



Questions & Answers Session 1

Please type your questions in the Question Box. We will try our best to get to all your questions. If we don't, feel free to email Amita Mehta (amita.v.mehta@nasa.gov) or Sean McCartney (sean.mccartney@nasa.gov).

Question 1: Does the building material matter in Urban Heat Islands, or is it negligible?

Answer 1: Properties of urban materials, in particular albedo, thermal emissivity, and heat capacity, influence urban heat island development, as they determine how the sun's energy is reflected, emitted, and absorbed. Building materials in urban areas generally reflect less and absorb more of the sun's energy. This absorbed heat increases surface temperatures and contributes to the formation of surface and atmospheric urban heat islands. Not negligible.

Question 2: How can Urban Heat Island research actually change urban planning for well established urban areas e.g. New York, Chicago, etc. (all large cities that have established infrastructure?)

Answer 2: Research into UHI helps city planners by understanding where to 1) increase tree and vegetative cover, 2) install green roofs, 3) install cool—mainly reflective—roofs, 4) use cool pavements (either reflective or permeable), and 5) utilize smart growth practices. Taken together, these actions can contribute to lowering overall UHI within hot spots of urban areas and provide greater benefits to residents.

Question 3: Can we analyze the urban heat island in the ArcGIS and QGIS?

Answer 3: Yes, LST products can be acquired from the websites referenced in today's training. Once you download them you can bring them into a GIS (either ArcGIS or QGIS) for further analysis (ID hotspots, time series trends, etc)

Question 4: How does one identify the impact of the Urban Heat Island effect on seaside megacities like Chennai, Mumbai of India with comparison to other Inland megacities like Delhi Kolkata?

Answer 4: UHIs are highly localized. Despite the fundamental physics behind them being similar, they are strongly modulated by local dynamics. It's best to identify the



impacts of UHI on cities individually. Past, long term LST data can help assess differences in UHI extent and strength among various cities.

Question 5: Landsat LST - When you say over the US, is it only the continental US? Does it Include US Territories?

Answer 5: Landsat LST products are currently available for the conterminous U.S., Alaska, and Hawaii.

Question 6: Are there future plans to generate Landsat LST data for areas other than the US? If so, is there a tentative date?

Answer 6: Yes, the USGS has plans to generate Landsat LST products for areas outside of the US, but currently it has not been released. The methodology we showed today using GEE allows you to generate LST for any area with Landsat coverage. If you join the third part of the webinar series we will have a guest presenter from the USGS EROS center and you can direct this question to him.

Question 7: With the use of MODIS LST data, certain rural areas are much hotter than the urban area in certain cities during the day, and urban areas get hotter comparatively in the night. What could be the cause?

Answer 7: Again, UHIs are highly localized. There might be rural areas with a high level of built up surfaces. This could cause these areas to be hotter than urban areas. As well, many cities in arid environments have planted trees throughout the city which cool the city and lead to temperatures being hotter in outlying areas. Regarding urban areas being hotter comparatively at night, many building materials, such as steel and stone, have higher heat capacities than rural materials, such as dry soil and sand. As a result, cities are typically more effective at storing the sun's energy as heat within their infrastructure which is radiated at night warming the city. It is also possible that rural areas with dry, arid surface heat up (cool down) more quickly during day (night) compared to built-up urban areas.

Question 8: Will the codes be provided for use in Google Earth engine at the end of the webinar?

Answer 8: All codes used in today's webinar can be accessed at the repositories provided in the slides. These can be found on the slides uploaded to the training page on ARSET's website. <https://appliedsciences.nasa.gov/join-mission/training/english/satellite-remote-sensing-urban-heat-islands>



Question 9: Can I use urban heat island data for sustainable urban planning in favor of reducing temperature in a city?

Answer 9: Yes, the LST products described today can be used for urban planning to better understand where to 1) increase tree and vegetative cover, 2) install green roofs, 3) install cool—mainly reflective—roofs, and 4) use cool pavements (either reflective or permeable).

Question 10: Is there consistent LST data starting from the 1980s? Just for trend analysis.

Answer 10: You can derive LST since 1980 using AVHRR or GOES. Landsat LST are available from mid-1982 to present and can be used to see trends.

Question 11: While deciding which satellite to use to retrieve data for UHI, is it better to use something like MODIS since it has LST & E simultaneously, yet the resolution is better in Landsat (30m)?

