EARTH SCIENCE
APPLIED SCIENCES

Applied Remote Sensing Training (ARSET) Program

Online Resource Guide
2015-2022

Remote Sensing Basics

Fundamentals of Remote Sensing

Participants will become familiar with satellite orbits, types, resolutions, sensors, and processing levels. In addition to a conceptual understanding of remote sensing, attendees will also be able to articulate its advantages and disadvantages. Participants will also have a basic understanding of NASA satellites, sensors, data, tools, portals, and applications to environmental monitoring and management.

ARSET Website

NASA'S Earth Observing Fleet

Get familiar with Earth observing satellites in NASA's fleet, sensors that collect data you can use in ARSET trainings, and their potential applications.

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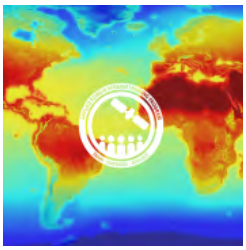
Climate & Resilience

Introduction to NASA Resources for Climate Change Applications

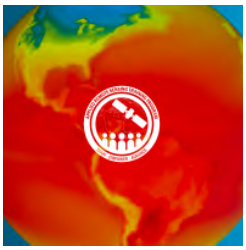


This two-part, introductory webinar series, co-produced by ARSET and the NASA Goddard Institute for Space Studies (GISS), will provide an overview of NASA resources for monitoring climate change and its impacts. The webinar will define the terminology and the role of Earth observations in climate change assessment, and then provide an overview of NASA climate models suitable for emissions policy, impacts, risk, and resilience applications.

Introductory

2021

NASA Earth Observations for Energy Management



This training will offer participants an introduction to how NASA EOs can contribute to a greater understanding of energy management applications. The course will summarize priorities and challenges for energy management and how various NASA EOs can support decision-making. Attendees will gain familiarity with a broad set of relevant NASA datasets, tools, platforms, and resources, as well as hear about case studies and real-world applications related to climate resilience, energy efficiency, and renewable energy.

Introductory

2021

Earth Observations Toolkit for Sustainable Cities and Human Settlements

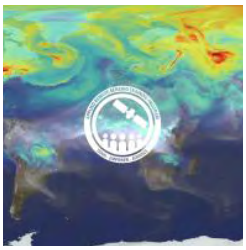
This three-part, introductory webinar series will provide an overview of the Earth Observations Toolkit for Sustainable Cities and Human Settlements, an online knowledge resource that shares ready-to-use Earth observation data sets and tools. These resources can be applied in policy areas that are important to resilient and sustainable cities. Such areas include sustainable urban planning, adequate housing, access to public transport, and access to public spaces.

Introductory

Bilingual

2022

Atmospheric CO2 and CH4 Budgets to Support the Global Stocktake

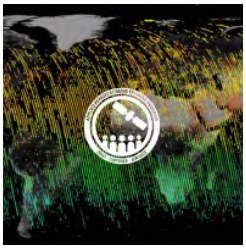


This three-part webinar series will introduce bottom-up and top-down methods for tracking emissions and removals of carbon dioxide (CO2) and methane (CH4) from the atmosphere. This training will explore how to combine this information to produce a more complete and transparent global stocktake, and support efforts to reduce net emissions and mitigate their impact on the climate.

Introductory

2022

Measuring Atmospheric Carbon Dioxide from Space in Support of Climate Related Studies



This introductory, four-part webinar series will provide an overview of atmospheric carbon dioxide measurements from space with the OCO-2 and OCO-3 satellite missions. It includes a theoretical portion that will describe the instrument, how the measurement is made, and the characteristics, limitations, and validation of the measurement.

Introductory

Bilingual

2022

(Click for Top Menu)

Climate & Resilience

Selecting Climate Change Projection Sets for Mitigation, Adaptation, and Risk Management Applications

This two-part training provides an overview of resources for choosing climate projection sets for mitigation, adaptation, and risk management applications. The training gives an overview of application areas, defines a list of distinguishing characteristics of climate projection sets, and then highlights the main benefits and drawbacks of different types of projection sets.

