



GHRC Lightning Support

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2018 GHRC User Working Group Meeting
November 13-14, 2018



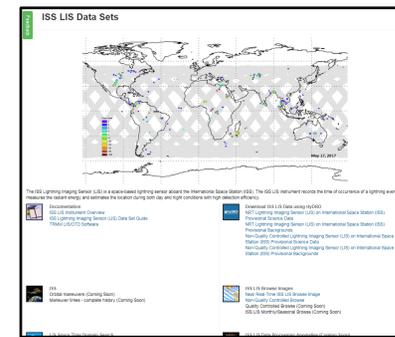
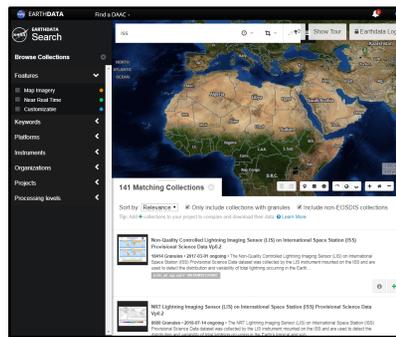
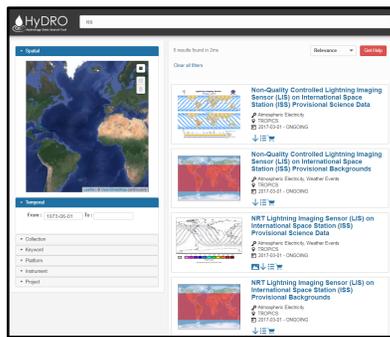
ISS LIS Status

- All operational issues from last year have been resolved
- Currently preparing for the final QC datasets
- Currently working with SPoRT to get data out to operational agencies
 - National Weather Service (NWS) Pacific Region
 - NWS Ocean Prediction Center
 - NWS Aviation Weather Center
 - NOAA National Hurricane Center