Answer 11: For looking at spatial LST patterns within urban areas Landsat is better because of the higher spatial resolution. MODIS data can provide area-integrated, continuous time-series of LST -- so for looking at frequent LST variations MODIS is better due to its temporal resolution. All these sensors are affected by clouds, however, so LST can not be derived for overcast days.

Question 12: Which season and data should be considered best to study urban heat island effects? And also, are the outputs of all the available datasets the same or different?

Answer 12: Usually summer season data are considered for looking at urban heat island effect - when LST are maximum - but all seasons will show indication of urban areas - warmer than surrounding non-urban, open areas. For data - please refer to the answer to question 11. The data sets we mention are not all in the same format but can be downloaded as Geotiff images using the data access tools. It is recommended to check metadata for each dataset as there may be scaling factors that you have to apply to LST values.

Question 13: What are appropriate atmospheric correction algorithms to apply to Landsat TIR data to compute LST? Are these already preprocessed?



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Answer 13: yes, Landsat LST are already processed as we saw in the presentation and are available from USGS EarthExplorer. But these are for the US only. What Sean is showing in GEE can be used to derive LST from Landsat. Landsat 8 corrections are different from Landsat 4, 5, and 6.

<https://www.usgs.gov/core-science-systems/nli/landsat/landsat-collection-1-surface-reflectance>

<https://www.mdpi.com/2072-4292/12/9/1471>

Question 14: Do you know any good tutorials or courses on how to use GEE with Python instead of Javascript?

Answer 14: I'm familiar with using JavaScript but I'm sure there are a number of tutorials on YouTube or online that can help you in Python.

Question 15: Can the CM-SAF SMW algorithm be used for any of the satellites' data, for example, ASTER data or ECOSTRESS?

Answer 15: LST are available from ASTER and ECOSTRESS as we just saw. CM-ASF algorithm is used with Landsat data - you may try to apply it to ASTER/ECOSTRESS with appropriate modifications to the algorithm.

Question 16: Can you share the GEE repository again and go over how to add the repository to our GEE?

Answer 16: The GEE repository can be accessed from the slides found on the training page on our website. By clicking on the repo it automatically adds it to your Scripts Manager.

<https://appliedsciences.nasa.gov/join-mission/training/english/satellite-remote-sensing-urban-heat-islands>

Question 17: How do I mask the ocean's area if it comes within the AOI while estimating LST?

Answer 17: There are water masks available from most of the sensors [e.g. Landsat, ASTER, MODIS, VIIRS, and ECOSTRESS.

Question 18: When we specify a month as in demonstration, what are the RGB bands? Means, medians over date range? Computed LST ..is it mean?

Answer 18: The RGB bands depend on the Landsat mission you specify. RGB bands are different for Landsat 4,5 (TM) and Landsat 7 (ETM+) than for Landsat 8 OLI.



LST estimates from the open source GEE code are actual LST estimates in Kelvin for a specific image.

<https://www.mdpi.com/2072-4292/12/9/1471>

Question 19: With the export code, are we able to export more than one LST image (different dates)?

Answer 19: With the export code you are able to export the LST image (or a different image, [e.g. EM, FVC, TIR BT, etc.]) from the Landsat scene in question. To export different dates you will have to select a different date range and rerun the code before exporting.

Question 20: Can UHI maps at high spatial resolution be used to calibrate weather station data? In other words, if we are interested in both high spatial and temporal resolution temperature data, can we use the UHI map developed in the exercise to calibrate our weather station (high temp resolution)?

Answer 20: Weather station data is used to calibrate and validate satellite data, not the other way around. We advise against this as LST from any satellite platform/sensor is an estimate, and even within higher spatial resolution imagery such as Landsat, there is still considerable variability within a given pixel.

Question 21: How to provide legend in GEE?

Answer 21: The Earth Engine code does not generate a legend. There are a number of tutorials online to help you add a legend to your map.

Question 22: How do you get that geometry of interested study area?

Answer 22: To get the geometry for your study area you will need to know the longitude and latitude for the southeast corner of your area of interest, as well as the northeast corner for your area of interest. You can find these by going to Google Maps or elsewhere online.

Question 23: Question about the code: what happens when there are no cloud-free images, or can we adjust this to a threshold of cloudiness?

