RICE

Christopher M. Johns-Krull
Assistant Professor
Department of Physics and Astronomy
Rice University
6100 Main St., MS-108
Houston, TX 77005

January 17, 2003

Philip R. Goode
Distinguished Professor of Physics
Director, Big Bear Solar Observatory
New Jersey Institute of Technology
40386 N. Shore Lane
Big Bear City, CA 92314

Dear Phil,

I am writing in support of your proposal to upgrade Big Bear Solar Observatory (BBSO) by replacing its current principal telescope with a modern, off-axis, 1.6 m instrument (the NST). Such an advance would be a great asset to solar physics in the United States. BBSO is located at an excellent site and recent advances made in the use of active optics and image reconstruction techniques are now delivering spatial resolution comparable to the best observatories in the world. This new instrument will go even further, permitting advances in many of the outstanding problems in solar physics. Studies in recent years have revealed the ever finer spatial scales over which the key physics involved in solar phenomena are occuring. Most of this is related to the size scale of solar flux tubes. Current solar telescopes using adaptive optics are now approaching this scale, but their relatively small size results in a lack of light (yes even from the Sun) to produce images, spectra, magnetograms, etc., on a time scale relevant for many of the processes. This is particularly true for solar flares. Study of the reconnection process will greatly benefit from high cadence, adaptive optic imaging on a 1.6 m class telescope. Such high cadence, high resolution imaging will also be critical for studies of the evolution of the small scale magnetic field on the Sun. There is great current interest in this component. It is likely this small scale component is produced by a turbulent dynamo, theories of which are just now beginning to be developed. These theories need better data to be adequately tested. This small scale component may also produce micro-flaring events in sufficient number to heat the solar corona (one of the great outstanding problems in solar physics). The NST will make great strides in these areas. Completion of the NST in 2006 will permit important studies of the Sun at solar minimum, and ensure that it is fully operational and complimented with instrumentation before the next solar maximum.

While BBSO is a research unit of the New Jersey Institute of Technology, one of its great strengths and assets to the US community is the observatory's outside users program. I have used the facilities at BBSO on several occasions in my studies of proton acceleration in solar flares. Not only was BBSO readily accessible to me as an outside user, it provided the best observational setup for my experiment in terms of instrument facilities available in the US. The extremely good seeing at BBSO and the specific instrument capabilities of the Video Magnetograph (VGM) were both important to the success of my study. Though I have not used the new instrument yet, BBSO has upgraded the VGM with the Digital Vector Magnetograph, which provides more sensitivity and flexibility. This attests to the state-of-the-art facilities BBSO maintains, both for use by BBSO researchers, but for the solar community as a whole. Finally, university-based solar observatories in the United States are critical for the training of the next generation of solar physicists in our country. Our continued reliance on orbital technology for our daily lives requires a better understanding of the solar influence on the Earth. We call this space weather, and the NST at BBSO will provide many of the key observations required to advance our knowledge in this important field.

With Best Regards,

Christopher M. Johns-Krull