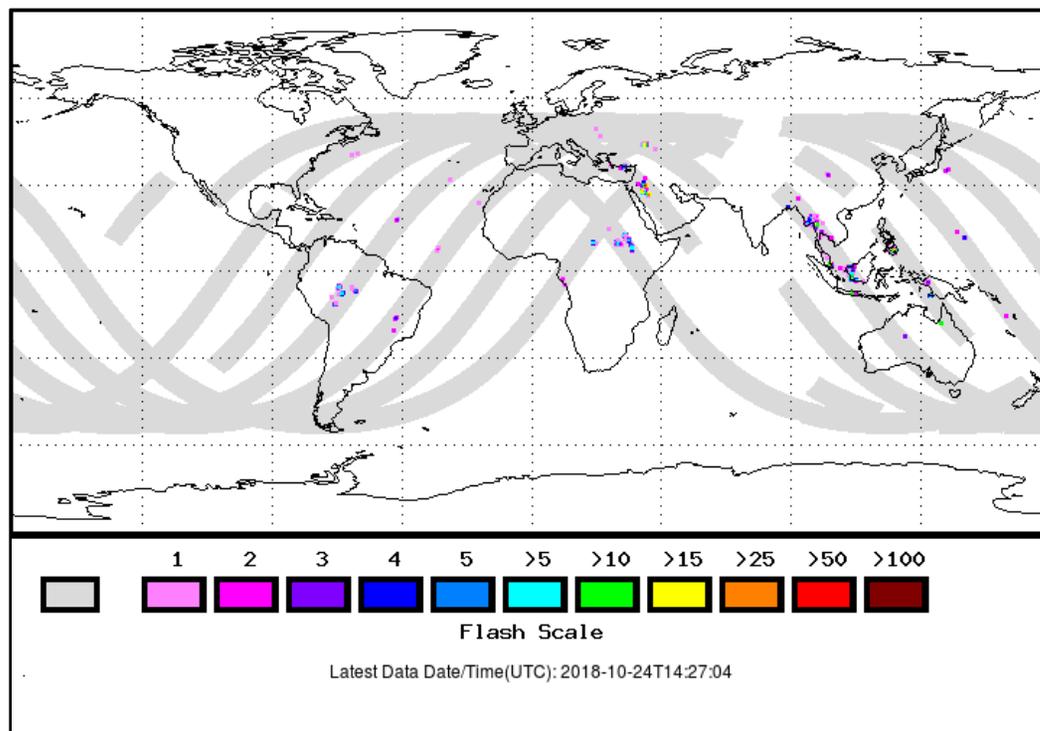
ISS LIS Data

- GHRC distributes the following ISS LIS datasets:
 - NRT: Near-Real Time
 - NQC: Non-Quality Controlled
 - FINAL: Final Quality Controlled (Not Available Yet)
- Provisional ISS LIS data are now available (published PO.2 this year)
- These ISS LIS data can be obtained at:
 - HyDRO 2.0 (<https://ghrc.nsstc.nasa.gov/hydro/>)
 - Earthdata Search (<https://search.earthdata.nasa.gov/>)
 - Lightning website (https://ghrc.nsstc.nasa.gov/lightning/data/data_lis_iss.html)
 - Push Subscriptions (Contact GHRC User Services: support-ghrc@earthdata.nasa.gov)

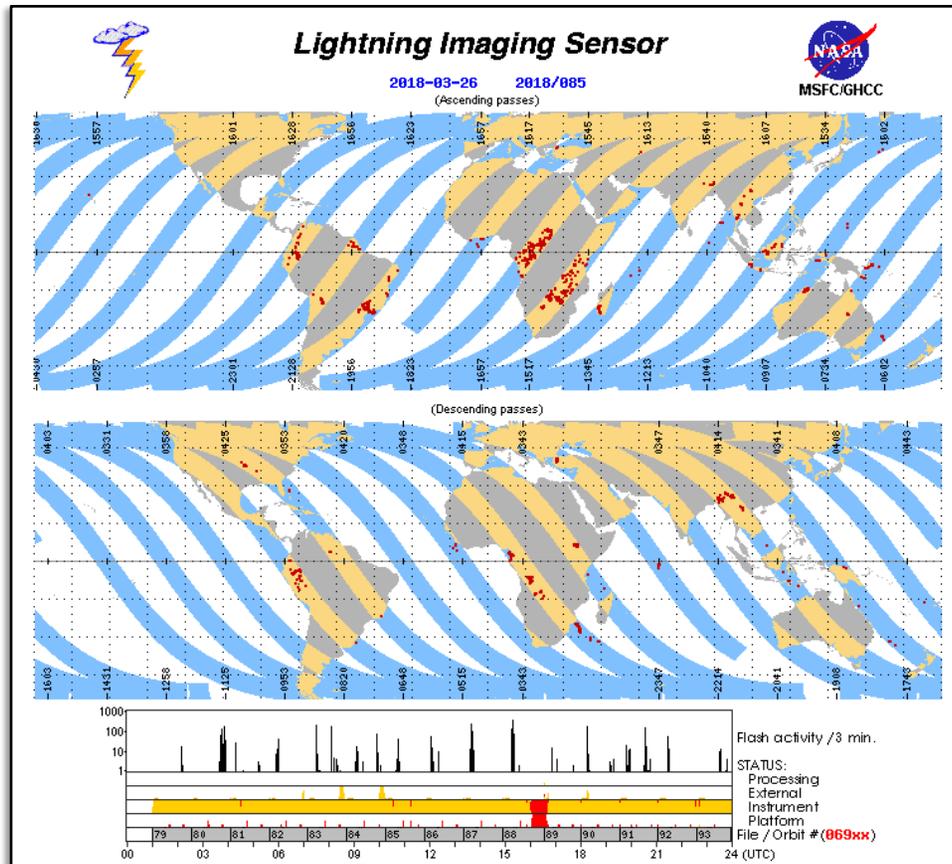


LIS Data: NRT

- Near-real time data are available within two minutes of observation
- Data may contains areas of no data
- Data appropriate for applications requiring low latency
- NRT data are available in [NASA's Land, Atmosphere Near real-time Capability for Earth Observing Systems \(LANCE\)](#)



