THE MAGELLANIC CLOUDS NEWSLETTER
An electronic exchange on Magellanic Clouds research
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Abstracts of Refereed Papers

The “Papillon” nebula: a compact H II blob in the LMC resolved by HST

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We present high spatial resolution HST imaging of the LMC compact H II region N159-5. This high excitation blob is revealed to be a “papillon” or butterfly-shaped ionized nebula with the “wings” separated by ~20′′ (0.6 pc). Two subarcsecond features resembling a “smoke ring” and a “globule” are detected in the wings, the origin of which is briefly discussed. N159-5 may represent a new type of H II region in the Magellanic Clouds overlooked so far because of insufficient spatial resolution. Our images also show a strikingly turbulent medium around the Papillon in the giant H II region N159, which manifests itself by a large number of subarcsecond filaments, arcs, ridges, and fronts carved in
the ionized gas by the stellar winds from massive stars in the N 159 complex.

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For preprints, contact heydari@obspm.fr
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Effects of Jet-like Explosion in SN 1987A

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We study the effects of jet-like explosion in SN 1987A. Calculations of the explosive nucleosynthesis and the matter mixing in a jet-like explosion are performed and their results are compared with the observations of SN 1987A. It is shown that the jet-like explosion model is favored because the radioactive nuclei $^{44}$Ti is produced in a sufficient amount to explain the observed bolometric luminosity at 3600 days after the explosion. This is because the active alpha-rich freezeout takes place behind the strong shock wave in the polar region. It is also shown that the observed line profiles of Fe[II] are well reproduced by the jet-like explosion model. In particular, the fast moving component traveling at (3000-4000) km/s is well reproduced, which has not been reproduced by the spherical explosion models. Moreover, we conclude that the favored degree of a jet-like explosion to explain the tail of the light curve is consistent with the one favored in the calculation of the matter mixing. The concluded ratio of the velocity along to the polar axis relative to that in the equatorial plane at the Si/Fe interface is $\sim 2 : 1$. This conclusion will give good constraints on the calculations of the dynamics of the collapse-driven supernova. We also found that the required amplitude for the initial velocity fluctuations as a seed of the matter mixing is $\sim 30\%$. This result supports that the origin of the fluctuations is the dynamics of the core collapse rather than the convection in the progenitor. The asymmetry of the observed line profiles of Fe[II] can be explained when the assumption of the equatorial symmetry of the system is removed, which can be caused by the asymmetry of the jet-like explosion with respect to the equatorial plane. In the case of SN 1987A, the jet on the north pole has to be stronger than that on the south pole in order to reproduce the observed asymmetric line profiles. Such an asymmetry may also be the origin of the pulsar kick. When we believe some theories that cause such an asymmetric explosion, the proto-neutron star born in SN 1987A will be moving in the southern part of the remnant.

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Also available from the URL http://xxx.lanl.gov/abs/astro-ph/9907109
The Optical Gravitational Lensing Experiment.
Variable Stars in Star Clusters of the Magellanic Clouds.
I. Eclipsing Systems in the Clusters of the SMC

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The list of 127 eclipsing stars in optical coincidence with star clusters from the SMC is presented. It was prepared using the catalogs of eclipsing systems and star clusters from the SMC based on observations collected during the OGLE-II microlensing project.

Location of 12 eclipsing stars in the color-magnitude diagram of clusters allows to exclude their membership. Photometric data of 73 systems support their membership. The remaining 42 objects were found in loose, faint clusters and therefore no conclusive statement about their membership can be made. All presented data are available from the OGLE archive.

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The Optical Gravitational Lensing Experiment.
Age of Star Clusters from the SMC

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We present determination of age of clusters from 2.4 square degree region of the SMC bar. The photometric data were taken from the BVI maps of the SMC and catalog of clusters in this galaxy obtained during the OGLE-II microlensing survey.

For 93 well populated SMC clusters their age is derived with the standard procedure of isochrone fitting. The distribution of age of cluster from the SMC is presented. It indicates either non-uniform process of cluster formation or very effective disruption of clusters.

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The Optical Gravitational Lensing Experiment.
Multiple Cluster Candidates in the Small Magellanic Cloud

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We present the list of potential multiple star clusters from the central part of the SMC. Presented systems were selected from the catalog of star clusters from the SMC. We find 23 suspected cluster pairs and 4 triple systems. The statistical analysis suggests that many of them may constitute physical
systems. Size, equatorial coordinates and age of presented clusters are given. Age of clusters which form five pairs and one triple system is coeval suggesting common origin of these objects.

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Chemical Evolution in the Large Magellanic Clouds

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We present a new input parameter set of the Pagel model for the LMC (Pagel & Tautvaisienë 1998) in order to reproduce the observations, including the star formation rate (SFR) history. It is concluded that high ratio of $A$ ($\sim 0.17$), which is the probability for $3-8M_\odot$ stars to explode as SNe Ia, is required. As a result, a steep initial mass function (IMF) slope or existence of the outflow is not needed in order to attain the low $[O/Fe]$ ratio in the LMC. As for the current supernova ratio, a high ratio ($\sim 1.3$) is concluded by the new parameter set, which is consistent with the X-ray observations. Although we can not conclude that our solution is an unique one, we can conclude that no solution which can explain the observations as many as ours has been presented.

