Questions & Answers Part 2

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: For US precipitation data, if I download data, what is the underlying geometry? It appears that some was on country of state boundaries and others were something else.
Answer 1: (Amita) Can you clarify which dataset you're talking about? Are you talking about for Giovanni? TRMM and GPM resolutions are uniformly gridded data. TRMM is a quarter degree - about 25 km. GPM IMERG is one tenth of a degree, about 10 km. They basically would give information on those grids and then you can crop it to the shapefile of your interest, either county or state.

Question 2: (Slide 13): What is the resolution of the global flood hazard distribution, and is this resolution sufficient for detailed studies?
Answer 2: That comes from Dartmouth Flood Observatory (slide 13) the actual resolution would be 250 m from MODIS but there are other slightly higher resolution data also. Whether it is sufficient or not depends on the size of the watershed/basin/stream you're looking at. For major river basins, this works.

Question 3: If climate change is affecting these various weather phenomena, all of these data are nonstationary. Is there a site/tool, where we can visualize and/or estimate a trend?
Answer 3: True - I am not aware of where data are available without trends. That was the point of showing GES DISC where you can look at data and de-trend them for your own region. That's where you need a little quantitative analysis for your own area.

Question 4: (QGIS Analysis - Cyclone Idai) For all that is described, we use past hazards (to facilitate risk assessment), correct? Would this also be useful for forecast and real time monitoring? Or would we use already processed information (e.g. from GDACS) for that?

Answer 4: I showed for the Houston area, but we didn't see the QGIS analysis for Mozambique. But you can use the same info. If you look at GEOS5 forecast - or any forecast in the area - if you see a storm approaching, you can look at past data and see which way it's heading, what intensity it is already in terms of winds or precipitation - that will allow you to have some assessment based on forecast data, also.

Question 5: Could you please come again on how you calculated the Idai anomaly?
Answer 5: This is somewhat subjective - I picked a threshold that said that the rationale was - this is the long-term mean, what we calculated from Giovanni, and standard deviation is the variability observed in an 18-year period. My logic is any rainfall in that range (mean + standard deviation) is not extreme. It's higher than normal, but could be within 1 standard deviation. Any rainfall above that is anomalous. Then you look in terms of 1, 2, 3 standard deviations to look at intensity. The threshold I used was looking at mean and added standard deviation, and that was the threshold used. Then I went over lifetime of Idai, had average precipitation for Idai, and then subtracted mean and standard deviation threshold from that - that was the anomaly. You can perhaps examine rainfall in detail based on, say, your in situ damage data. You might come up with the conclusion that unless precip is as heavy as 3 standard dev's, our community can still absorb the hazard intensity. Then you would have alerts or response when rainfall is above that. That is really dependent on the region you're looking at, I just picked this as an example. I picked the same for Houston flooding. But again, it depends on the community or area you're focusing on - how much precipitation, what kind of surface, is there a slope so water can run off than certain intensity rainfall. How can you look at different datasets and understand your own region? How hazard intensity is? How they can impact your area? This was still somewhat qualitative in that we did calculations, but we were still looking at results visually. If you want more detailed quantitative information, you would be analyzing digital data.

Question 6: Is there a public Amazon Web Service (AWS) Simple Storage Service (S3) bucket, from which one can access the NASA Earth Data (e.g. Giovanni, GES DISC, GDACS, Sedac, etc.) and feed it into an application for further analysis on the cloud?
Answer 6: There are several data that are available through Google Earth Engine (GEE) and ARSET is looking into GEE training. We'd like to introduce as many datasets as we can through GEE or cloud services.

Question 7: What is the accuracy of precipitation data over Mozambique, especially of high precipitation rates?
Answer 7: This question - there is no simple answer to that. If you look at validation of TRMM or GPM data, they are done on selected regions over Mozambique there is no detailed validation or comparison with in situ data. For a higher rain rate, also for a smaller region, the best way is to have in situ and compare - there may be biases. On the other hand ,the rain gauge calibrated data - IMERG and TRMM final data - they are calibrated with whatever rain gauges are available. On the grid the biases should be small. Random errors associated with datasets are available - if you look at GES DISC, you'll see error estimation and you can look at that to get an understanding of how accurate the data is.

Question 8: Houston Flooding: Is the TRMM resolution not too coarse to be used in such small extent?
Answer 8: What I wanted to clarify - TRMM data is quite coarse - GPM is 10 km - also coarse for urban flooding. For urban flooding, NASA doesn't have satellite data that is high enough resolution, but there are optical images that are used. And I want to show an example of this MODIS NRT flooding. Again, I would refer to previous ARSET webinars on Tropical Storms and Urban Flooding. For flooding - you can not use TRMM or GPM - you can use MODIS at 250 m resolution. We're looking at it because it gives you an idea of extreme precip. First of all, you need something like NRT Global Flood to see if there's flooding, or you need a model that gives you streamflow that goes into the region. That's a challenging thing - just by looking at precip, you'll get some idea. If a rain system is heavier than this, if certain areas are receiving more rain, you expect flooding. Over the US there is good radar coverage. If you go somewhere without continuous radar coverage, TRMM and GPM can give you an idea of precip and how it may cause flooding. That's why we also looked at SRTM and impervious surface (30 m) since those are much higher res. If you look at those, it gives you an idea of low-lying areas. Even if precip is low resolution, you can still ID areas more at risk of flooding.