LIS Data: Standard Products



- **NQC:**

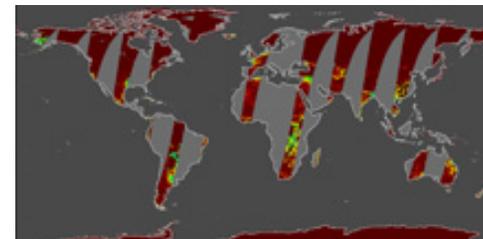
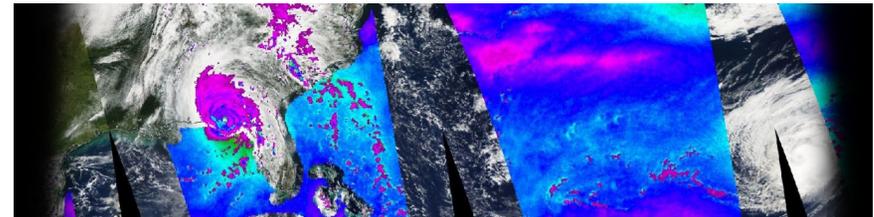
- Non-Quality Controlled standard products created daily
- More complete than near-real time products
- Data have not been reviewed to assure data quality

- **FINAL:**

- Validated, quality controlled steps performed to ensure that all bad data are flagged
- Data appropriate for scientific research and publications
- Creation in process

LIS Data: GHRC LANCE

- Land, Atmosphere Near-real time Capability for EOS (LANCE)
 - Enables users to get a snapshot of the Earth in near-real time
 - Rapidly assess hazards and disasters
 - Data and imagery available much quicker (<3 hours) than routine processing allows
- Create Full Resolution Imagery
 - Global Imagery Browse Services (GIBS)
 - Visualize the data by category in Worldview
