





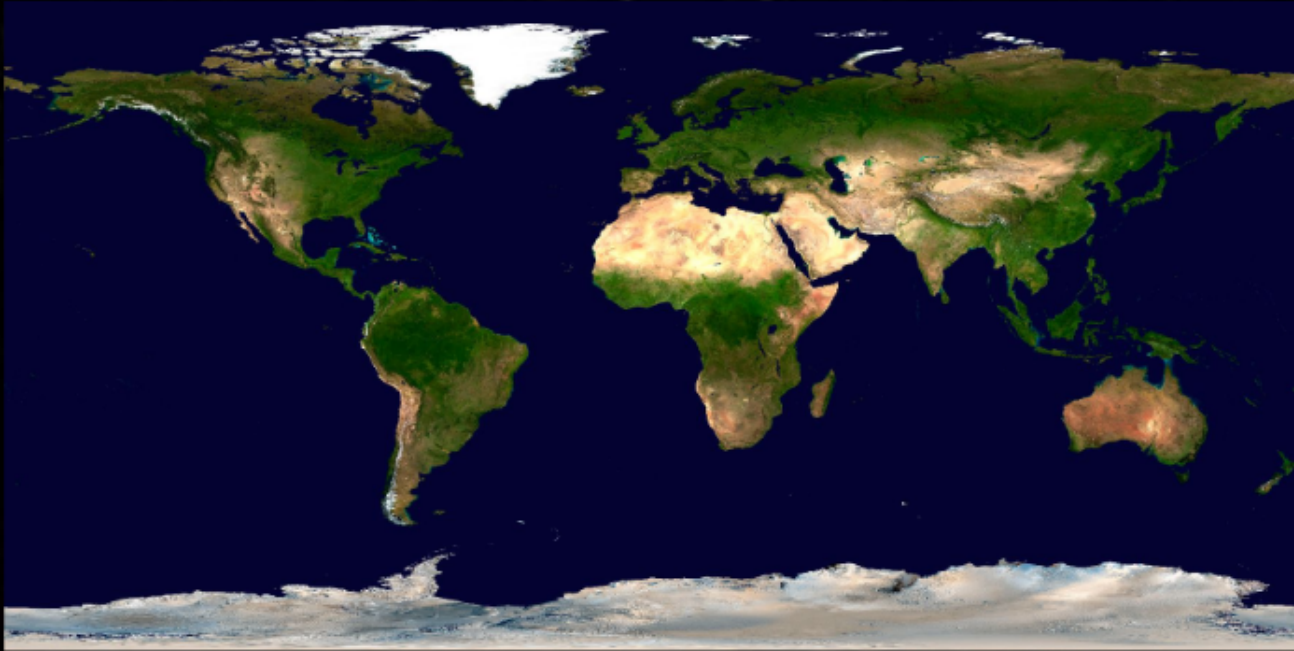
Working Group on Calibration and Validation
Land Product Validation Subgroup

Brief
History

Validation
Stages

Good Practice
Protocols

Information
Exchange





Working Group on Calibration and Validation
Land Product Validation Subgroup

Brief History of CEOS-LPV

Wickland



Running



c. 1999



Schaepman-Strub



Nightingale



Nickeson



An integrated approach to validation has encouraged widespread use of global Land products, helping CEOS agencies move toward standardized approaches for quantifying errors and uncertainties.

Belward



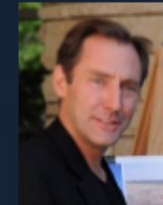
Justice



Privette



Morisette



Baret





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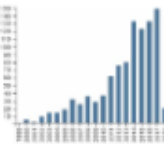
Working Group on Calibration and Validation
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Validation Hierarchy

Validation Stage - Definition and Current State	Variable
1 Product accuracy is assessed from a small (typically < 30) set of locations and time periods by comparison with in-situ or other suitable reference data.	Fapar Snow Cover Phenology LST & Emissivity Fire Radiative Power
2 Product accuracy is estimated over a significant set of locations and time periods by comparison with reference in situ or other suitable reference data. Spatial and temporal consistency of the product and consistency with similar products has been evaluated over globally representative locations and time periods. Results are published in the peer-reviewed literature.	Leaf Area Index Burned Area
3 Uncertainties in the product and its associated structure are well quantified from comparison with reference in situ or other suitable reference data. Uncertainties are characterized in a statistically rigorous way over multiple locations and time periods representing global conditions. Spatial and temporal consistency of the product and with similar products has been evaluated over globally representative locations and periods. Results are published in the peer-reviewed literature.	Land Cover Albedo Soil Moisture
4 Validation results for stage 3 are systematically updated when new product versions are released and as the time-series expands.	