Question 9: When working over Texas, why not use instead the precipitation data from National Weather Service (NWS), including radar data, which should be more precise than TRMM data?

Answer 9: (Answered above) over the U.S. you have high res data - you have good radar coverage - and you would be using that. When no such data is available (in most of the world they don't have radar coverage) in that case satellite data is very useful.

Question 10: Is the Giovanni tool and its variables available to get information about all countries (such as Portugal or Central America), or is the tool limited only for some countries? I selected one country in Central America, and I got this message:
Select Region (Bounding Box or Shape)
Format: West, South, East, North
'Precipitation Rate' has no data for the selected bounding box. Please select a bounding box overlapping the region [-180, -50, 180, 50].
Perhaps can you tell me what could be the error?
Answer 10: If the data are global, you can get it for all countries. Tool is not limited to some countries. If you look at Giovanni spatial subsetting, you can select watersheds, major river basins - those are available also. TRMM is limited to -50S/50N and outside that you won't have TRMM data, but GPM will. GEOS5 and MERRA2 rainfall can also be used globally.

Question 11: What is the spatial resolution of the images shown in the presentation?
Answer 11: Spatial resolution is listed in the table in Tuesday's session. Session 1 has a table with each dataset's resolution. It varies as we talked about it.

Question 12: You explained while mapping using QGIS, can you inform me what type of interpolation methods (Kriging, IDW, etc) apply it in mapping? Why did you use QGIS and not ArcGIS? Would like to elaborate it for me?
Answer 12: We use QGIS because it is open source - that's the simple reason. ArcGIS has many features, and is perhaps more stable, it also has some datasets available through ArcGIS, but it isn't open source. So that's why we opted for QGIS. Today, I didn't do any interpolation. You can do Kriging for precipitation, that would be a good idea. But here there was no interpolation used.

Question 13: Can you please explain again about SRTM data? How to convert SRTM data to slope in QGIS?
Answer 13: Let me find an exercise about converting to slope. It's the Shuttle Radar Topography Mission - we'll look. ARSET has an online exercise on how to download SRTM and get into QGIS. We'll find the link and post it here later:

https://arset.gsfc.nasa.gov/sites/default/files/water/Brazil/S8A1.pdf
https://arset.gsfc.nasa.gov/sites/default/files/water/Brazil_2017/Day3/S6P2.pdf

Question 14: Any reason you picked a 30-year data period for climate data spanning extreme data points?
Answer 14: It is standard to use 30-year minimum periods for climatology. I assume you're talking about the climate.gov site where 30-year data were used. We used even shorter period - from remote sensing because we don't have 30-year temporal resolution yet. It's closer to 20. We used 18 years in our analysis. But the climate.gov tool we saw uses 30-year for their climatology, and that has been recommended to use at least 3 decades as your reference. Longer is okay, because there's interannual variability. If you look at a shorter period, you can look at that rather than true mean.

Question 15: Any case of rainfall data and runoff data with stormwater and no-stormwater infrastructure conditions for cities?
Answer 15: I think for any city - stormwater, no stormwater infrastructure, info should be available. Not sure if SEDAC has that. Cities/municipalities might have that info. Then you can perhaps look at rainfall and runoff. We looked at satellite data here, but if you look at MERRA, that will provide runoff. Again, I keep pointing back to our ARSET webinars, but all these datasets like runoff and rainfall from land-data are described in fundamental, online webinars (https://arset.gsfc.nasa.gov/webinars/fundamentals-remote-sensing)1. You need that infrastructure and info. NASA doesn't have it maybe, but SEDAC may have it, but I haven't seen it.

Question 16: Do each of the global datasets have their own raster grid sizes?
Answer 16: Yes - that's the resolution we talked about.

Question 17: (Spanish) Los mapas de temperatura están disponibles para todos los países o solo para los EE.UU?
(English) Are temperature maps available for all countries or only for the US?
Answer 17: If you're talking about the tool we just saw from climate.gov there are global maps for temps available. You can also look at MERRA data - we looked at sea level and wind, but you can look at temp.

Question 18: What is the pixel size (i.e. spatial resolution) of MERRA2 and TMPA data?

Answer 18: MERRA2 is .5x.65 deg and TMPA is .25x.25 deg. If you look at Part 1 there's a table of resolutions for all the data we've talked about.