 - <https://worldview.earthdata.nasa.gov/>
- Over the last year we have published the NRT data in LANCE
- Implemented a new GHRC LANCE website that includes NRT ISS LIS and AMSR2
 - <https://lance.nsstc.nasa.gov/>



Lightning Support at GHRC

LIGHTNING RESEARCH
at GHRC DAAC

Lightning is an electrical discharge between positive and negative regions of a thunderstorm and can be deadly if the necessary precautions are not taken.
Researchers at NASA's Marshall Space Flight Center and the University of Alabama in Huntsville design, construct, and deploy instruments that detect and study lightning to better understand its characteristics, which in turn improve storm predictions.

Feedback

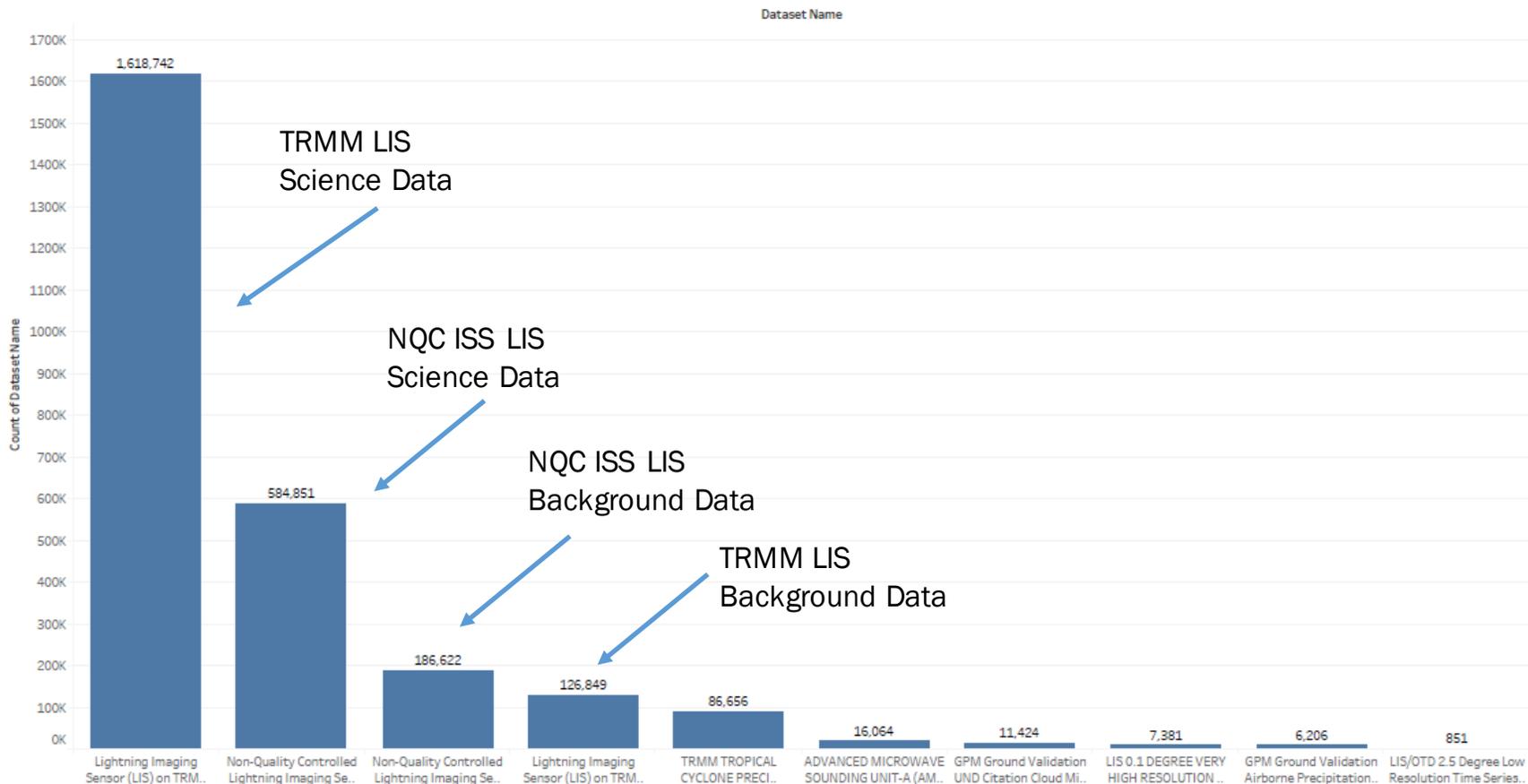
Lightning Primer
Lightning Research
Dataset Information
Space Search & Observation
Field Campaigns & Ground Validation

