Five Years of Magellanic Clouds Research: A Newsletter Editors' Perspective

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Abstract

We analyze the topical and demographic evolution of Magellanic Clouds research over the past five years based on submissions of abstracts of refereed papers to the electronic Magellanic Clouds Newsletter (`http://www.astro.uiuc.edu/projects/mcnews/MCNews.html`).

1 Introduction

In late 1995 the Magellanic Clouds Newsletter (MCNews) was founded by You-Hua Chu's Magellanic Clouds Working Group at the University of Illinois in Urbana-Champaign (UIUC). Two years earlier a joint "Graduiertenkolleg" (graduate school) for Magellanic Clouds research had been created by the Universities of Bonn and Bochum. Several members of the Graduiertenkolleg went to UIUC as exchange visitors, and the University of Bonn became the European mirror site for MCNews. The Graduiertenkolleg is now reaching the end of its funding period, and we use this opportunity to analyze the topical and demographical evolution of Magellanic Clouds research worldwide over the past five years as reflected in MCNews.

2 The Magellanic Clouds Newsletter

MCNews covers all areas of Magellanic Clouds research and publishes abstracts of submitted and accepted refereed papers, PhD theses, conference proceedings, and job and conference announcements. Its editors are Eva Grebel (MPIA) and You-Hua Chu (UIUC). Since September 1997 MCNews appears monthly and is currently sent out electronically in LaTeX format to ~ 440 subscribers in 31 countries. Fifty five issues have appeared as of May 2001, comprising a total of 532 abstracts of refereed papers (an estimated 80% of the refereed publications in this area), so we estimate that we are reaching ~ 80 % of the researchers active in this field.

3 Demographics of Magellanic Clouds research

Assuming that MCNews subscribers are approximately representative of Magellanic Clouds researchers, then Europe (42%) and North America (37%) have the highest concentration of Magellanic Clouds researchers. For the top eight countries the following fractional distribution of subscribers results: USA: 32%, Germany: 16%, Australia: 8%, France: 7%, UK: 6%, Italy: 5%, Chile: 4%, Canada: 3%. Between 8% (Asia) and 24% (South America) are women (i.e., 18% on average).

"Dwarf Galaxies and their Environment"; Bad Honnef, Germany, 23-27 January 2001; Eds. K.S. de Boer, R.-J.Dettmar, U. Klein; Shaker Verlag

