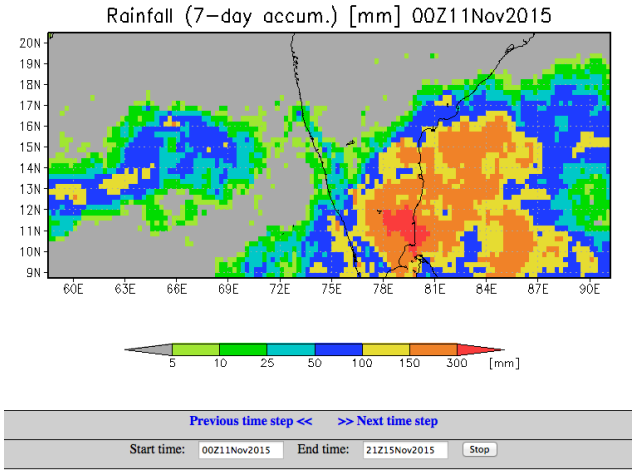
ARSET Advanced Webinar on Using NASA Remote Sensing for Flood Monitoring and Management: Week 4

Exercise: India Flood November 2015

Part 1a: Monitor Rainfall and Flooding Intensity Using GFMS

- Go to http://flood.umd.edu/
- Scroll down to **Rainfall (7 – day accum) [mm]**
- Using **'Pan the map'** and **'Zoom in' and 'Zoom out'** arrow zoom in on Southern India
- Under the map enter '**Start time:'** 00Z10Nov2015 and '**End time':** 21Z15Nov2015
- Click on **Animate** and observe how the rainfall changes
- Note the maximum amount of 7-day accumulated rain observed during 10-15 November, 2015
- Note the approximate area (in latitude and longitude) where heavy rainfall is observed



- From the major rivers map of India shown below and the rainfall maps from GFMS which river(s) are likely to be flooded?

- Now from the '**Plot different variables:'** on the right side of the map select '**Flood Detection (Depth)**' from the drop-down menu and click on **'plot'**

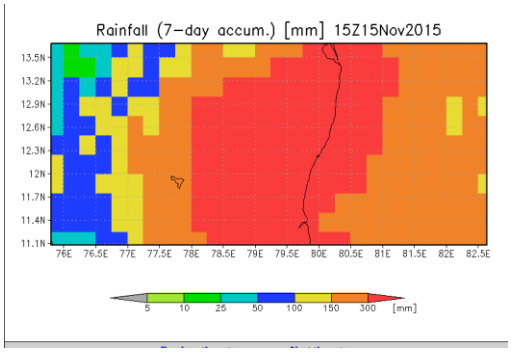
- Repeat map animation steps for the **'Flood Detection (Depth)'**. That is enter '**Start time:'** 00Z10Nov2015 and '**End time':** 21Z15Nov2015 and click on **Animate** and observe how the flood intensity is changing
- Were the rivers you thought would be flooded based on the rainfall animation show high **flood detection depth?**
- Which river had maximum intensity flooding? Note the date, time and maximum flood depth observed.

Part 1b: Rainfall Time Series as Flood Indicator

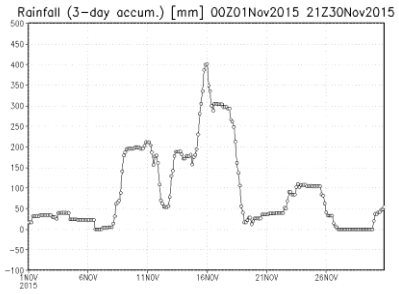
- From the **'Plot different variable'** select **'Rainfall (3-day)**' from the drop-down menu
- In the **'Plot time series for an individual point (lat, lon):**' section and enter

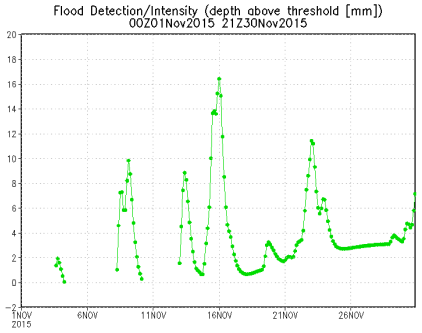
  T1: 00Z01Nov2015

  T2: 21Z30Nov2015



- In the map zoom in enough to individual pixels
- Enter lat –lon 13.0 and 80.0 (This is close the city of Chennai which was heavily flooded)
- Click on '**See time Series'**
- Save the time series on your computer (by dragging or right clicking the image with your mouse)
- Repeat the same time series for **'Flood detection (Depth)'**
- Examine both the time series and note the period when accumulated rainfall is rising; also examine the flooding detection depth and see if flood episodes can be deduced from the rainfall times series.