Total Publications

1021



h-index

82

Average citations
per item

29.5

Sum of Times Cited

30,175



Working Group on Calibration and Validation
Land Product Validation Subgroup

Good Practice Protocols

- Documents accepted best practices in an open and transparent manner.
- Undergoes rigorous scientific review by a panel of international experts.
- Establishes a coordinated strategy to ensure that in-situ reference data are adequate to meet the future needs and aspirations of CEOS Space Agencies.





Working Group on Calibration and Validation
Land Product Validation Subgroup

Information Exchange

fiducial reference temperature measurements

16 – 18 October 2017
FRM4STS International Workshop at NPL, UK
www.frms4sts.org

International Workshop on fiducial reference measurements for satellite-derived surface temperature

NPL | esa | DLR | CNRS | CNR | KIT | PIIB | CEOS

LPV Vegetation Index & Phenology Workshop



Satellite Soil Moisture Validation and Application Workshop



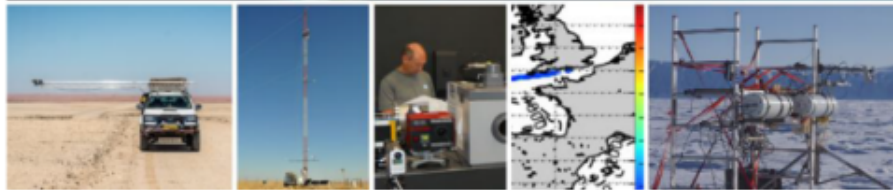
Bern Meeting and LPV Biomass Protocol Writing Workshop





fiducial reference
temperature
measurements

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International Workshop on fiducial reference measurements for satellite-derived
surface temperature



LPV Vegetation Index & Phenology Workshop



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Bern Meeting and LPV Biomass Protocol Writing Workshop





feature

Completing the jigsaw

The Australian science infrastructure playing a crucial role in some of the most advanced environmental initiatives in the world

55 global superstars of space-borne data validation

The screenshot displays the website for the CEOS Working Group on Calibration and Validation, Land Product Validation Subgroup. The page is titled "LPV Super Sites" and includes a navigation menu with links for HOME, ABOUT, DOCUMENTS, PEOPLE, and LINKS. The main content area features a section titled "CEOS land validation sites" with a paragraph explaining the group's history and goals. Below this, a list of criteria defines the LPV Super Sites, including being well-characterized, active, and supported by infrastructure. A world map shows the locations of these sites, with a red box highlighting a specific site in Europe. A pop-up window for this site, "Coteleaga", lists its characteristics: "Tree Cover, broadleaved, deciduous, closed". At the bottom, a "Network Visibility" legend identifies various networks by color: TERM (green), NEON (orange), INC (blue), EPDC (yellow), HCC (purple), forestGeo (light green), KOS (red), RT (dark red), and LTR (grey).

CEOS-LPV Super Site page added to LPV web site:

Definition: Well-characterized (canopy structure and biogeophysical variables) site following well-established protocols useful for the validation of satellite land products and for radiative transfer modeling approaches. Active long term operations (funding and infrastructure support).

Interactive map of sites, color coded by network (10 networks included). Click on site renders a pop-up window with site name, land cover type, and a link to site network page.

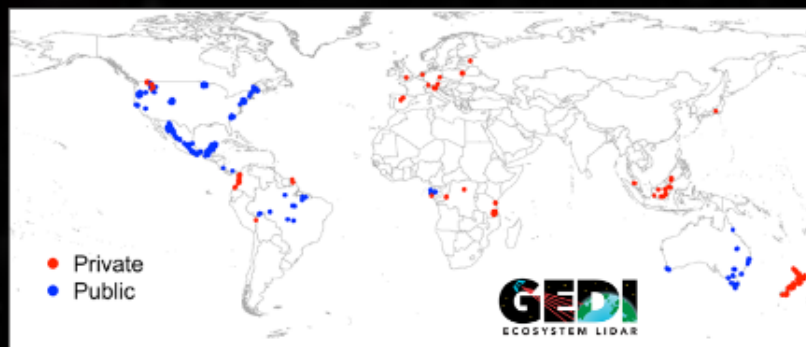
Page includes a link to spreadsheet of site details.

Link to selection report: <https://goo.gl/Mw7RMz>.

Objective site selection process helps inform CEOS Agency field experiments (e.g., ESAFiducial Reference Measurement framework: <https://earth.esa.int/web/sppa/activities/frm>).

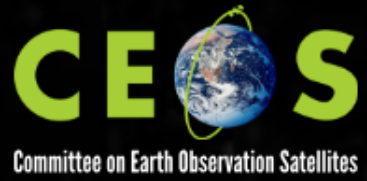
CARB-16: Cal/Val and Production of Biomass Products from CEOS Missions

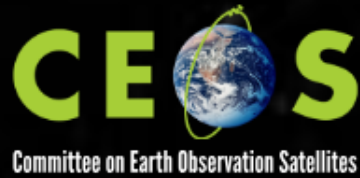
CARB-16: Intermediate Actions	Q4 2018	Book chapter for ISSI special issue on biomass: review on the importance of validation	NASA/ESA
	Q3 2019	CEOS WGCV biomass protocol	CEOS-LPV with contributions from NASA/ESA
	2019-2020	Recommendations for global ground-based biomass cal/val sites	NASA/ESA



GEDI Forest Structure and Biomass Database (Potential Biomass cal/val Sites)



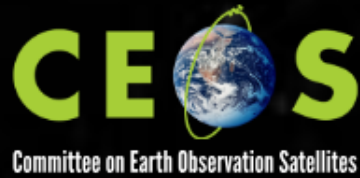




Continue to enhance the provision of space-based Earth observations for GEO, in the framework of the new 10-year strategic plan, while also stepping up to participate in GEO governance arrangements.

- The Kyoto Statement





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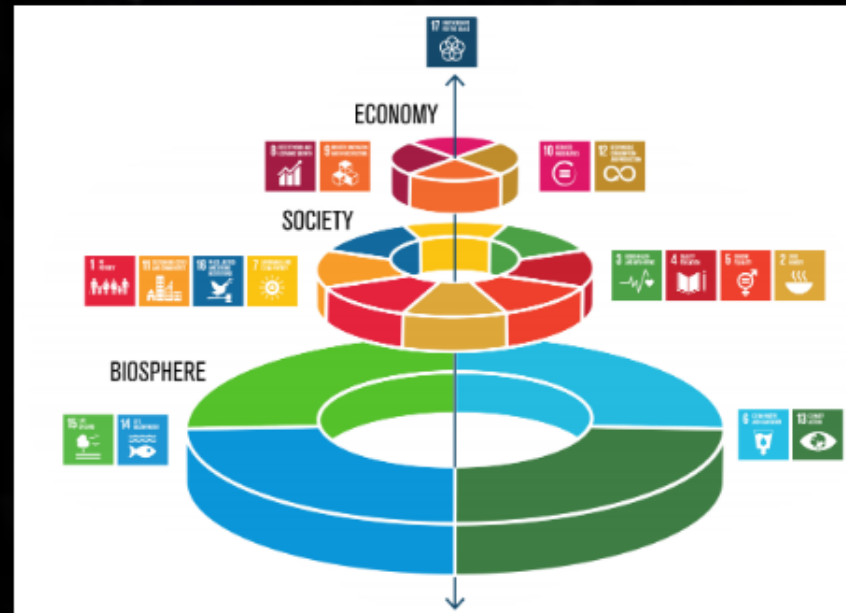
Committee on Earth Observation Satellites

Engage in global discussions on the critical challenges that face our modern society, such as achievement of SDGs, and ensure continuity and delivery of Earth observations from space to enable global, regional, and local solutions.

- The Kyoto Statement



17 SDGs and 169 targets





Committee on Earth Observation Satellites

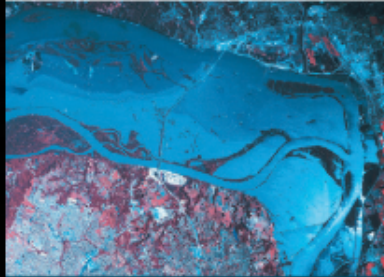
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17 SDGs and 169 targets





NASA Earth Science

Introducing 32 Projects Supporting
the Group on Earth Observations




These projects advance nine elements in the GEO Work Programme. The projects broaden the involvement in GEO by U.S. organizations, adding their expertise and contributions to realize societal benefits from Earth observations.

8 SOCIETAL BENEFIT AREAS

- Disaster Resilience
- Health Surveillance
- Food Security and Sustainable Agriculture
- Biodiversity and Ecosystem Conservation
- Water Resources Management
- Urban Resilience
- Energy and Natural Resources Management
- Infrastructure and Transport Management



Numerous projects support the Sustainable Development Goals



A Framework for the Validation of Nighttime Environmental Products





 **Black Marble**

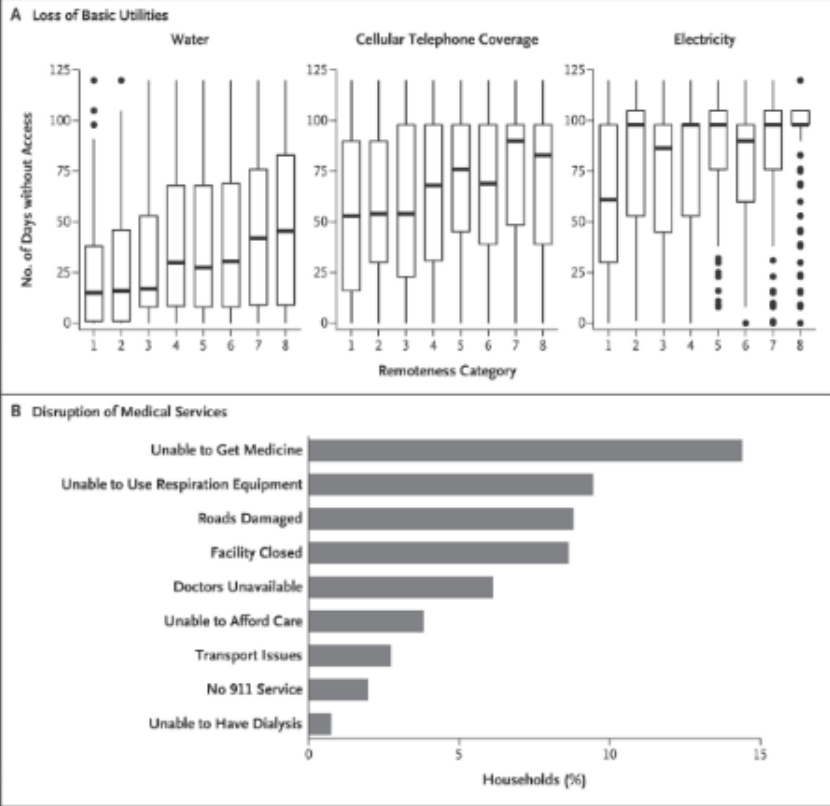
TARGET 13-1
STRENGTHEN
RESILIENCE
AND ADAPTIVE
CAPACITY TO
CLIMATE RELATED
DISASTERS