Question 19: He visto que la metodología se ha aplicado a escala de países...¿Sería posible aplicar esta metodología a escalas locales? Cuál sería la más recomendable a esta escala?
(English) I have seen that the methodology has been applied at the country level. Would it be possible to apply this methodology at local scales? Which would be the most recommended at this scale?
Answer 19: The limitation would be for remote sensing data would be spatial resolution. So each grid point for TMPA is .25 of a degree. Using that data it doesn't make sense to go to a lower spatial resolution. On the other hand as we showed here, for Houston case, say, we have integrated info on rainfall. We did not see distribution of rainfall in the urban area. At the same time, we used high res impervious surface and SRTM data that can aid in understanding if there's higher rainfall - what are the areas affected? A combination of datasets might help. If you have in situ data, it can help too. You can apply this to local areas depending on the resolution of data you have.

Question 20: Can we assess extreme drought risk through NASA data as for rain?
Answer 20: Yes - you can use the same way - anomalies and look at negative part where there is lower than normal rainfall. Look at the intensity and that tells you the intensity of meteorological drought. You can also look at soil moisture - we talked about SMAP in the last session - soil moisture deficit can be looked at just like for rainfall and that tells you if any hydrological drought is going on.

Question 21: Do you recommend using QGIS to do the analysis with the data?
Answer 21: We use QGIS because it's open source. If you're doing digital data analysis, you may want to use Python or R for the analysis. ArcGIS works well if you have access to the software.

Question 22: I see that DRA assessment examples only work in a qualitative way. How do we make it in a quantitative way?
Answer 22: This webinar focuses on qualitative way of doing disaster risk assessment, but we showed you all the tools to download digital data. So you can develop statistical schemes using this data. You can use similar methodology, or if you have in your area - other vulnerability or damage assessments, you can combine them all to

come up with quantitative DRA. The goal of this webinar is to introduce all these datasets and show examples of how you can potentially use them. (And let us know if you do end up using them!)

Question 23: Is this data available for all countries?
Answer 23: TRMM data is available at +50/-50 latitude. Most data is available globally. You can look at Part 1 - we have a table of all datasets that talks about spatial coverage and resolution.

Question 24: Can multiple datasets be used in this way to assess the risk in forest areas?
Answer 24: Yes, precip data can be used. You can also use wind data. You can look at land cover.

Question 25: Does GEOS "Forward Processing" (FP) system for weather prediction cover USA territory only?
Answer 25: GEOS FP for weather prediction is a global product.

Question 26: In the case of landslides. How could we know the vulnerability of landslides before the disaster occurs? (geological analysis, edaphic analysis, drainage?)
Answer 26: We will be covering landslide disasters coming up in the near future. We're planning a webinar to focus on landslide disaster risk assessment. For what you're asking - landslide before a disaster occurs. There are predictive models (based on precip, soil moisture, topography) based on that you can have some lead time in certain conditions you have potential of landslide. (Landslide Hazard Mapper) And we'll talk more about that in a future webinar.

Question 27: How can we analyze a disaster remotely with satellite images if the spatial resolution is inversely proportional to the spectral resolution of the space sensors? For example: the spatial resolution of the MODIS is very large and disasters cannot be determined within 1 square km, in floods or occasional fires.
Answer 27: Flood monitoring tools from MODIS uses 250 m resolution data. You're right that these are not very high res data we're talking about. There are satellites that have high res imagery that are very expensive. That option is there. But if you're looking for free, open source data, these are the best sources to look at.

Especially for flooding, there are limitations. That's why we infer flooding from different data such as precip, soil moisture, slope. There are flooding tools, again, if you look at previous webinars on Tropical Storms for Emergency Preparedness, there's a session on flooding and flood-related tools that are introduced there. It shows how you can work with a number of tools to get a better idea of where flooding might be occurring.

Question 28: TMPA and MERRA2 is usually used for cyclone intensity? What other data can we use?
Answer 28: Basically, for intensity, you want sea level pressure, rainfall, wind speed. This decides a storm category. IMERG, MERRA2 for surface wind you might be able to use a model called GLDAS (global land data assimilation system) that may help for winds, also. MERRA2 & IMERG I would say.

Interested in storm structure: GPM and TRMM both have radar on board to provide 3D structure of hydrometers within storms. But it's more for understanding cyclone processes than for disaster risk assessment.

Question 29: Any plans to cover water-borne disease outbreak?
Answer 29: We will make a note of that. We have been doing water quality (and cyanobacteria) webinars, but waterborne diseases related to heavy rain temperatures rain cover, we'll make a note and see if we can design a webinar around that.

Question 30: Is sea ice extent available? And other variables associated with coastal erosion?
Answer 30: Sea ice data is available through MODIS (which has sea ice). IceSat2 data will be released soon, and will have more information as well. Sea ice data are available for coastal erosion, yes. You can also look at sea level heights. Those are available elsewhere. Coastal flooding can also be seen from MODIS.

Question 31: Is there a way to get maps like the ones on the NRT global flood mapping from past years?
Answer 31: NRT flood mapping in MODIS does go back several years. But past flood maps are available.