THE UNIQUENESS OF THE GEOGRAPHIC SOUTH POLE FOR THE OBSERVATIONS OF LARGE SCALE VELOCITY FIELDS ON THE SUN: SOME EXPERIENCES FROM A 120 HOURS CONTINUOUS H-ALPHA PATROL DURING JANUARY 1979

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Continuous solar observations over extended periods of time with the sun at constant altitude have heretofore been unobtainable. A solar observatory at the geographic South Pole will provide continuous homogenous observations of various solar features during the austral summer months. An optical site testing campaign during January 1979 showed seeing conditions at the site to be even better than expected. During the 1979-80 austral summer solar global oscillations will be studied with the Nice sodium cell spectrophotometer. Lifetime studies of the chromospheric network will be conducted with a 30-cm heliostat in combination with a 20-cm f/100 objective lens to provide a 20-cm solar image for monochromatic filters during the following year.

A report published a decade ago by the U. S. National Academy of Sciences (1970) devoted one chapter to a discussion of the potential advantages of conducting certain types of astronomical observations at the geographic South Pole. One unique feature of this site is that it affords the opportunity for obtaining continuous homogenous observations with a single instrumental system over extended periods of time. Furthermore, special benefits for solar research stem from the constant angular level of the sun in the sky and the uniform local geography of the high altitude polar plateau (2912 meters, mean atmospheric pressure 680 mb corresponding to roughly 3300 meters at midlatitude).

The first field experience in utilizing this unique site for this purpose was gained in January, 1979, during a fortuitously selected continuous period of roughly 120 hours. One striking conclusion, based upon the actual conditions prevailing during this interval, is that the seeing conditions greatly surpass expectations based upon the historical climatological record cited in the aforementioned report and rough seeing tests that were carried out subsequently.

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A specially constructed vertical telescope (8 cm f/18) provided two non-rotating solar images, one of which was photographed in H alpha, while the other was focussed on the guiding sensor array. It was determined that the resolution was limited by the telescopic resolving power. Concurrent sky brightness measurements with an Evans-type photometer revealed that the seeing was always coronal quality in the absence of clouds (i.e., at $r_{\odot}$ = 2, the average intensity was 8 millionths of that of the solar disk).

The telescope itself, as well as the camera, operated in the ambient temperature of approximately -30°C. The associated electronics and the H-alpha filter were contained in thermally controlled insulated boxes. The automatic guiding system maintained the position of the image without adjustment throughout the entire period.

The telescopic system was designed and constructed at the Bartol Research Foundation to accommodate the latest version of the Nice Observatory global oscillation experiment utilizing a sodium vapor spectrophotometer (Grec, Fossat, and Vernin; Grec and Fossat 1977). This experiment is scheduled to be performed at the U.S. Amundsen-Scott South Pole Station by an American-French collaboration (M. A. Pomerantz, E. Fossat and G. Grec), during the 1979-1980 austral summer. The following year, a 20 cm f/100 telescope providing a 20 cm solar image for monochromatic filters will be installed by an American-Swedish group (the present authors and A. Wyller). The initial observations will be devoted to investigations of the chromospheric network, particularly phase evolution and lifetime studies. In addition, the feasibility of obtaining high resolution observations of solar fine structure with larger apertures will be evaluated.

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