Questions & Answers Session 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 our trainers Zachary Bengtsson (bengtsson@baeri.org) or Juan Torres-Pérez (juan.l.torres-perez@nasa.gov).

Question 1: To what extent can we pull fire model parameters, things like bulk density, fuel moisture, etc. from remotely sensed data?
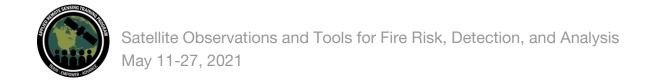
Answer 1: Vegetation related fire model parameters can be pulled from a variety of data sources and online tools. Within this session we covered some of the online tools you might find useful for this. For example, GWIS can be used to navigate and download fuel type and land cover info. Data products directly from sensors are also widely available from satellite missions. For example, SMAP soil moisture data can be pulled as a fuel moisture metric. Refer to the sensor summary table in the presentation for some useful data product links.

Question 2: Is there a landcover map focusing on understorey? What are the limitations of existing LULC maps in their use for understanding fire risk (in light of their focus on trees and lack of trees)?

Answer 2: I know that the North American Wildland Fuels Database tool that we just went over has the option to select understory as the fuel stratum. Here is the link to the tool: https://fuels.mtri.org/map. There are a variety of fuel maps available globally as well, so I recommend looking through those resources we've made available in this training to find data that works best for you. LULC maps are limited by the analyst creating them. A site specific land cover classification can do a great job of mapping vegetation type using ground-based training or validation data. The more relevant vegetation types you're able to identify, the more informative your classification will be for fire risk assessment. Check the tools within the presentation as well.

Question 3: Why are human factors not considered in the fire risk mapping since most wildfires are the result of human activity?

Answer 3: Human factors are considered in fire risk mapping, but usually from an ignition source perspective. In this training we are focused on vegetation-based biophysical parameters that influence fire risk, so we did not focus on this topic.

Question 4: When determining anomalies, what is usually considered a sufficient period for the average?
Answer 4: That would depend on the amount of data available. With some satellite data, such as Landsat, there are several decades of data available. Therefore, technically, you may look at all of these as an average and then see which years show either positive or negative anomalies. A minimum of ten years is often seen as a good start.

Question 5: Concerning NDVI anomaly, for the long term average, is this yearly average? Or is it monthly average over the years?
Answer 5: I would say you may use either. It will depend on the question you are trying to answer. For instance, if it is related to seasonality, monthly averages over the years might be more useful whereas if you are looking at trends over decades or similar, yearly averages may be more useful.
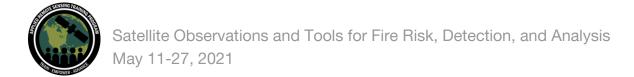
Question 6: Is there a way to use remote sensing to identify the difference between low vegetation moisture and tree die-off due to invasive species?
Answer 6: Remote sensing of tree health and vegetation moisture can be differentiated by the indices you use in your analysis. For example, the Evaporative Stress Index uses temperature data to assess vegetation moisture and NDVI uses a measure of greenness to assess vegetation health. Using different physical parameters (like temperature and greenness) can help you make distinctions like this.

Question 7: Is there a preference between SAVI and NDVI?
Answer 7: NDVI is a "classic" index for vegetation health as it is a measure of greenness. In areas where vegetation is sparse, SAVI is more useful as it also takes into consideration the influence of the soil brightness if the vegetation cover is low. Enhanced vegetation index is also useful for dense vegetation.

Question 8: Can we utilize ECOSTRESS imagery products for fire risk assessment?
Answer 8: ECOSTRESS products provide a great opportunity to assess evaporative stress on vegetation, but it depends on the unique requirements of your own fire risk assessment. For example, if you've identified the need to assess vegetation impacts from drought, ECOSTRESS's ESI product might be useful for you.

Question 9: Do you think there is a lack of communication between remote sensors and fire managers on the meaning of 'risk'? Because their definition of risk is different. See: https://www.fs.fed.us/rm/pubs/rmrs_gtr315.pdf. Your risk definition is typically their hazard definition. Their risk definition very specifically refers to the effect of fire hazard on highly valued resources and assets.