GLOBAL GOALS
#TARGETS4ACTION



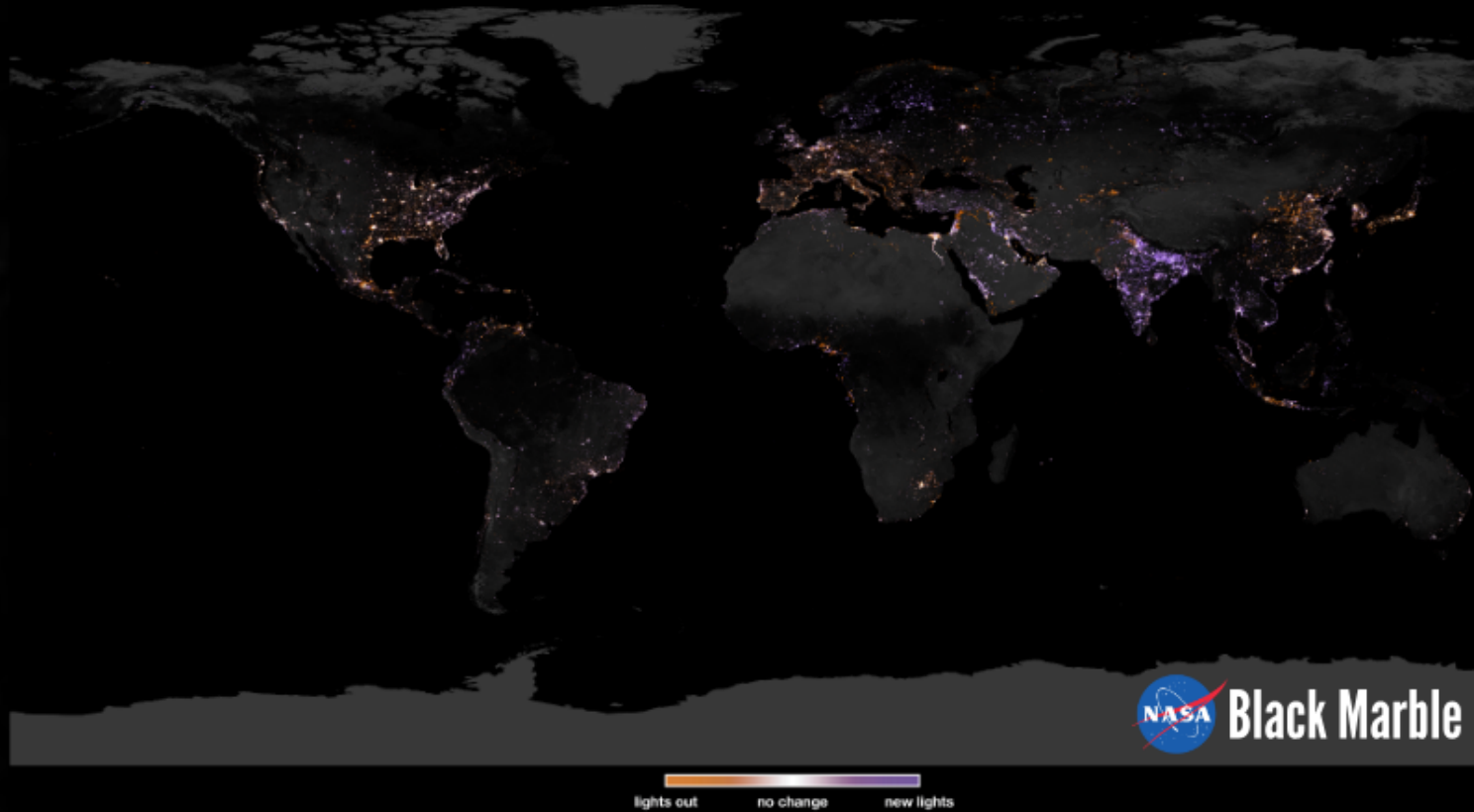
INTERNATIONAL DAY FOR DISASTER REDUCTION

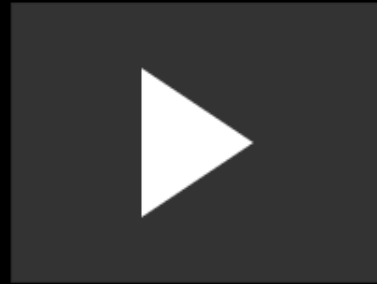
Hurricane Maria: Number of Days without Basic Services and Disruption of Medical Services.