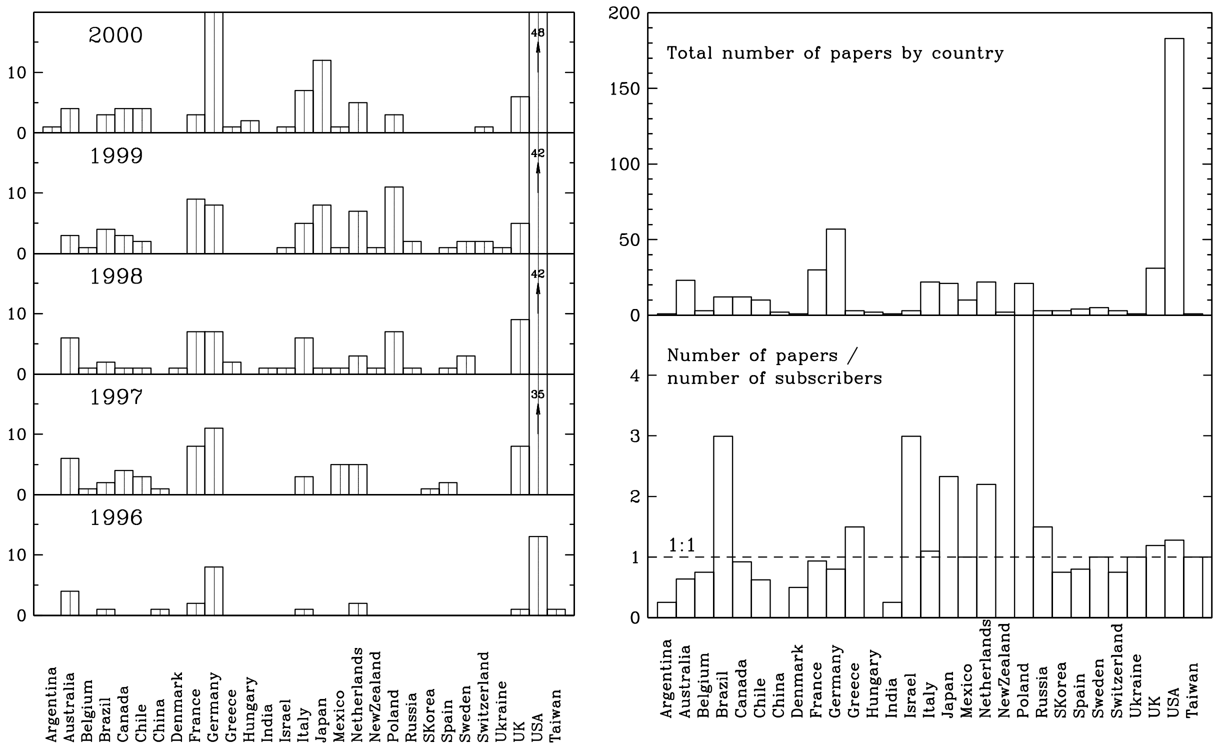

Figure 1: *Left panel:* Number of refereed papers listed in MCNews per country and year. The low overall count in 1996 is likely too low since MCNews was still in its initial phase then. *Upper right panel:* Total number of refereed papers per country from 1996 – 2000. *Lower right panel:* "Productivity" measured by dividing the number of refereed papers by the number of subscribers per country. Countries with few subscribers but comparatively large numbers of papers lie well above the line marking an average of one paper per subscriber.

4 Scientific productivity

The number of refereed papers corresponds roughly to the number of Magellanic Clouds researchers per country. The largest total number of publications is found in the US, followed by Germany, France, and the UK. We use the affiliation of the first author to assign a paper to a specific country without considering the rest of the author team. Some of the annual variations are directly correlated with special campaigns or instruments. For example, the pronounced increase in Japanese refereed papers on the Magellanic Clouds is based largely on data from the X-ray satellite ASCA. The activity peaks in Poland are almost exclusively due to the OGLE microlensing experiment.

Dividing the total number of papers per country by the number of subscribers per country gives an approximate measure of activity per researcher in the said country. Countries with few subscribers but very active research groups stand out in this normalization. Poland takes a pronounced lead due to its very productive OGLE group and small number of subscribers. Other countries where researchers have a per capita rate of refereed papers that clearly exceeds 1 are Brazil (especially star clusters), Israel (particularly theory), Japan (X-ray binaries), and the Netherlands. Countries with a large total number of refereed papers (e.g., USA, Germany) are close to one paper per subscriber, illustrating that not all of their subscribers actively work on the Magellanic Clouds. Further, not every person who submits an abstract to MCNews is a subscriber, and the number of papers per subscriber ranges from 0 to > 20.