Answer 9: Remote sensing from a vegetation-based fire perspective often focuses on the assessment of hazards. So the definition we provided is probably a little too tailored to today's session. There are a variety of ways in which fire risk is framed, so thank you for providing this resource from the forest service!

Question 10: How does long term climate change, or short term climate variability impact the use of ESI since ESI is determined by +/- standard deviations (i.e. comparison to "normal") when climate change is redefining what "normal" means?

Answer 10: I believe short term variability is detected relatively easily given its difference from the long term mean. I'm not 100% sure on this, but I would imagine that long term climate change will ultimately influence the current normal and change the way in which the ESI is calculated. Refer to some of the ESI links we've provided within the slides to get a better idea of how this works!

Question 11: What is the difference between the data from NDVI and land cover? Does NDVI also provide the data for vegetation density (e.g. quantity of vegetation per unit of area)?
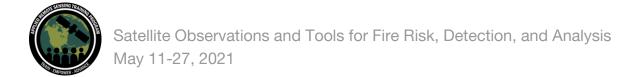
Answer 11: NDVI is a measure of greenness, not necessarily land cover which is usually obtained through supervised or unsupervised land classifications and provides more details on the types of vegetation in a particular site. Land cover assessment is a good way to differentiate between vegetation covers. NDVI can be a good way to measure agricultural and phenological applications.

Question 12: Where can I find soil and use coverage for the entire world? Do you know some script to do that or some local to download this information?

Answer 12: GWIS is probably a good place to start for land use land cover. This data is global and can be downloaded through the portal we showed during the session. GWIS can also serve as a good comparison tool between global and local data.

Question 13: Can LAI (leaf area index) be used to measure the forest fuel load? If yes, then how?

Answer 13: Leaf area index can be a useful metric in measuring fuel load, especially from a vegetation density perspective. As I mentioned, we didn't have time to provide an inclusive list of useful vegetation parameters for this training, but you can find more info about the LAI (particularly from MODIS) here:
https://modis.gsfc.nasa.gov/data/dataprod/mod15.php

Question 14: Can remote sensing be used to assess vegetation structure in non-forest fuels, like shrubland? Would you need to adapt the indices/approach used for different types of vegetation (shrubs compared to forest stands)? Really useful and informative presentation, thank you!
Answer 14: Vegetation structure can be assessed in non-forested areas, like shrubland. Your methodology would likely need to be adapted from a forest perspective. Radar/LiDAR data can be a good resource to use for a variety of vegetation structures, including shrublands.
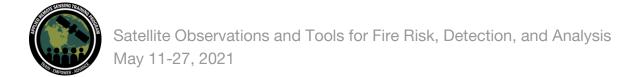
Question 15: Are the equatorial countries or tropics more prone to fire conditions?
Answer 15: Good question! Tropical or equatorial countries typically have one or more rainy seasons and hot summers so it depends on which part of the year you are comparing. Also, usually the vegetation is different at least at a forest level, temperate forests tend to be dominated by pine-type plants vs tropical forests are more dominated by broad leaved vegetation.

Question 16: Can the same kind of sensors and satellites used for vegetation be used for city fires? If not, which satellites are used for it?
Answer 16: This would depend on your definition of a city. Typically, heavily developed human settlements are not ideal for vegetation based fire risk assessment since vegetation is not the main source of fuel in these areas. A dense urban area may not be ideal for vegetation assessment due to the inherent lack of vegetation.

Question 17: Is the EO-1 Hyperion available globally? And what is the accuracy of vegetation classification?
Answer 17: There are various EO-1 Hyperion images available around the world, but this coverage is spotty and by no means global. The accuracy of a hyperion based classification depends on things like training data and the analyst's familiarity with the study area. Earth Explorer from USGS can be a good resource for Hyperion imagery. Refer to our previous training on Hyperspectral applications:

https://appliedsciences.nasa.gov/join-mission/training/english/arset-hyperspectral-data-land-and-coastal-systems

Accuracy is dependent on ground data, local knowledge of the study area, and how specific you want your land cover classification to be.

Question 18: Fire is not only impacted by biophysical variables but also by various social and anthropogenic variables. If one were to incorporate these variables in a remote sensing and GIS setting, how would one approach it?
Answer 18: We can't really speak to that within this session, but I would imagine some relevant factors would be population density and proximity to human settlement.

