# NASA DIRECT READOUT CONFERENCE (NDRC) WEBINAR

December 4, 2019

## MINUTES

**Purpose/Objectives of the NDRC Webinar Series**
At 11:00 a.m. Brad Quayle (USDA FS GTAC) convened the NASA Direct Readout Conference (NDRC) Webinar. He reviewed the purpose of the NDRC, activities to date, and objectives going forward. This webinar agenda featured Dr. Dalia Kirschbaum's (NASA/GSFC) presentation, "Landslide Hazard Assessment for Situational Awareness (LHASA): A Remote Sensing-Based Global Hazard Assessment System for Landslides."

Mr. Quayle's presentation, including webinar wrap-up slides, is available here:
https://directreadout.sci.gsfc.nasa.gov/links/rsd_eosdb/PDF/NDRC_Webinar_Series_20191204 - Quayle.pptx

The post-webinar survey (less than 3 minutes to complete) is available at: https://www.surveymonkey.com/r/NDRC-December2019

**LHASA: A Remote Sensing-Based Global Hazard Assessment System for Landslides – Dalia Kirschbaum, PhD (NASA/GSFC)**
Rainfall-triggered landslides occur in nearly every country in the world, causing billions of dollars in damages and thousands of fatalities each year. Accurately resolving the time, location, and impacts of these hazards is vital for characterizing their variability, providing appropriate and timely responses to disaster events, supporting robust recovery plans and formulating mitigation strategies. Satellite data provides a unique perspective to approximate where and when landslides may be occurring at regional to global scales as well as to monitor or map landslide distribution and movement over smaller areas. This presentation outlines several on-going efforts to better understand landslide activity at different spatial and temporal scales using an array of modeling, mapping and citizen science methods. This work will also outline how the landslide projects fits into the larger NASA Disasters Program, which seeks to connect global data to local decision making throughout the disaster lifecycle. One recent activity of the NASA Disasters Program has been to develop a Disaster Portal to demonstrate the utility and application of a variety of satellite data and products to support disaster activities. This presentation will provide a tour of that system as well as identify potential opportunities for engagement going forward.

Questions and Answer Session with Dr. Kirschbaum:

**Q**: I help process a lot of satellite imagery including MODIS, VIIRS, Worldview-2, and soon ECOSTRESS. Most relevant to this presentation, we are computing coastal land cover using a decision tree similar to what was described. Much of our work is coded in-house but I see a lot of similar work in this and other presentations. How can we better collaborate instead of re-inventing the wheel? Although the landslide products specifically are not useful for my work, I suspect we have a lot of software infrastructure in common. How can we better connect and collaborate on the commonalities between our processing pipelines?
**A:** Yes the NASA Landslide Program is very interested in collaborating. Dr. Kirschbaum would be happy to discuss opportunities for collaboration. The current model is rather simplistic, and could be used for a wide range of things. Please reach out to Dr.

Kirschbaum via email (dalia.b.kirschbaum@nasa.gov). We have a project funded through the NASA Disasters Program to advance our model using a machine learning approach with global landslide data, and we also build in other modeling efforts, including post-fire debris flow modeling. After a fire, there is tremendous change to the landscape, and landslide frequency and mechanisms also change. How can we better characterize post-fire debris flow landslides mechanisms? We are working with USGS on this, and welcome other collaborators, as there are other areas for further exploration.

**Q:** Do you have a need for supplemental ancillary or geospatial data that might help with landslide modeling? For example, the US Forest Service and USGS EROS Data Center colleagues create preliminary burn severity mapping products. These products are provided to first responders, who in turn produce soil burn severity products, which are then input into USGS models. Is there a need for these inputs for the landslide modeling process?
**A:** Yes, being able to evaluate the performance of our model is an ongoing challenge. There are few post-fire debris flow inventories against which to evaluate. Detecting landsides on a vegetative landscape is much easier than detecting landslides on a post-fire landscape. Mr. Quayle indicated that the Forest Service would be happy to provide the burn severity inputs.

**Q:** What is the ultimate goal of the project? Are there different goals for developing countries and for the US? Do you intend to use this as a warning system, or for infrastructure planning?
**A:** Model outputs are being evaluated and validated in the context of local forecasts. The framework is designed to be flexible to meet user needs. For instance, we are working with the city of Rio de Janeiro to provide local landslide forecasts. Also, the Landslide Program is looking to implement global forecast information into the LHASA modeling approach. Global forecast information is of interest to aid organizations. There are regional agencies that are interested in seasonal scale forecasting. We are working with the World Bank to better characterize exposure of critical assets, and many different communities are interested in that work. The Intelligence community and DoD are always interested in assessing hazards in the areas in which they work. Everything the Landslide Program is doing is based on open source and can be shared for implementation into other applications, but ultimately the users must own their local and regional implementations.