Lightning Research
Lightning research has come a long way in the past few decades. We now have a better understanding of why lightning occurs and where, what lightning patterns exist over the globe, and what lightning tells us about atmospheric convection. Lightning continues to be studied by scientists and engineers who use a variety of instruments. There are new instruments and different instruments viewing the same events allowing for assessment of instrument measurement characteristics and

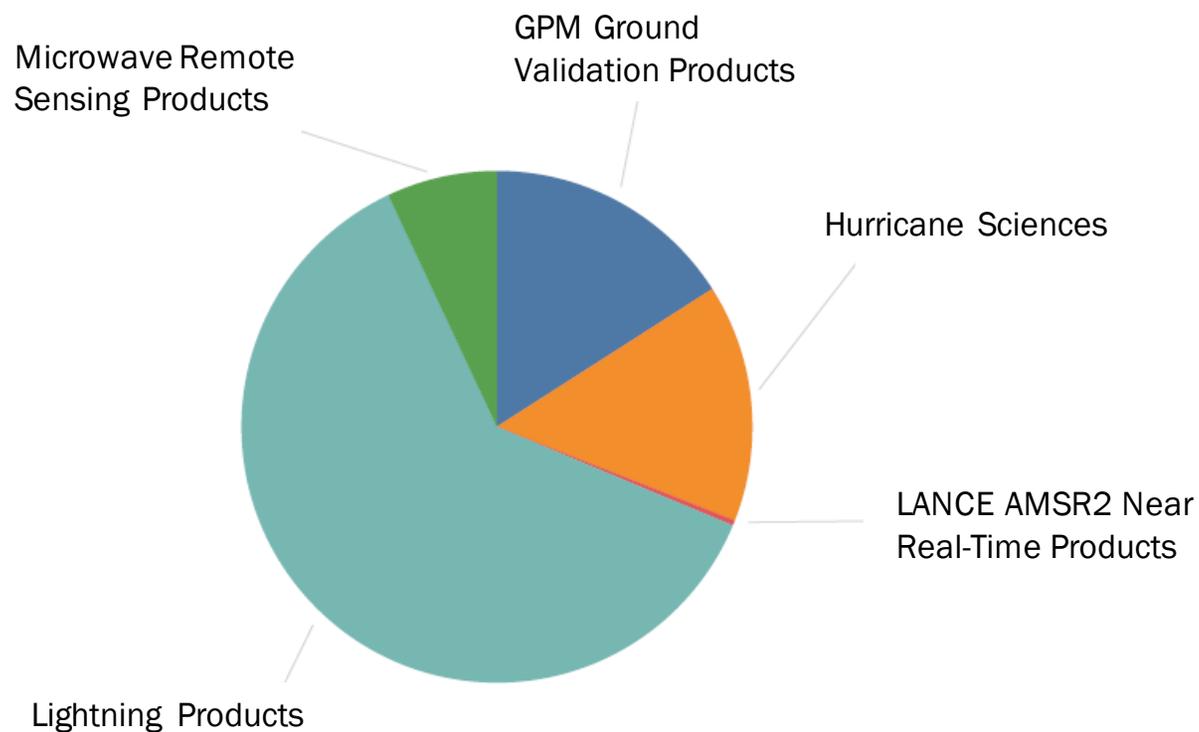
Global Lightning Image
Global lightning strikes from January 1998 to April 2015 from

