution of individual galaxies in the dense environment of clusters will be directly interrelated with observations. They will both support the interpretation of observed phenomena, as well as give motivation for new observations.

Applications for postdoctoral positions are invited from experienced observers (ideally with good knowledge of multi-object spectroscopy) and from theoreticians working with N-body/SPH simulations, including star and galaxy formation. The start date can be between November 1st, 2000 and April 1st, 2001. Salary is based on German federal public service scales (BAT IIa, about 100,000 DM per year depending on age and marital status) and includes health insurance, a pension scheme etc. It is anticipated that the appointees will initially work about 60 with the rest of the time being used to pursue their own research. Experience with PC networking would be an advantage. In addition, we seek applications from candidates for Ph.D. positions in the above research areas, whose salary will be half BAT IIa.

Goettingen has guaranteed time at the ESO-VLTs, the Hobby-Eberly Telescope in Texas and SALT. It has access to all ESO, ESA (including HST, XMM, Chandra and SOFIA), Calar Alto and McDonald observatory facilities. A modern PC-Linux network is running including GRAPE hardware, and we have regular access to IBM parallel computers.

Applications for Postdoctoral positions should be supported by a curriculum vitae, publication list, 2 letters of recommendation, and a statement on research interests.

Applications for Ph.D. studentships should include copies of university records, a CV and a letter of recommendation.

The University of Goettingen operates an equal opportunities employment policy.

Please send your application until September 30th, 2000, to:

Dr. Bodo Ziegler  
Universitaetssternwarte  
Geismarlandstr. 11  
37083 Goettingen  
Germany

For informal inquiries, please contact me by email: bziegler@uni-sw.gwdg.de
Meeting Announcement

Dwarf Galaxies and their Environment

Date: 23 to 27 January 2001

Place: Physikzentrum, Bad Honnef near Bonn, Germany

URL: http://www.astro.uni-bonn.de/~webkg/dwarfconf.html

Contact: Klaas S. de Boer, deboer@astro.uni-bonn.de

Scientific Goal: Within the framework of the Gradschool The Magellanic Clouds and other Dwarf Galaxies the conference will focus on research developments in the general field of dwarf galaxies and their interactions with the environment. The program will consist of presentations (talks and posters) by invited speakers, by students from the Gradschool, and by further participants.

Our graduate school, funded by the Deutsche Forschungsgemeinschaft, is being jointly run by the Astronomical Institutes of the Universities of Bonn and Bochum since 1993. This very successful education and research programme will enter its last year of funding and we feel this is the right time to get together for a meeting devoted to the topics that our grad school students have been putting their efforts into during the recent past. With our very positive experience of the last workshop of that kind at Bad Honnef in January 1998 (see http://www.astro.uni-bonn.de/~webkg/ws98/cover.html) we are very much looking forward to meet again at this pleasant and comfortable venue.

SOC: Klaas S. de Boer, Rolf Chini, Ralf-Jürgen Dettmar, Uli Klein, Ulrich Mebold, Rheinhard Schlickeiser, Wilhelm Seggewiss

Proceedings: The proceedings of the meeting will be published.

Registration: The technical details of the meeting and a registration form can be found on the homepage of the meeting (URL see above). Participants will be selected on a first-come, first-served basis and on how well their proposed contribution fits to the topic of the meeting. The registration deadline is 20 October 2000. Due to space and logistic limitations the number of attendees will be limited to ~ 75 people.