Canadian Network for Space Research/ University of Calgary Polar Cameras

The Polar Cameras are a pair of advanced all-sky imagers for airglow and auroral studies. Each of the imagers has a fish-eye objective lens, telecentric fore-optics, a five-position filter wheel, and an unintensified CCD detector thermoelectrically cooled to below -40 C. Such cooling, combined with advanced readout technology, provides extremely low-noise images. Both imagers are controlled by a 80386-based PC which provides fully automatic and programmable turn-on and turn-off, data acquisition, and data archiving to 4mm DAT. Each of the imagers and its electronics is sealed in an insulated enclosure purged with dry nitrogen, and is capable of operating outdoors continuously through the four-month-long polar night.

The imagers differ only in the filters through which they image the sky. In auroras the Polar Camera images the [OI] 630.0 nm line and the N2+ Meinel (2,0) band simultaneously, to allow diagnosis of the mean energy of the precipitating auroral electrons. In high-altitude polar auroras the same information may be obtained from the 630.0 nm and [OI] 557.7 nm emissions, which are also imaged simultaneously. When auroras are not present, these filters also image airglow emissions to study dynamic processes in the neutral and ionized upper atmosphere. The Polar Camera also obtains simultaneous images of the near-IR OH airglow in two adjacent wavelength bands (829 nm and 835 nm), from which the temperature at the

mesopause (~85 km altitude) can be deduced. In addition to these features, the Polar Camera can image auroral emissions at 520.0 nm ([NI]) and 668 nm (N2 1 Positive (5,2) band), and the background continuum emissions at 608 nm, 714 nm, and 820 nm.