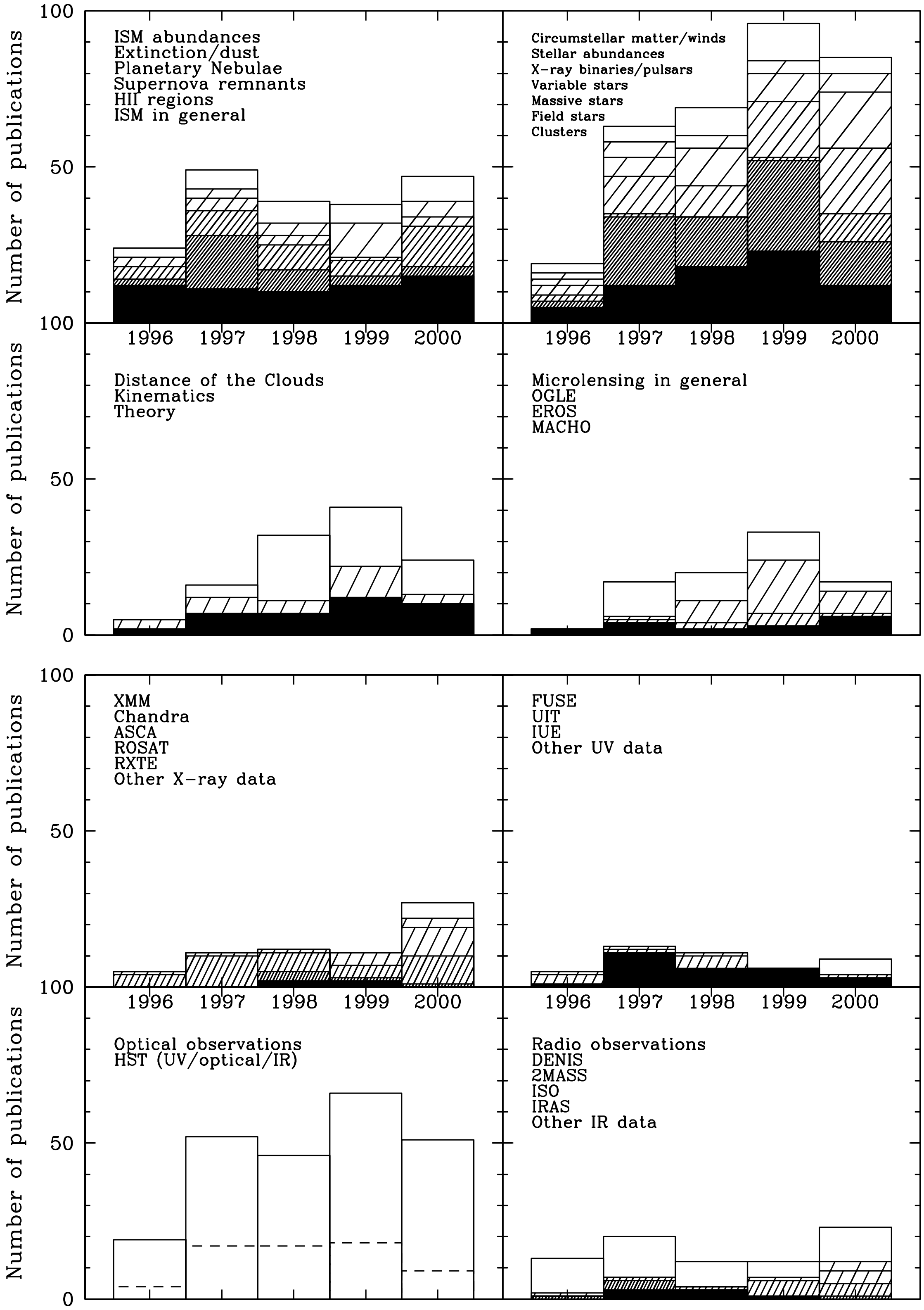

Figure 2: *Upper panel:* Topics in Magellanic Clouds research by year and total number. The numbers for 1996 are probably incomplete. The sequence of subdivisions of the histogram bars corresponds to the sequence in the legend of each plot (white: top item; black: bottom item; hashed with increasing density: items in between). *Lower panel:* Magellanic Clouds research by wavelength/satellite per year and total number.

5 Main areas of Magellanic Clouds research

Stellar populations – individual stars such as massive stars, AGB stars, variables, binaries; field populations, clusters and associations – account for the largest number of refereed publications on the Magellanic Clouds. The fractions of the main research areas are as follows: Stellar populations: 45%, interstellar medium: 27%, microlensing: 12%, theory: 7%, distance: 5%, dynamics/kinematics: 3%. Many studies belong to several of these research areas, each of which was credited in these cases. Interestingly, theoretical studies account only for a small fraction of the total. Theoretical research concentrates mainly on evolutionary models, both for individual stars as well as for stellar synthesis and chemical evolution. Many Magellanic Clouds studies are based partially or wholly on optical data (fractional distribution: Optical: 53%, X-ray: 16%, UV: 12%, radio/sub-mm: 11%, infrared: 8%).

6 Milestones of Magellanic Clouds Research

The past five years have seen significant progress in many areas of Magellanic Clouds research, with large-scale surveys playing an important role. To highlight just a few, we recall the impact of the Australian H I synthesis maps of the Clouds, which revealed a complex, fractal ISM full of shells, holes, and fragments. The HIPASS multi-beam survey detected the leading arm of the Magellanic stream. The NANTEN CO survey showed the distribution of molecular clouds at unprecedentedly high resolution and correlated their location with the age of star-forming regions. A growing body of high-resolution infrared data (e.g., NICMOS, VLT) is resolving pillars, Bok globules, and pre-main sequence stars in the Clouds. High-resolution studies of the stellar IMF in clusters (mostly with HST) show evidence for Salpeter-like slopes, but also clear indications of mass segregation. Infrared and optical imaging surveys (e.g., DENIS, 2MASS, the Magellanic Clouds Photometric Survey) unveiled the structure of the Magellanic Clouds as traced by their various stellar components and led to comprehensive point source catalogs of special stellar types such as AGB stars and carbon stars. Searches for carbon stars at the periphery of the Clouds, and kinematic studies resulted in extended rotation curves and the identification of kinematic subcomponents. Many studies concentrated on red clump stars as distance and evolutionary indicators. The microlensing surveys (esp. EROS, MACHO, OGLE) yielded a wealth of information on variable stars in the Clouds and contributed to the still unsolved question of the distance to the Clouds. Eclipsing binaries are emerging as one way to solve this question independent of stellar evolutionary assumptions. X-ray surveys (e.g., ROSAT, ASCA) are helping to complete the census of supernova remnants, X-ray binaries, as well as revealing the large-scale distribution of hot gas. Deep HST observations (WFPC2) made possible accurate relative age determinations for the oldest globular clusters in the Magellanic Clouds, and the derivation of detailed star formation histories for their field populations. OGLE and other imaging surveys led to improved star cluster catalogs and cluster age-dating. Abundances of field stars and clusters were derived photometrically (Strömgren, Washington) and through increased spectroscopic samples (Ca II triplet), revealing a complex age-metallicity relation. High-resolution stellar abundance measurements are also becoming more available; an area that will likely expand with the advent of the new large southern telescopes. The IUE archive, GHRS, and STIS advanced our knowledge of the UV and wind properties of massive stars. GHRS, STIS, ORFEUS, and FUSE increased our knowledge of interstellar abundances in the Clouds and led to the detection of H_2. These studies are complemented by radio and sub-millimeter measurements in the Clouds and in the Magellanic bridge. Surprisingly, stellar and gaseous abundances in the bridge turn out to be lower than those of the young field populations in both the LMC and SMC.

We look forward to the exciting results that the coming years and the new large telescopes and satellite missions will bring.