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For preprints, contact nagataki@utaphp1.phys.s.u-tokyo.ac.jp
Also available from the URL http://xxx.lanl.gov/abs/astro-ph/9907108

Dark Bulge, Exponential Disk, and Massive Halo
in the Large Magellanic Cloud

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The rotation curve of the Large Magellanic Cloud, which we have derived from high-resolution HI position-velocity diagrams observed by Kim et al. (1998), shows a steep central rise and flat rotation with a gradual rise toward the edge. Using the rotation curve, we have calculated the distribution of surface mass density, and show that the LMC has a dark compact bulge, an exponential disk, and a massive halo. The bulge is 1.2 kpc away from the center of the stellar bar, and is not associated with an optical counterpart. This indicates that the “dark bulge” has a large fraction of dark matter, with an anomalously high mass-to-luminosity (M/L) ratio. On the contrary, the stellar bar has a smaller M/L ratio compared to the surrounding regions.

For preprints, contact sofue@ioa.s.u-tokyo.ac.jp
Also available from the URL http://www.ioa.s.u-tokyo.ac.jp/~sofue
Abstracts of Non-Refereed Papers

Fine structure of the red clump in Local Group galaxies

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Some fine structures can nowadays be identified in the high-quality colour-magnitude diagrams (CMD) of Local Group galaxies. The clump of red giants, for instance, may present a significant colour spread, and extensions to both brighter and fainter luminosities. Such features are predicted by population synthesis models which consider stars in the complete relevant ranges of ages and metallicities, and are potentially useful for constraining the star formation histories of the parent galaxies over scales of gigayears. We briefly comment the cases of fields in the Magellanic Clouds, M31, and the local CMD from Hipparcos.

For preprints, contact Lgirardi@pd.astro.it
Also available from the URL http://xxx.lanl.gov/abs/astro-ph/9907086

Meeting Announcement

Darwin and Astronomy: the Infrared Space Interferometer (IRSI)
November 17 – 19, 1999, Stockholm, Sweden

Organisers:
Swedish National Space Board (SNSB), European Space Agency (ESA) and Stockholm Observatory

E-mail contact: darwin@astro.su.se

This is the first announcement for the conference ‘Darwin and Astronomy - the Infrared Space Interferometer’ to be held in Stockholm, Sweden, from November 17 to 19, 1999. The conference is organised by the Swedish National Space Board (SNSB) and the European Space Agency (ESA), with support by Stockholm Observatory.

All relevant documentation regarding the conference, including electronic forms for registration and hotel reservations, can be found on the web at http://www.astro.su.se/~index.html
Purpose of this conference:

- To identify the most profound questions in the fields of modern astrophysics that can be addressed with a space-based interferometer working from 5 to 25 μm with baselines of up to 500 m and much more sensitive than ground-based instruments.
- To provide insights into the optimisation of the design of the instrument in the light of those questions.

It is envisaged that 30% of the time of the ESA candidate space mission for the Darwin infrared space interferometer will be devoted to general astrophysics. While much of the design will driven by its primary aim of extrasolar planetary systems studies, the astrophysical aims will also be important factors in the design.

This conference will start from a description of the present Darwin concept and its performance in different astrophysical observations. The inputs from participants in this conference will then constitute an important driving mechanism for the development of design characteristics of the instrument.

If you want to understand the prospects for space infrared interferometer astronomy or if you want to affect the design of Darwin so it can address your needs, you should attend this conference.

Topics and invited speakers include:

**Galaxies and their Evolution**  Andrew Wilson (confirmed),
**Active Galactic Nuclei/GC**  Reinhard Genzel (confirmed),
**Observational Cosmology**  Malcolm Longair (tbc),
**Supernovae (and Cosmology)**  Jason Spyromilio (tbc),
**AGB and Related Phases of Stellar Evolution**  Hans Olofsson (confirmed),
**Star Formation and Early Stellar Evolution**  Stephen Strom (confirmed),
**Planet Formation and Disk Evolution**  Pawel Artymowicz (confirmed),
**Physics of Planets**  Tristan Guillot (confirmed),
**Planetology and Zodiacal Light**  Jane Luu (confirmed),
**Astrobiology**  Baruch Blumberg (tbc),
**Planets and Life**  Tobias Owen (tbc),
**Origin of Life**  André Brack (confirmed),
**Nulling Interferometry**  Neville Woolf and Bertrand Mennesson (confirmed),
**Darwin - the Infrared Space Interferometer**  Malcolm Fridlund (confirmed),
**TPF - the Terrestrial Planet Finder**  Chas Beichman (confirmed),
**GAIA - the Global Astrometric Interferometer for Astrophysics**  Lennart Lindegren (confirmed),
**NGST - the Next Generation Space Telescope**  Peter Jakobsen (confirmed),
**VLTI - the Very Large Telescope Interferometer**  Francesco Paresce (confirmed),
**ALMA - the Atacama Large Millimeter Array**  Roy Booth (tbc)

Scientific Organising Committee:


Local Organising Committee: