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Short Communication

Modeling the land surface temperature using thermal remote sensing at Godhra, Gujarat

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The gridded information on temperature are generally being used for various application in agriculture. Most of the methods to determine spatial variation in temperature often use spatial interpolation and extrapolation of data from the nearest meteorological stations. The problem with temperature interpolation and extrapolation is that they depend on many local parameters that can influence its estimation spatially-distributed (Marquínez *et al*. 2003). Satellite remote sensing technique has become an effective tool for obtaining vital information(Choudhury 1997). Shah *et al.* (2012) estimated the spatial distribution of minimum and maximum air temperatures using land surface temperature (LST) and normalized differential vegetation index (NDVI) products from the MODIS sensor and air temperature (Ta) data from collected from automatic weather stations (AWS) over Gujarat region of India. The results obtained showed the potential of MODIS product for satisfactory estimation of maximum and minimum temperature. Dakhore *et al.*(2011) applied MODIS AQUA derive evapotranspiration (ET) values for computation of mean water use efficiency (WUE) for three growth stages viz. vegetative, flowering and grain filling in wheat growing districts over semi-arid agro ecosystem of Gujarat. This present study was conducted to explore the possibilities of remote sensing imagery along with GIS to simulatemaximum and minimum temperature at two sites CAET, Godhra campus and an agricultural research farm at Kakanpur region of Gujarat.

The maximum and minimum temperature data were collected from Maine Maize Research Station (MMRS), AAU, Godhra, Gujarat and the MODIS imagery obtained for different dates during January to April and July to September 2015 were processed to extract all the pixel values over CAET, Godhra and Kakanpur. Later on pixel values of these two stations were applied to simulate the temperature with the pixel values of respective gauge station.

The daily MYD11A1 LST product was constructed with the results in the MOD11_L2 products of a day through mapping the SDSs (scientific data set) of all pixels in MOD11_L2 products onto grids in the sinusoidal projection and averaging the LST values of overlapping pixels in each grid with overlapping areas as weight.

A relationship between pixel values of all the MYD11A1 product of MODIS remote sensing data including LST_Day_1km, QC_Day, Day_view_time, Day_view_angl, LST_Night_1km, QC_Night, Night_view_time, Night_view_angl, Emis_31, Emis_32, Clear_day_cov, Clear_night_cov was established and the results for LST_Day_1km, Emis_32 for Godhra station, whereas results for LST_Night_1km, are presented for both the Godhra and Kakanpur stations using MODIS imagery.

Date wise maximum temperature, minimum temperature and pixel value obtained for Godhra gauge station using sub database-3 LST_DAY_1KM (8-bit unsigned integer) are shown in Fig. 1.Pixel values extracted for the Godhra gauge station were modelled to simulate maximum and minimum temperature by using regression equation. The relationship between temperature pixel value obtained for LST_ *Emis _32* and that with LST_NIGHT_1KM are shown in Fig.3.

Based on the scatter plot for each site in the figures, the validation results derived from the temperature from the ground-measured station data were in good agreement with the pixel values derived using the MODIS imagery (Fig. 4). In general, the regression equation were able to model the maximum and minimum temperature in Godhra using LST_NIGHT_1KM remote sensing imagery a promising agreement between the MODIS 1-km land surface temperature products and the ground-measured temperatures

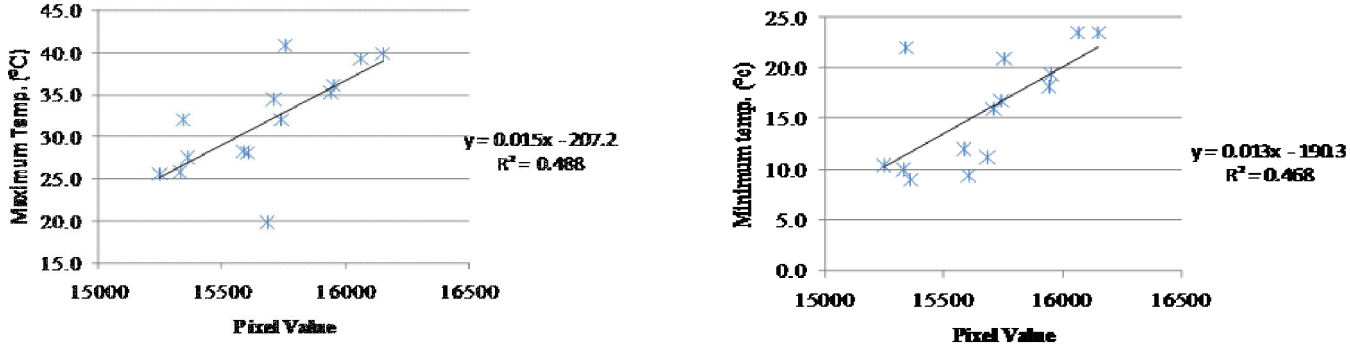

Fig. 1: Relationship between pixel value and minimum and maximum temperature in Godhra gauge station using Subdatabase-3, LST_DAY_1KM (8-bit unsigned integer) MODIS imagery.

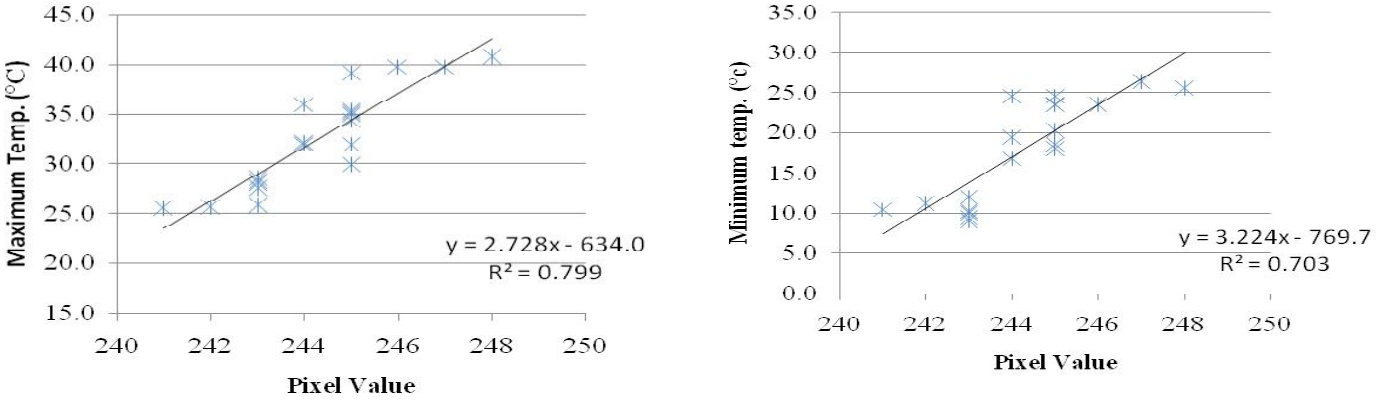

Fig. 2: Relationship between pixel value and minimum and maximum temperature in Godhra gauge station using Subdatabase-3, Emis_32 (8-bit unsigned integer) MODIS imagery.

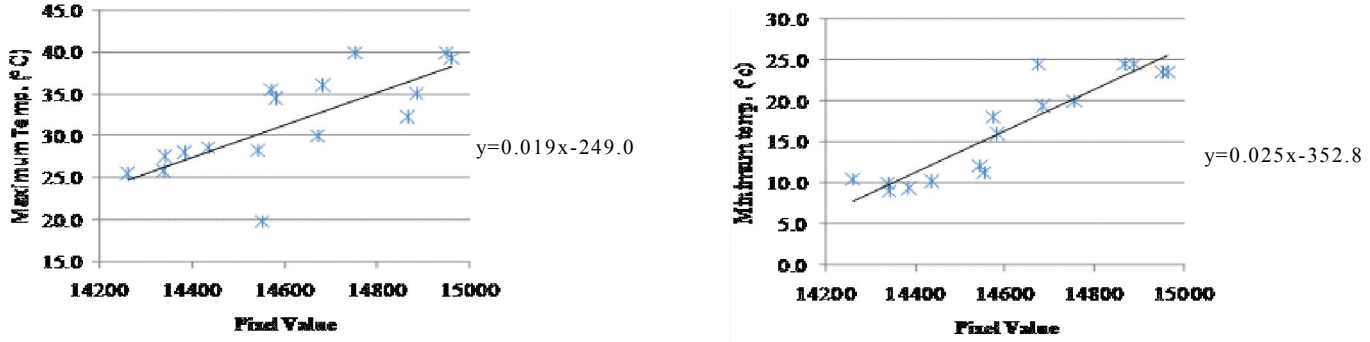

Fig.3: Relationship between pixel value and minimum and maximum temperature in Godhra gauge station using Subdatabase-3,LST_NIGHT_1KM(8-bit unsigned integer) MODIS imagery.

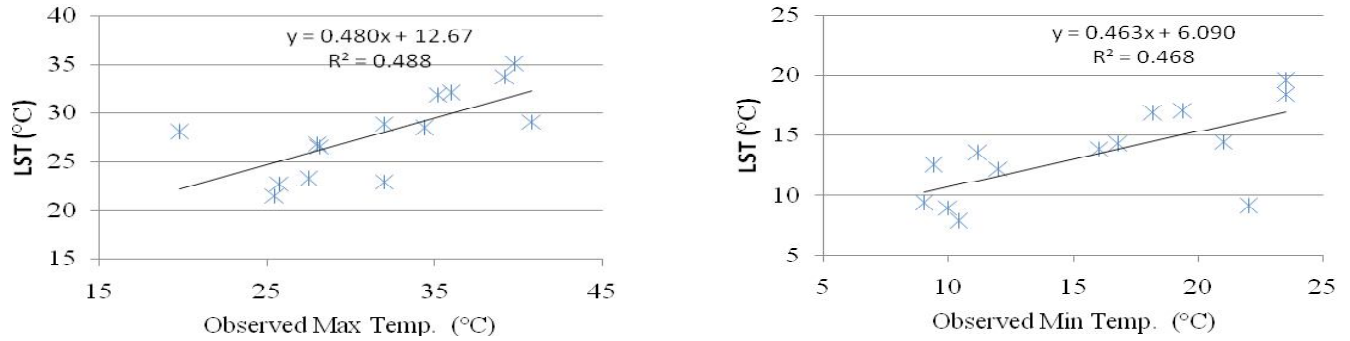

Fig.4: Relationship between LSTfrom MODIS imagery and (a) observed maximum temperature and (b) observed minimum temperature in Godhra gauge station.

for the Godhra station, indicated the applicability of selected MODIS imagery for temperature simulation in the whole Kakanpur watershed and adjoining area.

Thus it can be concluded that LST_Night_1km band could be used to calculate temperature over the CAET, Godhra and Kakanpur gauge stations of middle Gujarat.

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