

Editorial

Highlights of this edition of the Bulletin:

- Special Adaptive Optics; we have gathered 5 articles on various aspects of the AO Bonnette project including illustrations of the mechanical casting, optical path, bimorph mirror electrode geometry etc. This report illustrates the extent of the tasks that have to be tackled/supervised, and help the reader understand the impact such project has on CFHT staff.
- Scientific results of CIRCUS observations.
- In the Director's corner section, a word from the director P. Couturier about the situation at CFHT after almost 5 months in the "Pilot's Seat".
- Too many unfortunate departures from CFHT.

I would like to take this opportunity to write a few words about the way the bulletin is prepared. The bulletin has greatly benefited from the spreading use of electronic mail, and computer networking. We can have the Bulletin prepared more efficiently and rapidly.

Workstations (SUN or HP) and personal computers are all linked on the CFHT network. Internal articles are edited by CFHT staff on their computers and then copied onto a general directory where me or C. Hickman can access it. Coleen is responsible for putting together the whole Bulletin in Wordperfect. The articles usually come in a variety of formats, so that an uniformization is necessary. Outside articles are usually E-mailed to me. I convert the E-mails into files that I pass on to Coleen. After homogenization in Wordperfect and multiple typing/reading/correction cycles, we send a hardcopy and diskette to a professional typesetter. The internal processing at CFHT lasts about a week and so does the external typesetting. The master copy is then given to a local printing business, that generally needs 2 weeks to provide us with the fresh 1100 copies of the Bulletin.

To insure a smooth continuation of the editing of the bulletin, I would like to give some simple directions to the authors:

1. Text files can be E-mailed or ftp'ed on the CFHT anonymous directory.
2. The format is ideally a simple ASCII file.
3. Exception: for French articles, a Wordperfect (preferred) or Latex file allows us to keep track of the accents. If you use Latex, please do not use style files. Make the document as simple as possible.
4. Hardcopies of plots and graphs can always be mailed, but the E-mailing or ftp'ing of postscript files has worked extremely well in the past, and I encourage you to do so.
5. Images: mailing (normal mail) of hardcopies is always acceptable. Again, sending postscript or FITS files by E-mail or ftp works very well. It is preferable to always send a print of a color image, because color printers usually do not provide a good quality of print.

If you send material by normal mail, please make sure you mail them well before the deadline. Files can be copied on the CFHT anonymous account at the address ftp.cfht.hawaii.edu.

R. Arsenault

Galaxy-Scale Windblown Superbubbles: NGC 3079

Introduction

The edge-on spiral galaxy NGC 3079 provides an extreme example of a nuclear superbubble leading to polar breakout. Galactic-scale outflows have been found in other nearby galaxies such as M82 (Bland & Tully 1988), NGC 253 (McCarthy, Heckman, & Miley 1987), and the prototype Seyfert 2 NGC 1068 (Cecil, Bland, & Tully 1990). The phenomenon may be common in far-infrared luminous galaxies (Heckman, Armus, & Miley 1990; Veilleux, Kim, & Sanders 1993). Compared with other nearby and well-studied examples, NGC 3079 is exceptional. The amount of outflowing matter is comparable with the situations in M 82 and NGC 1068 but velocities are an order of magnitude higher and, consequently, the global energy budget is higher by two orders of magnitude.

The galaxy-scale superbubble phenomenon is to be distinguished from nuclear ejection into 'jets' because the bubbles subtend wide angles. The energy deposition might be due to multiple supernova explosions or an active nucleus. A characteristic of windblown bubbles, such as the one in NGC 3079, is accelerated flow at larger radii.

Computer modeling of the interaction between windblown outflowing material and the interstellar medium (e.g., Mac Low, McCray, & Norman 1989) has led to the following picture. Initially, the kinetic energy introduced by supernovae, stellar winds, or an active nucleus is thermalized via shocks leading to high temperatures, low densities, and adiabatic expansion. Shocked interstellar matter at the bubble boundary is pushed outward much more slowly than the freely flowing wind at smaller radii (Weaver et al. 1977). The shell expands, accumulates matter, and becomes denser. Eventually the cooling time becomes shorter than the expansion time and the shell cools radiatively. Acceleration perpendicular to the galactic plane occurs once the bubble reaches dimensions comparable to the scale height of the disk. Fragmentation arises out of Rayleigh-Taylor instabilities. Freely flowing wind and shocked wind with fragments are injected into the galactic halo and may escape.

Galactic wind models are becoming more sophisticated (e.g., Slavin & Cox 1992; Mineshige, Shibata, & Shapiro 1993) but the observational constraints have been limited. NGC 3079 provides a particularly attractive study target because the geometry of the bubble is well defined due to the almost edge-on aspect of the disk and because the energetics are so extreme. Fig. 1 [front cover picture] is a map of the combined H α + [NII] $\lambda\lambda$ 6548, 6583 flux superimposed on a radio continuum contour plot (see also Fig. 1 of Ford et al. 1986). There is strong evidence for both an active galactic nucleus (AGN) and intense star formation in the nuclear region (Duric & Seaquist 1988; Irwin & Seaquist 1988; Young, Clausen, & Scoville 1988). A goal of the current study is to assess the relative importance of these two energy sources in powering the outflow.

Earlier long-slit observations (Heckman, Armus, & Miley 1990; Filippenko & Sargent 1992) have had only partial success in defining the geometry and kinematics of the outflowing gas since these studies had incomplete spatial coverage. An imaging Fabry-Perot interferometer can provide complete two-dimensional coverage, sensitivity to faint emission, and good