Answer 23: If there are no cloud-free images you will need to adjust the date range in the code.

Question 24: How do you calculate the mean LST for two images of the same month?



Answer 24: To calculate the mean LST for two images of the same month, you will need to add the two images together and divide by 2.

Question 25: In GEE you can set a date range (e.g. daily or monthly). Does it calculate an average when you have monthly or yearly for example?

Answer 25: No, the date range specifies **when** you want to derive LST estimates from the Landsat catalog from GEE. It will select the best cloud-free image from the parameters you specify in the code. The code does not calculate the average when you have a monthly or yearly range. You will have to write a new script that adapts the open-source code to do so.

Question 26: Is it possible to create a time series, which automatically provides a biophysical variable (e.g. NDVI) for my AOI for every month or do I have to adjust each month manually in GEE?

Answer 26: It is possible to do so but you will have to create a new function and incorporate it with the open-source code provided in the training.

Question 27: What is the unit of computed LST?

Answer 27: LST estimates measure the temperature of the surface of the Earth in **Kelvin (K) and there is a scale factor (0.1) that you multiply the data with.**

Question 28: How do we get the GEE link to this example_1?

Answer 28: You can access the code through the ARSET training page or from the creator of the code: Ermida et al (2020).

<https://appliedsciences.nasa.gov/join-mission/training/english/satellite-remote-sensing-urban-heat-islands>

<https://www.mdpi.com/2072-4292/12/9/1471/htm>

Question 29: Which preprocessing steps for Landsat 4,5,7,8 Level 1, Tier 1 should we do before calculating the UHI, and NDVI? Is it okay to calculate the indices directly from Landsat level 1 tier 1 without preprocessing?

Answer 29: The data are organized into Tiers based on their quality. Landsat scenes with the highest available data quality are placed into Tier 1, being suitable for time-series analysis, while the remainder are assigned to Tier 2. The results shown in this work are entirely based on Tier 1 data, but the code may equally be applied to Tier 2



data. The red and near-infrared (NIR) bands used to derive NDVI are calculated from the Surface Reflectance (SR) values and have already been atmospherically corrected.

Question 30: Can we use LST at nighttime to understand heating energy efficiency in residential areas (e.g. energy escaping from buildings)?

Answer 30: I am unaware of any study using Landsat-based LST estimates to understand heating energy efficiency in residential areas.

Question 31: Is there any easy way using GEE to obtain the Geometry (i.e. long/lat) for any area of interest?

Answer 31: Yes, the **Inspector** tab next to the Task Manager lets you interactively query the map. When the **Inspector** tab is activated, the cursor becomes a crosshair which will display the location and layer values under the cursor when you click on the map.

Question 32: Which Landsat 8 bands are used in this script? TOA or surface reflectance?

Answer 32: TOA brightness temperatures are used for the Landsat's thermal infrared (TIR) channels. Red and near-infrared (NIR) bands are used to derive NDVI which is calculated from surface reflectance values.

Question 33: How can we find the legend for the LST image to know the range of values and the pseudo colours refer to which values?

Answer 33: The Earth Engine code does not generate a legend. There are a number of tutorials online to help you add a legend to your map. To understand the range of values and the pseudo colors you'll need to look at the palette created in the code (e.g. var cmap1). You can also refer to the publication below:

<https://www.mdpi.com/2072-4292/12/9/1471/htm>

Question 34: Can I directly change in the example 1 the area of analysis by dragging a rectangle? Is there a way to input your own polygons into google earth engine map?

Answer 34: You can adapt the code by dragging a rectangle or drawing a polygon for your area of interest, but you'll have to assign the variable for your area of interest as the geometry. There are a number of tutorials online showing you how to create your own area of interest within GEE.



Question 35: How accurate is the use of GEE?

Answer 35: GEE is only as accurate as the data and the code you perform your analysis. The data from the Landsat series are considered consistent and inter-calibrated, and the accuracy of the open-source code can be found from the publication below:

<https://www.mdpi.com/2072-4292/12/9/1471/htm>

Question 36: Does LST have any effect on hydrological or agricultural drought in an area?

Answer 36: Yes, LST has a big effect on hydrological or agricultural drought in an area. To learn more please refer to the ARSET training, *Satellite Remote Sensing for Agricultural Applications*:

<https://appliedsciences.nasa.gov/join-mission/training/english/satellite-remote-sensing-agricultural-applications-0>

Question 37: Hello, I was wondering if there is a need for intercalibration of LST data when using the landsat sensors, like you would require with nighttime light data?