- Create Micro Articles and Data Recipes relating to lightning
- Present about lightning products at conferences
- Completed new lightning dedicated web pages (<https://ghrc.nsstc.nasa.gov/lightning/>)
- Lightning Virtual Collection
- Mastheads highlighting lightning data

Top 10 Data Downloads for FY18



Top 5 Data Collection Downloads for FY18



NASA DEVELOP Project

DEVELOP, part of NASA's Applied Sciences Program, **addresses environmental and public policy issues** by conducting **interdisciplinary feasibility** projects that **apply the lens of NASA Earth observations to community concerns** around the globe. Bridging the gap between NASA Earth Science and society, DEVELOP **builds capacity** in both **participants** and **partner organizations** to better prepare them to address the challenges that face our society and future generations. With the competitive nature and growing societal role of science and technology in today's global workplace, DEVELOP is fostering an adept corps of tomorrow's scientists and leaders.



NASA DEVELOP Project: Hindu-Kush Himalayan Disasters

- Integrating NASA Earth Observations to Monitor Intense Thunderstorms and Assess Lightning Exposure and Risk in the Hindu-Kush Himalayan Region
- Objectives:
 - Aid project partners in emergency management
 - Identify areas vulnerable to frequent lightning activities
 - Provide partners with a resource to use precipitation patterns as a proxy for lightning strikes
- Data:
 - TRMM LIS
 - ISS LIS
 - TRMM PR
 - SRTM Elevation
 - United Nations International Strategy for Disaster Reduction, Global Assessment Report (GAR)
 - Oak Ridge National Laboratory (ORNL) LandScan Population Dataset

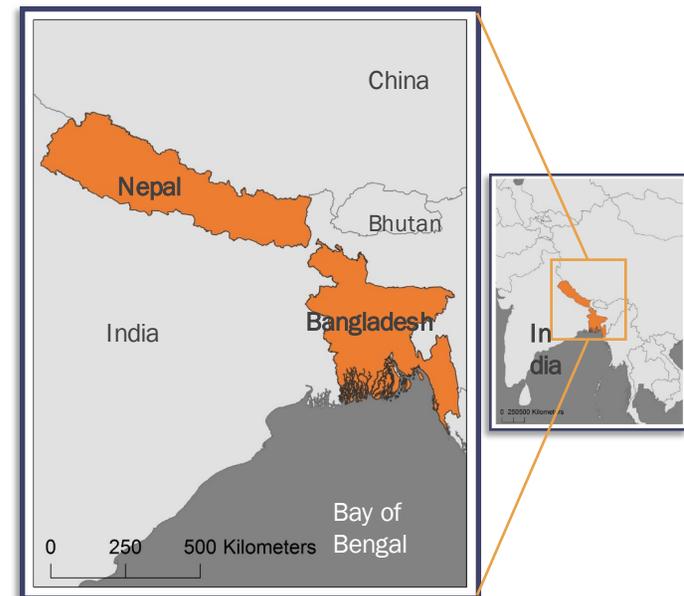
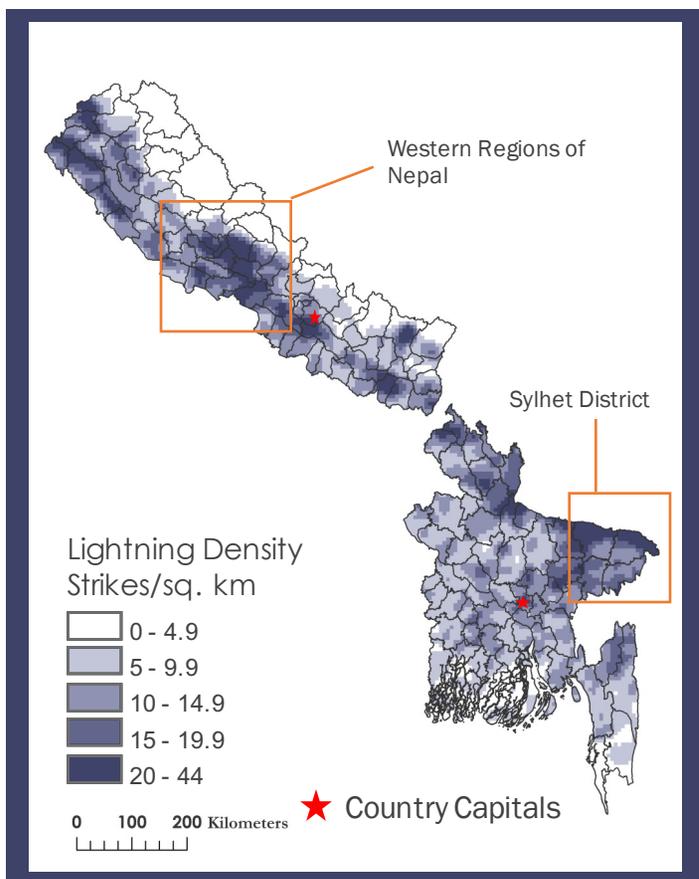