Question 19: Why do you recommend SRTM DEM data instead of the PALSAR RTC DEM at 12m resolution?
Answer 19: Here's a paper that compares both SRTM and PALSAR DEM uses, advantages and disadvantages for Brazil:
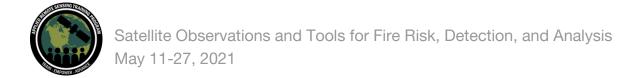https://www.tandfonline.com/doi/full/10.1080/01431161.2010.549852
In general it shows the highest efficacy of SRTM data in detecting geologically meaningful lineaments. Nonetheless, provided there is data available from both sensors to the study area, it doesn't hurt to try both and then choose the appropriate one based on your research question.

Question 20: What are the main problems in using out of date DEM data (as ALOS PALSAR) in fire risk assessments - since this parameter is not strongly affected in a short time range in most cases?
Answer 20: Topography isn't necessarily changing as much as other physical parameters within remote sensing. You can have extreme changes in topography such as after a natural disaster, but those cases tend to be rare. We still recommend the use of these DEMs despite the risk of changes in topography since it was created.

Question 21: Do non government researchers have access to FIA data?
Answer 21: Yes. FIA data can be difficult to navigate, but if you can get in contact with the right person, they can guide you in the right direction. Forest Inventory Analysis Contact Info: https://www.fia.fs.fed.us/contact-us/index.php
Choose the right regional contact for your study area.

Question 22: Slide 55 shows a really nice map. How can we create the map, was it done in GEE?

Answer 22: In reference to ESI map viewer, it is a widely available global data set. That data layer can be imported into ArcGIS. For live fuel moisture content, it is a Google Earth Engine app. The GitHub repository within the app is also a good resource to use for a custom map of your choosing. We will also be hosting a future webinar on GEE for Land Applications.

ESI Data Product Documentation Link: https://www.drought.gov/data-maps-tools/evaporative-stress-index-esi

LFMC Github Repository Link (Scroll down to the Use/analyse maps on GEE and follow instructions for code): https://github.com/kkraoj/lfmc_from_sar

Question 23: Is there a land cover map for C3-C4 grasses?

Answer 23: Here is a paper with global C3-C4 grass distribution maps that might be useful: https://doi.org/10.1029/2001GB001807 It is a bit old (Still et al 2003) though.
Also, here's a link to the NASA DAAC (https://daac.ornl.gov/ISLSCP_II/guides/c4_percent_1deg.html) where more info and data can be obtained, at least for C4 plants.
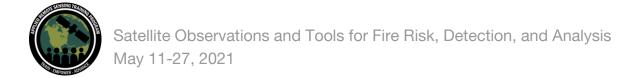
Question 24: Thank you for this very informative presentation! RE slides 29-34: are there materials you can refer us to on how to apply this information? For example, how to process lidar correctly (using tools like ArcGIS) to create a workflow that flags high-risk areas?

Answer 24: You'll find that a good resource is the summary table of sensors to get you started on what data to use. There are also numerous tutorials covering how to utilize these resources. Email us and we can point you in the direction you want to take.

Question 25: Can we get land cover information about a particular area of our country on GWIS? Does GWIS cover the Indian region?

Answer 25: GWIS is a global dataset. If your area happens to not be covered, you can contact them directly. You can download GWIS datasets using GeoTIFF or NetCDF formats.

Question 26: What's the spatial resolution of layers in GWIS? Do they have the same spatial resolution? Can we download data within a shapefile (e.g., within a state)?

Answer 26: Spatial resolution is varied. The available data layers vary in spatial resolution, and you should be able to download the data. Reference the data and services app: https://gwis.jrc.ec.europa.eu/applications/data-and-services

Question 27: Can LFMC be used for post-fire assessment as well?
Answer 27: It can. LFMC can be a good indicator of assessment post-fire. We will cover this briefly during session 6.