Answer 37: The USGS derives the TOA values from raw orthorectified digital numbers data using the respective calibration coefficients. The data from the Landsat series are considered consistent and inter-calibrated.

https://www.usgs.gov/core-science-systems/nli/landsat/product-information?qt-science_support_page_related_con=3#qt-science_support_page_related_con

Question 38: Since what is measured from satellite sensors are at canopy layer what happens to the boundary layer heat islands, how are they estimated?

Answer 38: Correction, satellite sensors estimate **land surface temperature**--a measure of the temperature of the surface of the Earth in Kelvin. Canopy layers are measured by in situ sensors mounted on fixed meteorological stations or mobile traverses. The boundary layer is measured by tall towers, radiosondes, and aircraft, and can be estimated through models.

Question 39: Is it possible to downscale the LST to even lower resolution?

Answer 39: Yes, there are a number of publications describing statistical methods used to downscale MODIS and Landsat data. An internet search using Google Scholar will bring up a number of recent publications.



Question 40: You had mentioned Landsat scale factor of 0.1 on slide 38. What do you mean by scale factor?

Answer 40: When you download Landsat Analysis Ready Data (ARD) from USGS as a “surface temperature” product, USGS has multiplied the temperature in Kelvin by a factor of 10. To change the surface temperature to its actual value, you need to multiply the image by a factor of 0.1 so values are represented in actual Kelvin temperatures as observed at the time of satellite overpass.

Question 41: Is the data atmospherically corrected in Ermida’s Module? Can this module be applied in India?

Answer 41: TOA brightness temperatures are used for the Landsat’s thermal infrared (TIR) channels. Red and near-infrared (NIR) bands are used to derive NDVI which is calculated from surface reflectance values. Surface reflectances have been atmospherically corrected. Yes, you can use the code provided by Ermida et al to derive LST estimates for India.

Question 42: Satellite data help to analyse surface thermography. Will you present a method to analyse the correlation between surface thermography and air-UHI?

Answer 42: We will not be presenting any methods in this webinar series to analyze the correlation between surface thermography and air-UHI. There are a number of publications online we recommend you research to learn more.

Question 43: Can LST be used to differentiate between different types of buildings (e.g. between residential and commercial buildings)?

Answer 43: It will depend on your access to in situ data and high spatial resolution LST products (< 10m).

Question 44: What would be the best way to quantify the need for vegetation and ensure that increasing vegetation quantity will compensate for certain warming impacts produced by hard and dark surfaces (for the benefit of urban planning)?

Answer 44: I don’t know the answer to this off hand, but below are a couple publications which might answer your question:

https://www.fs.fed.us/psw/topics/urban_forestry/products/2/cufr_646_Muncpl%20For%20Bnfts%20Csts%20Five%20Cty.pdf



https://www.epa.gov/sites/production/files/2017-05/documents/reducing_urban_heat_islands_ch_2.pdf

Question 45: How can the concept of Urban Heat Island be used in urban and regional planning? What changes of perspective in the planning approach are vital considering the concept of urban heat islands?

Answer 45: Please refer to the website below from the U.S. Environmental Protection Agency to learn more about mitigating the effects of UHI.

<https://www.epa.gov/heatislands/heat-island-cooling-strategies>

<https://www.epa.gov/heatislands/heat-island-compendium>

Question 46: Can we incorporate air quality data into UHI calculation, since atmospheric pollution (e.g SO², NO²) affects the temperature of a local region?

Answer 46: Yes, stay tuned for the second part of the webinar series where you'll learn more about how to incorporate air quality data in situ into UHI assessments.

Question 47: What can local areas do to increase the resolution of satellite data to work in an area that's ~6 square miles?

Answer 47: The best option is to use the highest resolution LST-product that is freely available. Currently these are LST estimates derived from the Landsat missions. There are statistical methods to downscale MODIS-derived LST using Landsat imagery for a higher temporal and spatial analysis. Refer to literature online for more information.

Question 1: Are there many local sources of information on anthropogenic heat? It's so clearly felt in cities in summertime, but seems like not a lot of data on it.

