Development of New Solar Optical Observation Systems at Mitaka, NAOJ

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We present three optical observation systems of the Sun being developed at Mitaka, NAOJ. The first is a data acquisition and processing system of solar full-disk digital images (2k×2k pixels) put into operation in April 1998. This system is aimed at an automated detection and reduction of sunspots and faculae and at replacing the conventional hand drawing observation being continued since 1930's at Mitaka.

The second is a full-disk observation system in He 10830Å line. The optical system consist of a 15cm aperture refractor, a telecentric optics, a Lithium Niobate etalon of 5cm aperture, and a 2k×2k CCD camera. The etalon whose passband is about 0.5Å in the telecentric beam of F/30 can be tuned around 10830 Å by changing the voltage applied. The performance of the etalon and test images are presented.

The third is a tridimensional spectroscopic observation system for a partial sun. Tridimensional spectroscopy or integral field spectroscopy is a technique to produce a spectrum of each spatial elements in an extended, two-dimensional field. The scientific advantages of this technique for studies of localized and transient solar surface phenomena such as flares are obvious, because light from the full extent of the structures is sampled simultaneously; one can make both monochromatic images and line profile analyses in two-dimensional field. One of the techniques to realize tridimensional spectroscopy is a microlens- array spectrograph, in which pupils made by the microlenses works as multi-slit of a circular arerture. We describe the development of the microlens-array spectrograph, which gives the Hα spectrum of 20Å wide sampled at 0.13Å for a 1.4 x 1.4 square- arcsec element simultaneously over a 57 x 57 square-arcsec FOV.