



NATIONAL RADIO ASTRONOMY OBSERVATORY

EDGEMONT ROAD, CHARLOTTESVILLE, VIRGINIA 22903-2475

Dr. ALAN H. BRIDLE

TELEPHONE 804 296-0375 FAX 804 296-0278
BITNET abridle@nrao SPAN 6654::abridle
INTERNET abridle@nrao.edu UUNET ...!nrao!abridle

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Mr. Chris Williamson,
1025 Oglesby,
1001 College Court,
Urbana, IL 61801.

Dear Chris,

Thank you for your letters, it was good to hear from you. I hope both you and Rebecca are recovered and off to a good start on the new semester.

Enclosed are some color slides I made of some of the 3C353 images. These were just photographed from the TV screen with my 35mm camera so we can do better eventually but they still give a pretty good picture of what's going on. I used large prints from several of these for the poster at the AAS meeting.

The AAS presentation on 3C353 went well and attracted a lot of interest, both from extragalactic astronomers and the press!

Scientifically, the immediate interest is of course in the filamentation and what I have started to call the "cold spot", i.e. the strange circular dark feature. One immediate consequence of the filamentation is that the standard "equipartition" calculation used to estimate particle energies and magnetic field strengths in radio lobes is probably incorrect for 3C353; it assumes that the lobes are fully "relaxed" whereas this extensive filamentation probably is not. The "cold spot" remains a puzzle, and several theorists camped at the poster for most of the day discussing it with me and trying to explain it. Nothing very convincing has emerged yet. The main possibilities are a) a geometrical "hole" in the source (statistically unlikely), b) absorption by some cold gas in the lobe (requires a large mass, but there's no galaxy visible there), c) absorption by a process that only a theorist could love, involving pitch angle anisotropies in a relativistic electron population that has spent a long time in a uniform magnetic field. While (c) has the most plausible ingredients, it requires a great deal of regularity (ordering) in the magnetic field and Nature doesn't usually make the same approximations as the theorists when it comes to degree of organization. I'm still about as puzzled as I was the night we first saw the "cold spot"!

The astronomical magazines loved the images and are climbing over one another to publish them. I have promised them to Sky & Telescope and to Astronomy magazine when we have proper versions from the image recorder (not just snapped from the TV screen like these ones - if you look closely you'll see the TV raster scan on the slides; we can do much better than that on a direct recorder). The final versions will also go into the NRAO slide series that the Hansen Planetarium distributes.

Stefi was also at the AAS meeting, she's job-hunting in the U.S. now, and we had a long discussion about follow-up observations. I've discovered that there is an old observation of the 3C353 region from the HEAO-1 X-ray astronomy satellite that showed an extended X-ray emitter in that direction. Stefi will put in a proposal to reobserve it with the new European ROSAT X-ray observatory. This will tell us more about the gaseous environment of 3C353. She also has some time coming up on the 4-meter optical telescope on Tenerife, and will make a deeper scan for optical line emission from the lobes and the jet. This is particularly interesting because we have clear evidence for a set of depolarizing filaments in the East lobe, features with very low polarization on the 1385 and 1665 MHz images but normal polarization at the higher frequencies. This is a signature of cool gas in a tangled magnetic field, which we may also be able to detect in optical line emission. It could be either in a shell of shocked intergalactic material around the radio lobe or (with rather extreme and unlikely parameters) part of the "cirrus" in our own Galaxy's interstellar medium along the line of sight. We'll look for gas at the local velocities of our Galaxy and of 3C353 in the attempt to decide which. We'll also do some more VLA observing, to try to tie down some properties of the filaments at higher resolution.

We decided to try to get some of these other observations done before writing up a formal paper on 3C353. Now that it has been "announced" to the radio world, it's worth taking the time to try to tie up some of the details. When we do put it all together, you'll be an author with us, of course.

I also had a long talk with Mike Norman, who's in the National Center for Supercomputing Applications at Illinois and who does numerical modeling of fluid dynamical processes in radio jets and lobes. He's very keen to try some detailed modeling of 3C353 to see if we can understand the hot spot and filament structures in some detail that way.

Have you given any more thought to the possibility of getting funds from Illinois to come back and work on this some more next summer? There will be lots to do, and I would be glad to have you back if it can be arranged. Let me know how things are going and whether you are interested in another summer of radio imaging in thunderstorm city! Another alternative might be to link you up with Mike Norman at Illinois for a while. But if you also have plans to work with John Dickel, don't worry - we'll keep the work on 3C353 going along anyway!

Mary sends you and Rebecca her best wishes.

Yours,