Answer 1: There are not a lot of sources of information for anthropogenic heat. Below is a link to a paper that provides open source code to derive global anthropogenic heat estimation based on high-resolution nighttime light data.

<https://www.nature.com/articles/sdata2017116>

Anthropogenic Heat Flux data, at multiple spatial scales, is also available from NCAR/UCAR at the link below:

<https://www.cgd.ucar.edu/tss/ahf/#:~:text=Nearly%20all%20energy%20used%20for,within%20Earth's%20atmosphere%20or%20land.&text=Globally%2C%20in%202005>



[%2C%20this%20anthropogenic.because%20of%20anthropogenic%20greenhouse%20gases.](#)

Question 48: What is the product name of the UHI in the USA that was in slide 23. Is it available?

Answer 48: Yes, Landsat Level-2 “Provisional Surface Temperature (ST)” is available for the conterminous US as analysis ready data (ARD) from the USGS. More information on data acquisition can be found on slides 37 & 38, and from the link below:

https://www.usgs.gov/centers/eros/science/usgs-eros-archive-landsat-archives-landsat-level-2-provisional-surface?qt-science_center_objects=0#qt-science_center_objects

Question 49 : What type of atmospheric corrections are used in processing LST products?

Answer 49: The SR data from Landsat 8 are generated using the Land Surface Reflectance Code (LaSRC) algorithm, where atmospheric correction is performed using a radiative transfer model, auxiliary atmospheric data from MODIS, and makes use of the coastal aerosol band for aerosol inversion tests. For Landsat 4-to-7, SRs are derived with the Landsat Ecosystem Disturbance Adaptive Processing System (LEDAPS) algorithm, which calculates the radiative transfer for atmospheric data from MODIS and NCEP.

https://www.usgs.gov/centers/eros/science/usgs-eros-archive-landsat-archives-us-landsat-analysis-ready-data-ard-level-2?qt-science_center_objects=0#qt-science_center_objects

Question 50: Can you explain the differences in products of LST, brightness temperature, and radiative temperature?

Answer 50: The brightness temperature is a measurement of the emitted radiation traveling upward from the top of the atmosphere to the satellite, expressed in units of the temperature of an equivalent black body.

When Earth absorbs the sun's energy (most of which arrives in the form of visible light), the energy changes into heat. Some of that energy, in turn, is then radiated away from Earth's surface as radiative temperature. Land Surface Temperature is the radiative skin temperature of the land derived from solar radiation. A simplified definition would be how hot the "surface" of the Earth would feel to the touch in a particular location.



(The brightness temperature includes contributions from the surface as well as the atmosphere.)

Question 51: What is the average download time of a typical dataset (for example: MODIS)?

Answer 51: This depends on your connection. It can take a matter of seconds to minutes. MODIS datasets are smaller in file size than Landsat datasets, so much depends on what connection you have and what files you are trying to acquire.

Question 52: Is there a need to apply orbital corrections for correcting sensor viewing angle to derive LST?

Answer 52: No, you do not need to apply orbital corrections to correct sensor viewing angles to derive LST from Landsat data. To learn more about how USGS applies orbital corrections and calibrations, refer to the link below:

https://www.usgs.gov/core-science-systems/nli/landsat/calibration-validation?qt-science_support_page_related_con=2#qt-science_support_page_related_con

Question 53: To observe the nighttime UHI, which satellite product of LST is popular to be used? What's the best spatial resolution?

Answer 7: ASTER has 90m resolution and is available at night time. MODIS & VIIRS also have night time LSTs at 1 km resolution.

Question 53: There was discussion about products from individual sensors, are there any products that use data that combine data from multiple sensors to improve the temporal/spatial coverage?

Answer 53: You can find publications - fusion of data sets are used for research but no such product to our knowledge is available.

Question 54: What are general preprocessing steps to derive LST from any sensor?

Answer 54: There are different preprocessing steps to derive LST for varying sensors. We will include them in the Q&A doc before we post it to the website within a couple weeks.

You also have the opportunity to ask this question during part 3 when we'll have a guest presenter from the U.S. Geological Survey, Earth Resources Observation and Science Center.



https://www.usgs.gov/centers/eros/science/usgs-eros-archive-landsat-archives-landsat-8-olitirs-level-2-data-products?qt-science_center_objects=0#qt-science_center_objects

https://www.usgs.gov/centers/eros/science/usgs-eros-archive-landsat-archives-us-landsat-analysis-ready-data-ard-level-2?qt-science_center_objects=0#qt-science_center_objects

Question 55: Are the coordinates defined manually, or can they be created as a polygon?