**Q:** We would like to operationalize your landslide assessments in the post-wildfire environment so we can assess risk to life and property. What would be the best way to facilitate your work and make it available to Burned Area Emergency Response teams?
**A:** We would need to have a three-way discussion with the USGS Debris Flow Modeling Group to plan and coordinate. Please reach out to Dr. Kirschbaum to initiate that conversation, and she can reach out to her colleagues at USGS.

**Q:** For agencies/organizations who already track landslide information and prepare it in geospatial databases, can those data be provided to the NASA Landslide Program without entering them through the provided data entry portal?
**A:** Yes. The landslide viewer can connect to the source data provided by hosting agencies/organizations via their map/data services. The Landslide Program is already integrating these sources of data from various agencies and organizations in the Landslide Viewer. Please contact Dr. Kirschbaum to coordinate. Sharing landslide data inventories is underway, and we are working to guide users on the appropriate usage of these data. The more data that is available to share, the better.

**Q:** I see methods to produce products, but it is difficult to reproduce them in another environment. Is it possible to take your models and implement them in other user applications?
**A:** Yes, with a little bit of facilitation. For example, the Met Service in Colombia has retrofitted the model and developed a their own prototype. The direction we want to go is containerizing the landslide data processing, models, etc., on Amazon Web Services (AWS), and then the containers can be rapidly deployed. We are working on documentation to support this effort. Also, relevant training is planned and will be conducted by NASA ARSET. The Landslide Program is looking at a lot opportunities for technology transfer to further make the developed technologies and methods available. We look forward to feedback from any group trying to replicate the model.

**Q:** We are looking at inputs for classifying watersheds to assign them into condition classes. Two critical data inputs are the occurrence of landslides and the risk of landslides. How do the modeled outputs perform at a local, sub-watershed scale?
**A:** LHASA currently runs at 1km resolution. However, the Landslide Program is evaluating and considering the possibility to run it at higher spatial resolution (30m). In regard to landslide occurrence information, a historical landslide database is currently being developed by the program and will be made available in the LP-DAAC in the future. Regarding risk potential, we have published journal papers and additional information is forthcoming in the next year. We expect many new products to be released in the next year.

**Q:** Regarding climate change models/projections, are you incorporating this into your modeling approaches to assess where landslides will be more prevalent in the future?
**A:** Yes. The Program recently completed a focused study on Nepal that evaluated landslide potential under increased precipitation regimes in the future. The paper is in review and anticipated to be published in Geophysical Research Letters. Study results indicated that there will be a significant increase in landslide activity in some areas under particular climate projection scenarios of extreme precipitation. We hope to do these kinds of projections globally, and look at how extremes of precipitation may modulate landslide activity.

**Q:** How are you validating your model outputs?
**A:** We do it in a number of ways. A paper that was published in Earth's Future in 2018 describes the Landslide Program's approach. The landslide reporting database is key to the validation efforts. Regional assessments have been conducted where reliable and comprehensive landslide data is available that also includes information of type, severity, etc. With machine learning, the number of inventories we are using is rapidly increasing based on mapping we have done, and inventories shared with us.

**Q:** Do you differentiate between landslides and debris flows?
**A:** No, we do not. Right now we focus on all rapid mass movements. Unfortunately, the granularity of the model does not allow for this to be done reliably.

**Q:** What is the "trigger" used by the NASA Disasters Program to monitor/support an event?
**A:** It is currently a semi-formal mechanism. We have a tier system we have implemented. Collaborating agencies, domestic or international, may submit a request to the NASA Disasters Program. The NASA Disasters Program is not operational, but we are enabling operational organizations by providing relevant products. Activation of the international disaster charter for a given event is also a key consideration. The severity and extent of the event is also considered.

Dr. Kirschbaum's presentation is available here:
https://directreadout.sci.gsfc.nasa.gov/links/rsd_eosdb/PDF/Kirschbaum_December3_DRL presentation.pptx

**Meeting Wrap-up**
Mr. Quayle thanked Dr. Kirschbaum for her presentation, as well as Webinar participants for all of their great questions. Mr. Quayle also thanked the DRL for providing logistics support. Mr. Quayle stressed the value of participant feedback as we evaluate future software technologies and algorithms, and prioritize resources accordingly to meet the needs of the global user community. He invited participants to submit feedback and additional suggestions for future webinar topics to him directly via email, and encouraged participants to complete a post-webinar survey (less than 3 minutes to complete) available at: https://www.surveymonkey.com/r/NDRC-December2019. Mr. Quayle adjourned the webinar at 12:15 p.m.

**Next Webinar**
The next webinar is planned for March 4, 2019. Additional details will be provided via the Direct Broadcast Users email alias.