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Temperature distribution along meridional line of the Sun obtained with Hinode

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Abstract. We discover clear temperature variation along the central meridional line from the equator to latitude of 50° with the broadband filters of the Solar Optical Telescope (SOT) aboard the Hinode. The 3-color (G band: 430.5 nm, Red: 668.4 nm, Green: 550.0 nm, Blue: 450.5 nm) mosaic observations with field of view of $112'' \times 223''$ seamlessly cover the central meridional line with 20 exposures and the East-West line with 13 exposures. We perform elaborate calibrations to correct the effects of SOT instrument throughput, CCD quantum efficiency and flat-field. The temperature was obtained from the ratio of the two-color photometric data. The limb-darkening was corrected with the East-West mosaic data, and the temperature distribution along the central meridional line is obtained with respect to that along the East-West line. We find that the temperature increases from the equator to latitude of 50° by 2.4K. We apply the baroclinic thermal wind equation for the observed latitudinal temperature i.e. entropy profile. We point out that the temperature distribution of the photosphere through precision photometry opens a new window for measurement of the internal structure of the Sun.