Answer 55: USGS AppEEARS and NASA Earthdata will allow uploading your own shapefile polygon. EarthExplorer will allow drawing a polygon. For GEE, you will have to specify two separate lat-long to create a bounding box around your area of interest.

Question 56: How do we eliminate radiometrically broken landsat images and cloudy images?

Answer 56: In EarthExplorer you can choose images with cloud fraction criteria. You can also view images before downloading. In GEE, scripts exist that will select the least cloud-covered images to use.

Question 57: How do we identify the geometry rectangle for our site of interest?

Answer 57: Please see Q10 answer. A simple click and drag can be used to define the polygon of your choice.

Question 58: Why are there blank gaps without data in the LST layer?

Answer 58: The gaps are because of areas between swaths that are not observed. This is unavoidable for a particular sensor. Also when clouds are present you will have missing data.

Question 59: I signed up for a GEE account earlier today and I am having trouble adding the GEE repository. When I click on the link to the repository (https://code.earthengine.google.com/?accept_repo=users/sofiaermida/landsat_smw_lst) I am directed to my empty GEE. How can I fix this?

Answer 59: Go to your GEE account, scripts manager, under that drop down you should see the repository. Sometimes it takes 15 minutes (or longer) for any repos to be uploaded to your Earth Engine account.



Question 60: What is the best spatial resolution available with GEE for LST exercises?

Answer 60: Currently the best spatial resolution for global LST in GEE is 30m (Landsat-based) from the open-source code provided in today's webinar.

Question 61: If I am trying to measure the LST of a product that has been installed to a road to mitigate UHI, what would be the best way to approach that? Would it be by studying the data before and after the application date?

Answer 61: Yes, looking at a time series of data collected from before any mitigation efforts were undertaken to after the mitigation efforts will indicate the efficacy of what was implemented.

Question 62: Many of the researchers calculate urban heat island intensity (UHII). What is the correct method to calculate it over a city? How to delineate urban or non urban areas and to average the temperature (LST) over them?

Answer 62: Based on land cover data we can identify urban and non-urban areas. For many urban areas boundary polygons may be available also.

Question 63: Is there a way to consider vertical surfaces in cities? Maybe by stereo satellite imagery?

Answer 63: The Japan Aerospace Exploration Agency (JAXA) provides a Digital Surface Model (DSM) for most of the planet derived from imagery collected from the Advanced Land Orbiting Satellite (ALOS) mission. DSM refers to data of the heights including objects on the ground such as buildings and vegetation. Certain cities collect higher resolution DSMs from aerial LiDAR missions which might be available depending on your city of interest.

<https://www.eorc.jaxa.jp/ALOS/en/aw3d30/index.htm>

Question 64: There is some limited nighttime imagery from Landsat 4-8. Is there a simple way to adapt this code and processing method to work for nighttime Landsat TIRs products?

Answer 64: Data products must contain both optical and thermal data (e.g., LC08 products for Landsat 8) to be successfully processed to Surface Temperature, as ASTER NDVI is required to temporally adjust the ASTER GED product to the target Landsat scene. Therefore, nighttime acquisitions cannot be processed to Surface Temperature.



https://www.usgs.gov/core-science-systems/nli/landsat/landsat-provisional-surface-temperature?qt-science_support_page_related_con=0#qt-science_support_page_related_con

Question 65: Is there some code to infer air temperature from LST available in GEE?

Answer 65: I am not aware of any.

Question 66: About the period time of orbit, is that time based on the timezone or is it the same time as every timezone?

Answer 66: Landsat has a 16-day repeat cycle with an equatorial crossing time of 10:00 a.m. +/- 15 minutes (**mean local time**).

Question 67: The extent of the analysis area must necessarily cover a single path/row of the satellite image?

Answer 67: As the code is provided, yes, the extent of the analysis area covers a single path/row.

Question 68: the LST products are readily available, why do we still need emissivity and other data to derive LST by ourselves?

Answer 68: LST products are provided by the USGS as Analysis Ready Data (ARD) only for the conterminous US. If your area of interest is outside the US, you need to calculate LST using surface reflectance-based NDVI and emissivity data from ASTER GED.