Question 28: How can GWIS create a current land cover map?
Answer 28: It depends on the availability of ESA's CCI Landcover products, which GWIS uses for land cover layers. CCI Landcover data products link: http://www.esa-landcover-cci.org/?q=node/164

Question 29: Is ECOSTRESS data good to use for research purposes?
Answer 29: Refer to Q 8 above. It would depend on the research question you are trying to answer. ECOSTRESS is releasing data as they process it for public availability.
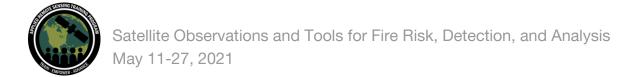
Question 30: Do you know any tool to define some more detailed frequency parameters of fire regime as fire return period at pixel level?
Answer 30: You'll notice that a variety of tools mentioned throughout this training series can be used for this application. We encourage you to attend every session and examine the tools we go over on your own after each session is complete. We will take a look at fire regime and fire return period during Part 6.

Question 31: Concerning FC, the fractional factor, could you please explain more for arid regions and how these can affect the fire risk?
Answer 31: I am not sure what exactly you are referring to with arid regions. For arid regions with sparse vegetation, the pixel itself may only include slight influences from vegetation given a lack of density. Fractional Cover can be a good way to examine land cover at a sub-pixel level, picking up on some of these slight influences. This type of spectral un-mixing might provide better classification of sparsely vegetated areas.

Question 32: Is the resolution of RS-based data good enough for building level fire risk assessment?

Answer 32: It depends on what you are doing with your fire risk assessment. Remote sensing can provide you with access to data products over a large area at landscape scale, but spatial resolution of data may be a limiting factor. The indices and products we have discussed typically have spatial resolutions as determined by the sensor itself. For example, Landsat 8 vegetation indices will be at a 30m resolution. You should attempt to identify parameters of interests and then examine whether or not each product's resolution will be sufficient for your fire risk assessment.

Question 33: For the Live Fuel Moisture Content and Evaporative Stress Index in Slide 62 and 63, respectively, I didn't find those two products in GEE. Could you please share the scripts mapping those two indices?
Answer 33: The GEE script for LFMC can be found via the author's GitHub repository: https://github.com/kkraoj/lfmc_from_sar
ESI is a product provided by NASA/USDA. We accessed this product via the ArcGIS webmap of data linked on the slide. Here is a link to the data specifications: https://www.drought.gov/data-maps-tools/evaporative-stress-index-esi

Question 34: How can we determine the location of the start of the fire, especially if it was aroused?
Answer 34: Active fire mapping through MODIS would be a good tool for this, which we will be covering in future sessions of this webinar series.

Question 35: Hi, is there information for FMC foliar moisture content that can be used to calculate crown fire?
Answer 35: Foliar moisture content is an important canopy metric for assessing risk of crown fire. Please refer to some of the following resources we found related to this topic.
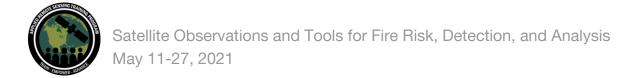Forest Service: https://www.fs.usda.gov/treesearch/pubs/25964
Forest Service: https://www.fs.fed.us/rm/boise/research/fisheries/fire/biblio_pubs/agee_2002_foilarmoisture.pdf
Journal of Wildland Fire: https://www.firescience.gov/projects/11-1-4-16/project/11-1-4-16_Alexander_and_Cruz_2012_FME_online_early.pdf

Question 36: Is there a way to identify near-real time fire-front (fire propagation line) that can feed into models for fire predictions?

Answer 36: For this application, attend Parts 3 & 4 of this webinar series to get a more accurate answer.

Question 37: Can NDVI identify tree species in forests, for example differentiate between a pine forest and a cork forest?
Answer 37: NDVI is not great for identifying tree species, but it is frequently used to identify different types of trees such as coniferous vs deciduous. Deciduous trees lose their leaves in the fall, meaning that NDVI assessment in the winter can identify the location of coniferous trees (like pines).

Question 38: Is there any global fuels/veg data comparable to LandFire?
Answer 38: Our go-to for that would be GWIS given its global coverage and capabilities.

Question 39: What kind of methods are used to produce forecast products for wildfire risk? Are they supervised methods, or mathematical models that use multiple parameters to produce a risk factor?
Answer 39: Depends on the type of products you are interested in. Climate parameters for example will utilize different models and methods. The summary table of sensors in the presentation is a good start for exploring data.

Question 40: What does FIA mean?
Answer 40: Forest Inventory Analysis. It is a US Forest Service site that contains reports and the status and trends in species, size, health, among others. Please refer to Slide #52 of the presentation for more details.