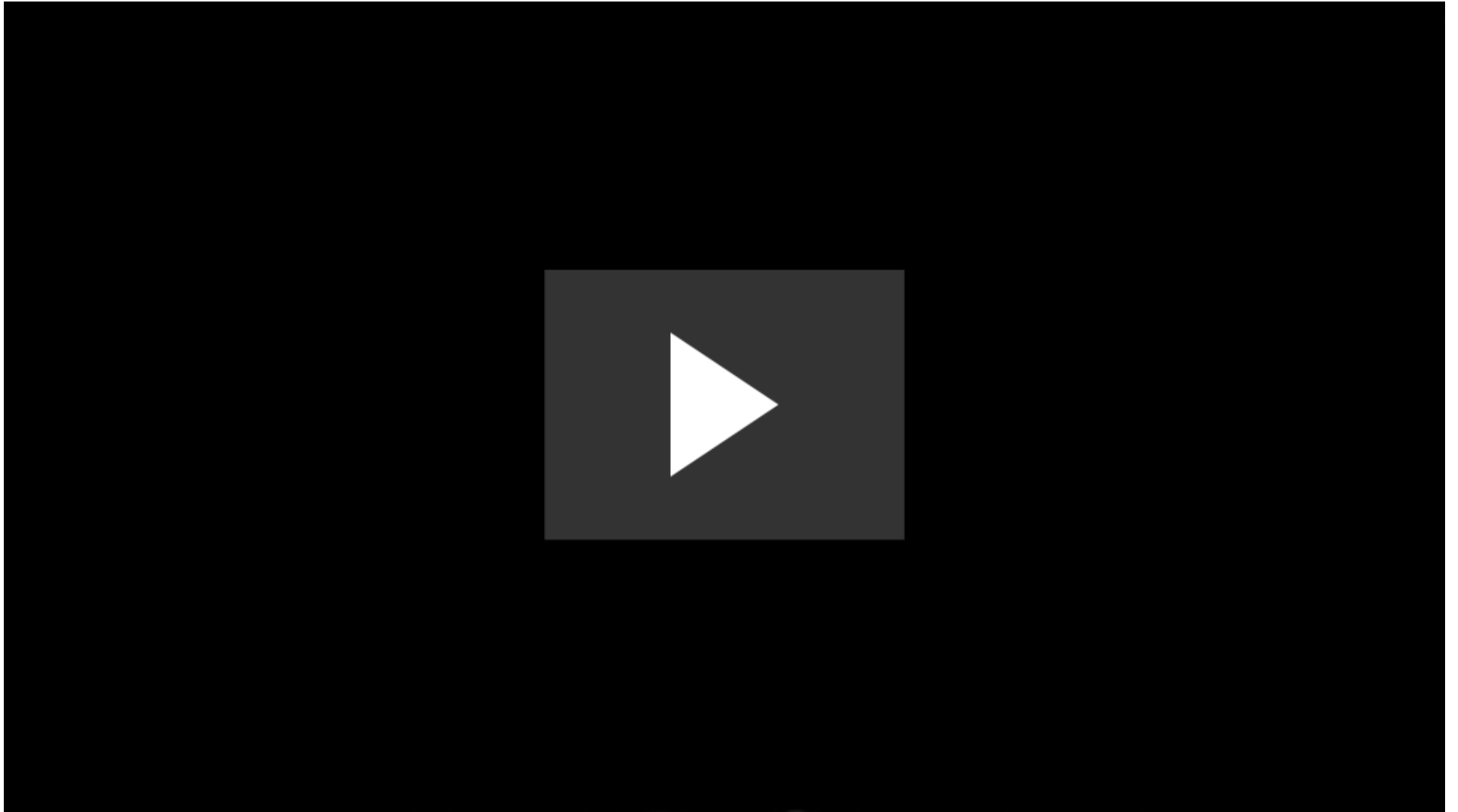


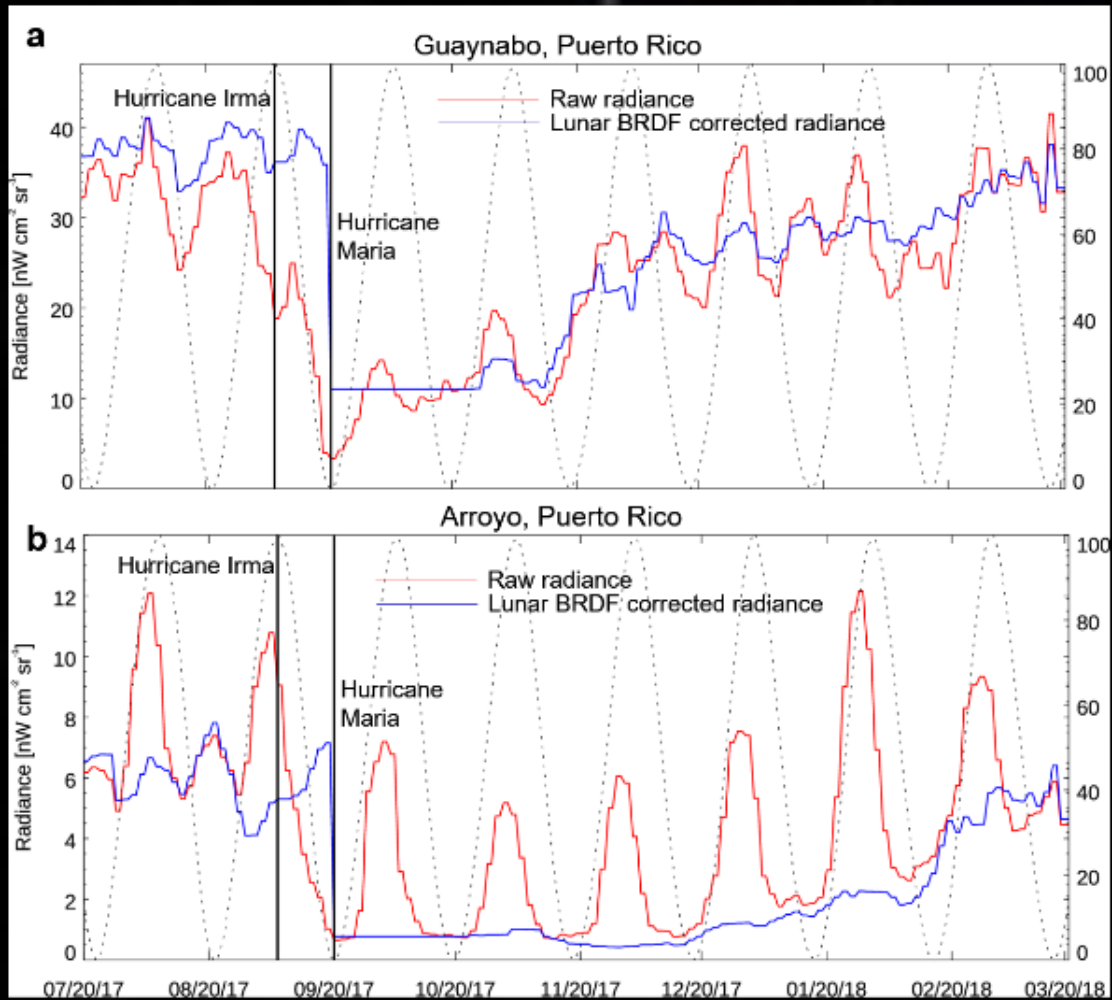
Kishore et al., 2018 NEJM

A Changing Earth at Night

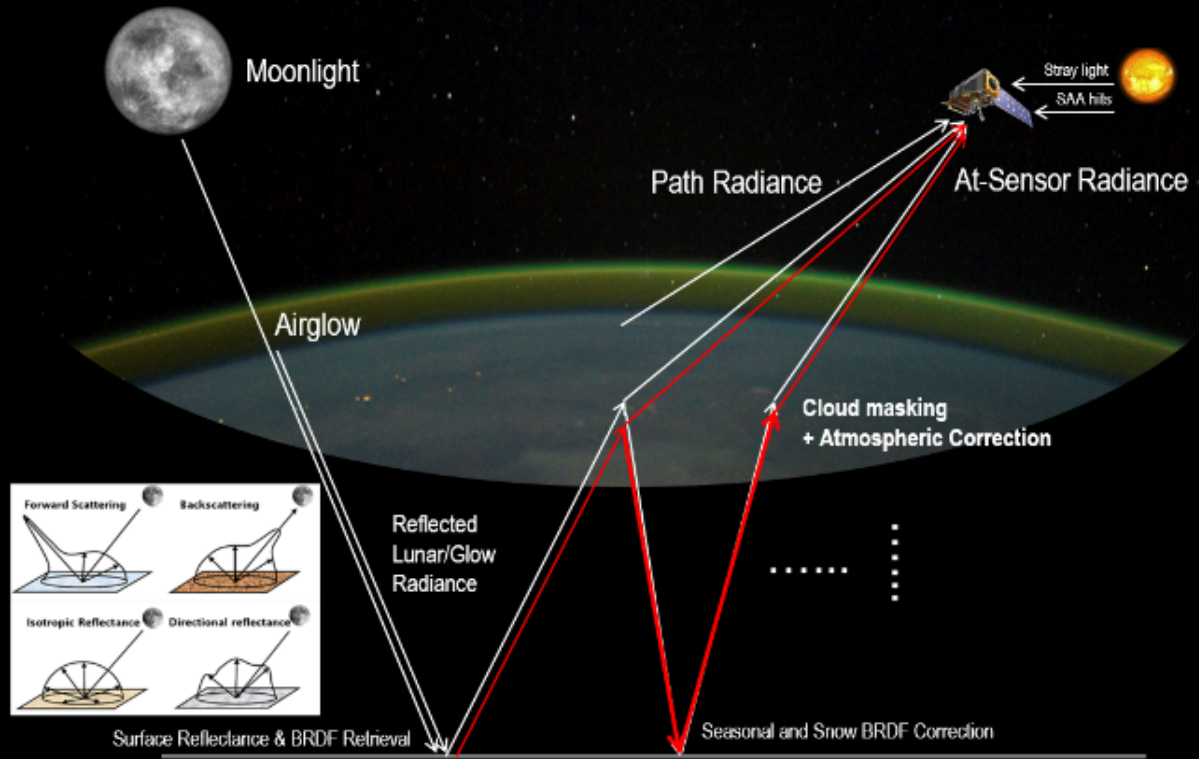








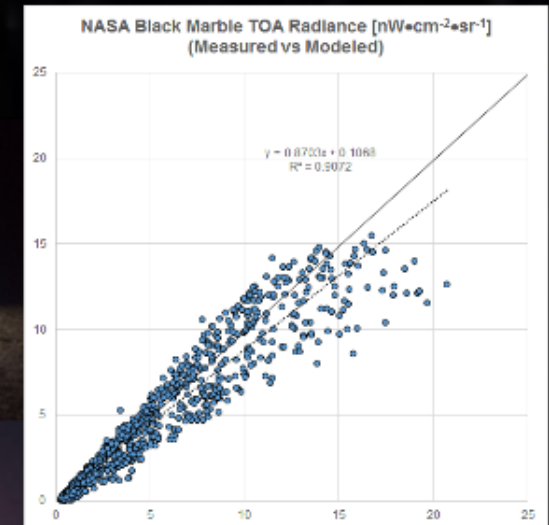
Nighttime Remote Sensing: Basic Principles



Roman et al., 2018 (RSE)

GEO's Nighttime Product Validation (NPV) Task

- Dedicated to the uncertainty assessment of global nighttime lights products through validation.
- Facilitates international objective benchmarking and standardization.
- Supports decision making by governments, NGOs, and individuals.



Challenge?

Confluence of climate, disaster risk reduction, and sustainable development agendas.

Benefits?

Communities that are more sustainable, resilient, equitable, and safe.

Evolution of Global Land Products

So What?

New era of global cooperation requires high-quality satellite data and new analytical tools.

Solutions?

Routinely validated satellite-derived Sustainable Development Indicators (SDIs) across local, regional, and global scales.