Part 2: Examine Surface Inundation for the November-December 2015 from MODIS NRT

- Go to the MODIS Near Real-Time (NRT) Global Flood Mapping Portal:

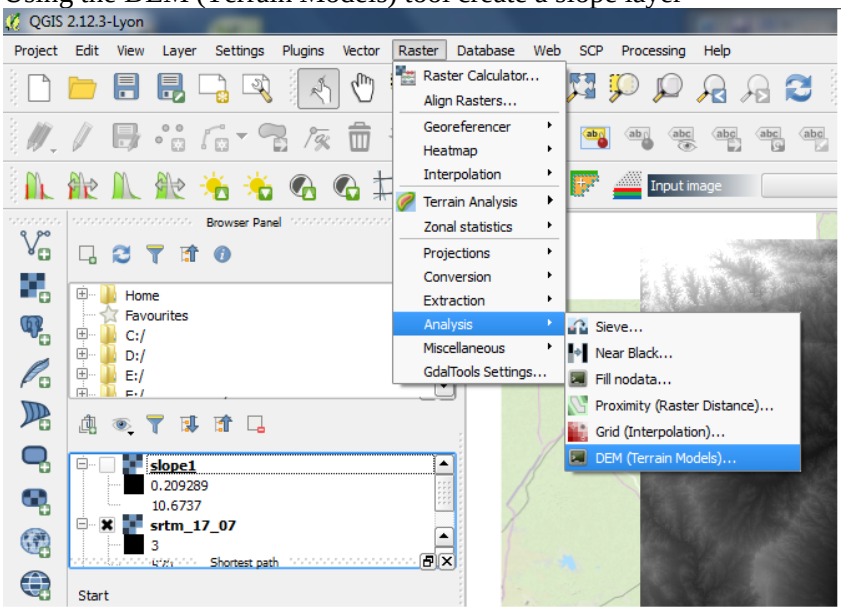
  http://oas.gsfc.nasa.gov/floodmap/

- Click on the **plus icon** next in the **Data Viewer** (left hand menu)
- Click on **Asia**

- Click on the grid 80E and 20N
- From the top bar select **'14 Day Composite'**
- Using the calendar in the top upper left, select **15 November, 2015**
- Do you see any inundation where GFMS shows high rainfall?
- Also use the direction arrows to explore surrounding grids to see if there is surface inundation present
- Next, for **"14 Day Composite"** examine how the inundation maps change from 20 November -15 December 2015 in 80E and 20N as well as 80E and 30N grids
- Click on the maps to zoom-in and see the surface inundation
- **Download the MODIS Flood Water** shapefile for the 80E, 30N grid using the 14 day composite of 20 November, 2015.
- Examine the same flood event from the Flood Observatory site: http://floodobservatory.colorado.edu/Events/2015India4309.html

Part 3: Use the Shuttle Radar Topography Mission (SRTM) Terrain and Slope in the Flooded Area

- Go to the SRTM download portal: http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp
- Download SRTM elevation using the following input coordinates:
  - **Latitude min**: 15N **max**: 20N
  - **Longitude min**: 80E **max**: 85E
- **Open QGIS** Desktop
- Load a basemap of your choice
- Import the SRTM data previously downloaded
- Using the DEM (Terrain Models) tool create a slope layer

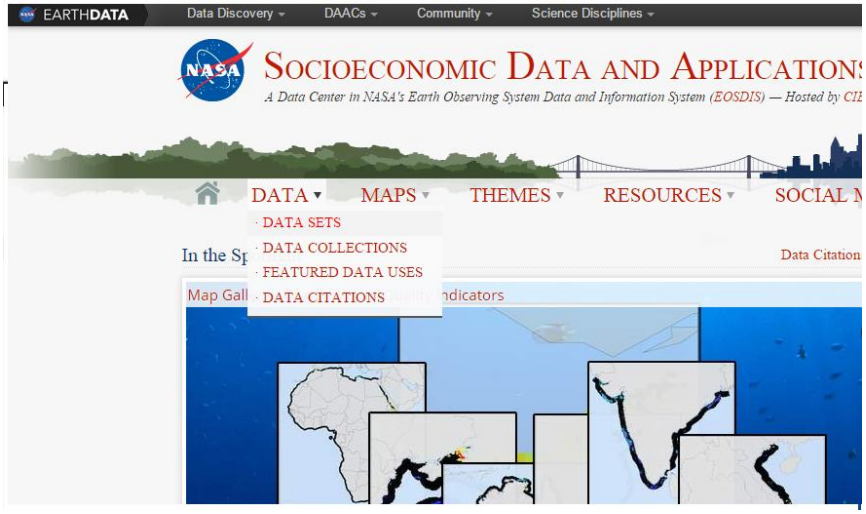


  - Set the input file to the SRTM Digital Elevation Model (DEM)
  - Select an output file location and name
  - Change the Mode to Slope

    - Check the box next to Slope expressed as percent
    - Set the Scale to 111120.00 to convert to meters
- Visually inspect the slope layer and how it intersects with the MODIS Flood Water data
- Note how areas of lower slope and elevation have flooded and where areas of potential flooding may occur
- This can help decision makers determine areas most at risk and where to focus disaster response.

Part 4: Examine SEDAC Population Density, Roads, and Landmarks in the Flooded Area

- Go to the SEDAC website: http://sedac.ciesin.columbia.edu/
- **Login** using your previously created SEDAC username and password
- Click on the **Data** tab and select **Data Sets**



- Type **'population density'** in the **All Fields** search box
- Download the **'Population Density Grid, v3'** dataset for the country of India
- Go back to the Data Sets tab and type in **'roads'** in the **All Fields** search box
- Download '**Global Roads Open Access Data Set (gROADS) v1'** for Asia
- Import both of these products into QGIS Desktop
- Import the MODIS Flood Water dataset downloaded previously
- Visually inspect the areas near and around the flood water
- Are there any highly populated areas experiencing flooding?
- Are there any roads that may be under water?
- Where should your relief efforts be focused and why?