Image Credit: Christine Evans

NASA DEVELOP Project: Hindu-Kush Himalayan Disasters

Image Source: Christine Evans



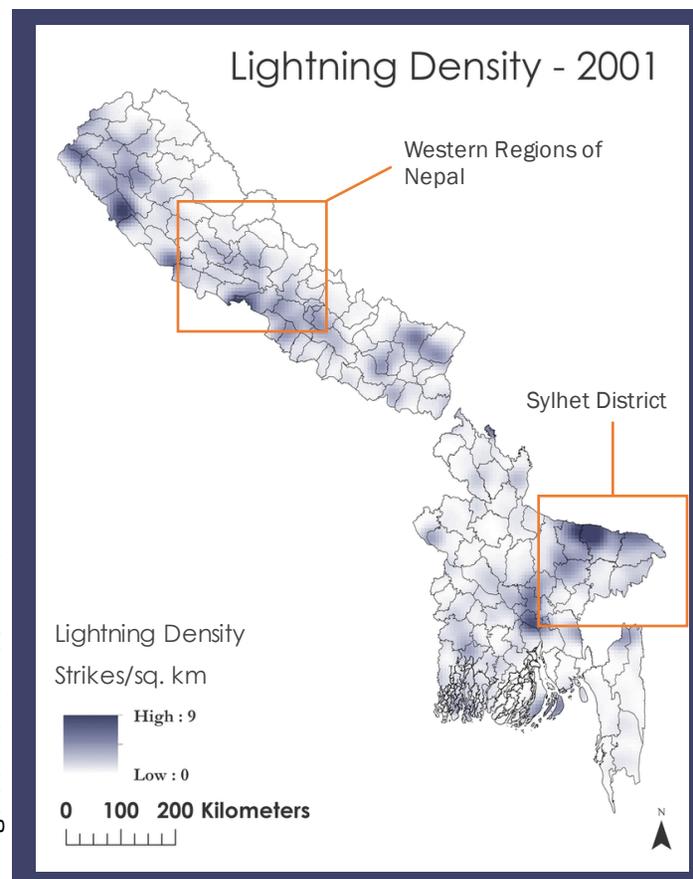
Lightning Exposure - Time Series



Total Lightning Exposure

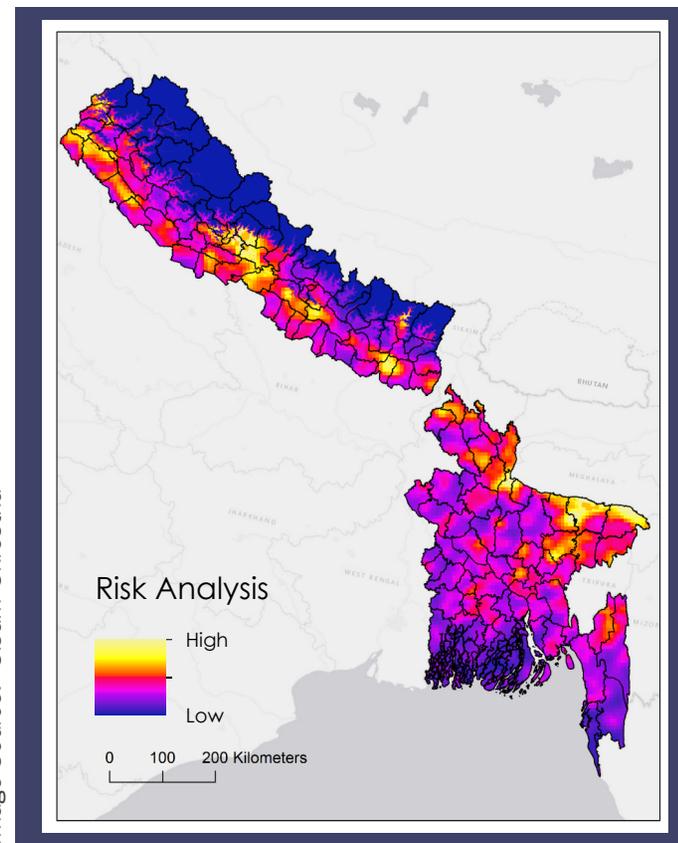


Image Source: Christine Evans



- Inputs:
 - TRMM LIS/ISS LIS lightning (2001-2017)
 - SRTM elevation (2008)
 - ORNL LandScan population density (2016)
 - United Nations International Strategy for Disaster Reduction, GAR socioeconomic data – housing conditions, employment (2015)
- Northern Bangladesh and the Southern Belt of Nepal are the highest lightning risk areas.

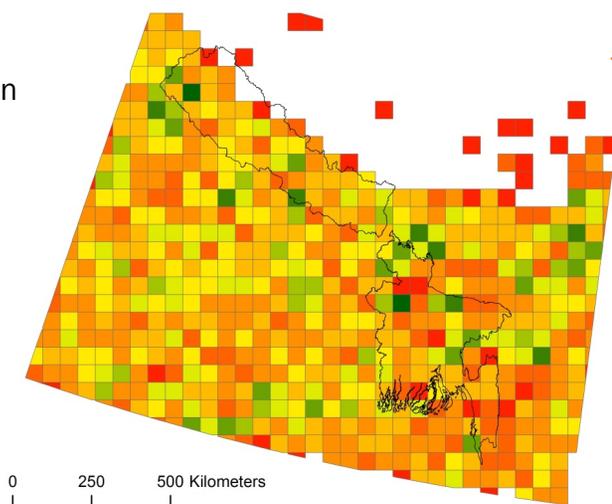
Image Source: Sisam Shrestha



NASA DEVELOP Project: Hindu-Kush Himalayan Disasters

- Spearman's Rank Correlation Coefficient
- Parameters:
 - Convective precipitation rate (mm/hr)
 - Lightning flash count

Spearman's Correlation R_s -Value



Month	R_s -Value
January	0.68021
February	0.77266
March	0.82939
April	0.83069
May	0.80599
June	0.64459
July	0.32119
August	0.37081
September	0.59054
October	0.68054
November	0.50358
December	0.53021

Image Source: Essence Raphael

NASA DEVELOP Project: Hindu-Kush Himalayan Disasters

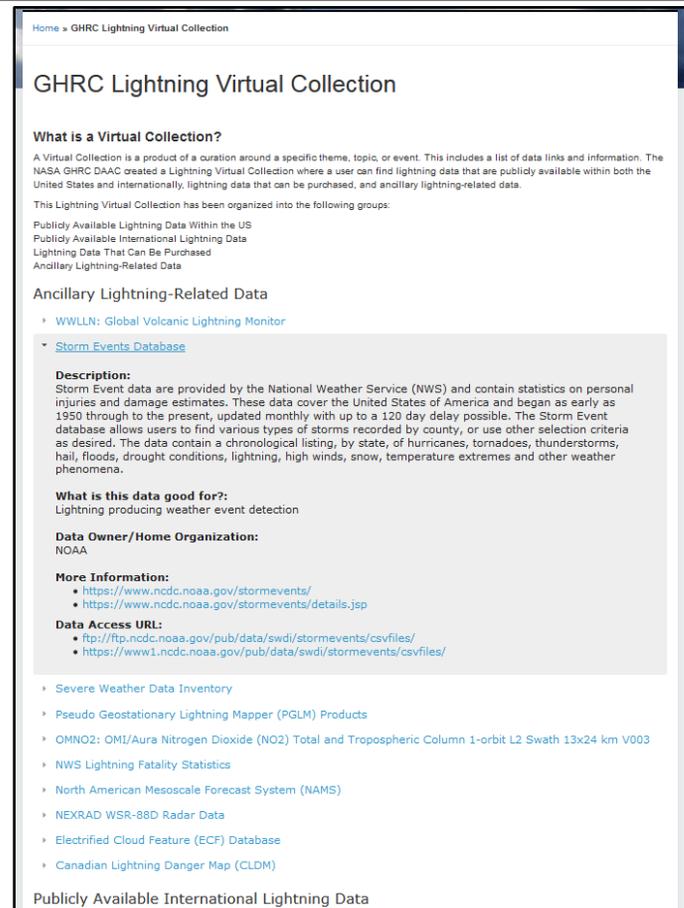
- Greatest lightning occurrence - western regions of Nepal and Sylhet district of Bangladesh
- Greatest Lightning Risk – Northern Bangladesh and Southern Belt of Nepal
- Averaged monthly correlation over the entire study area is positive
- Limitations:
 - Data gap between TRMM LIS and ISS LIS lightning data
 - 2015 - 2016
 - Ancillary datasets were not current
 - Population: 2016
 - Socioeconomic: 2015
- Future Work (Summer 2019):
 - Further analysis of correlations with respect to monsoons
 - Create a lightning climatology using ISS LIS data
 - Time series of lightning risk with changing yearly populations



Lightning Virtual Collection

- A Virtual Collection is a product of a curation around a specific theme, topic, or event
 - Includes data links and information
- Created a Lightning Virtual Collection where a user can find lightning and lightning-related data that are publicly available
- Organized into 4 sections:
 - Publicly Available Lightning Data Within the U.S.
 - Publicly Available International Lightning Data
 - Lightning Data That Can Be Purchased
 - Ancillary Lightning-Related Data

<https://ghrc.nsstc.nasa.gov/home/lightning-virtual-collections>



Home » GHRC Lightning Virtual Collection

GHRC Lightning Virtual Collection

What is a Virtual Collection?
A Virtual Collection is a product of a curation around a specific theme, topic, or event. This includes a list of data links and information. The NASA GHRC DAAC created a Lightning Virtual Collection where a user can find lightning data that are publicly available within both the United States and internationally, lightning data that can be purchased, and ancillary lightning-related data.
This Lightning Virtual Collection has been organized into the following groups:

- Publicly Available Lightning Data Within the US
- Publicly Available International Lightning Data
- Lightning Data That Can Be Purchased
- Ancillary Lightning-Related Data

Ancillary Lightning-Related Data

- ▶ [WVLLN: Global Volcanic Lightning Monitor](#)
- ▶ [Storm Events Database](#)
- ▶ [Severe Weather Data Inventory](#)
- ▶ [Pseudo Geostationary Lightning Mapper \(PGLM\) Products](#)
- ▶ [OMNO2: OMI/Aura Nitrogen Dioxide \(NO2\) Total and Tropospheric Column 1-orbit L2 Swath 13x24 km V003](#)
- ▶ [NWS Lightning Fatality Statistics](#)
- ▶ [North American Mesoscale Forecast System \(NAMS\)](#)
- ▶ [NEXRAD WSR-88D Radar Data](#)
- ▶ [Electrified Cloud Feature \(ECF\) Database](#)
- ▶ [Canadian Lightning Danger Map \(CLDM\)](#)

Publicly Available International Lightning Data

Future Plans

- Update visualization tools:
 - LIS Browse Calendar
 - Space-Time Search/Interactive Browse
- Produce more Micro Articles and Data Recipes related to lightning
- Develop an easy-to-use lightning product for GIS use
- Continue presenting about lightning products at GHRC in conferences
- Explore other tool ideas
- Support scientists using GHRC lightning data by highlighting their research on the webpage





THANK YOU!

Discussion

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