Introductory

2022

Disasters - Wildfires

Introduction to Remote Sensing for Wildfire Applications

This webinar series provides a basic overview of remote sensing tools for accessing and visualizing NASA Earth science data relevant to wildfires and case study applications for utilizing tools for pre- and post-burn wildfire conditions.

Introductory

2015

Satellite Observations and Tools for Fire Risk, Detection, and Analysis

Remote sensing can be used to monitor pre-, during-, and post-fire conditions; including weather and climate conditions, fuel characterization, fire risk, smoke detection, monitoring, and forecasting, fire behavior, and the post-fire landscape. This 6-part, intermediate training will provide lectures and case studies focused on the use of Earth observations for operational fire monitoring: pre-, during-, and post-event.

Intermediate

Bilingual

2021

Techniques for Wildfire Detection and Monitoring

With more frequent and severe droughts, certain areas are experiencing longer fire seasons. Wildfire detection, monitoring, and mitigation is increasingly important in these regions. Satellite remote sensing data is useful for identifying active fires, evaluating burned areas, and assessing fire emissions. This advanced training will highlight tools useful for local fire managers. Presentations and exercises will introduce participants to tools to identify active fires, visualize fire emissions, and calculate burn severity.

Advanced

2018

Using Earth Observations for Pre- and Post-Fire Monitoring

During the first session, this training will review pre-fire risk assessment by investigating land surface variables (e.g., vegetation type and height, fuel regimes, fuel moisture, and topography) and climate variables (e.g., temperature and precipitation). In the second session, this training will teach you to conduct post-fire mapping of burned area and burn severity using vegetation indices such as the Normalized Burn Ratio (NBR).

Advanced

2022

(Click for Top Menu)

Disasters - Floods

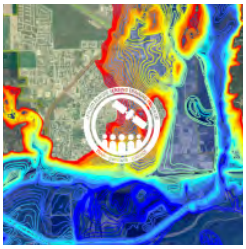
NASA Remote Sensing Observations for Flood Management

This training introduces remote sensing resources available for monitoring extreme precipitation and flooding, as well as flood mapping tools for flood management and planning.

Introductory

2015

Monitoring Urban Floods using Remote Sensing



According to the UNDP, by 2050, two thirds of the world's population is likely to live in cities. Urban flooding is already a major risk for cities. Increasing impervious surface area, inadequate storm water drainage, and aging infrastructure all contribute. As a result, growing urban populations will face a greater risk of flooding from extreme weather events. This webinar series will focus on the components of urban flooding that satellite data can track extreme precipitation, flooding, and waterlogged and ponded surfaces.

Introductory

2018

Monitoring and Modeling Floods using Earth Observations

ARSET has offered several trainings on flood monitoring based on optical and SAR observations in the past. This two-part training focuses on recent developments and updates in flood monitoring tools and flood modeling techniques. Specifically, an overview of the Hydrological Modeling and Analysis Platform (HyMAP), a routing model used with NASA's Land Information System (LIS), and examples of flood modeling cases is presented in this training.

Intermediate

2022

Using NASA Remote Sensing for Flood Monitoring and Management

This webinar provides demonstrations and hands-on experience in using NASA remote sensing observations and flood mapping tools useful for flood management. Participants learn to access rainfall, streamflow, and surface inundation extent data for regional flood cases. In addition, participants learn to access digital elevation and terrain data, as well as socioeconomic data, to facilitate flood risk assessment and post-flood relief planning using a GIS framework.

Advanced

2016

Disasters - SAR

Introduction to Synthetic Aperture Radar

SAR can observe the Earth's surface day and night, through most weather conditions, and the signal can penetrate the vegetation canopy. There are a number of existing SAR datasets from current and past airborne and satellite missions, as well as exciting upcoming missions. This online webinar will focus on building the skills needed to acquire and understand SAR data, including polarimetric and interferometric SAR (PolSAR and InSAR), as well as potential applications.

Introductory

Bilingual

2017

(Click for Top Menu)

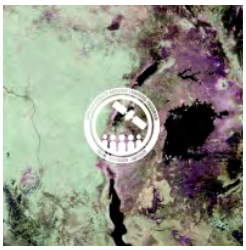
Disasters - SAR

Disaster Assessment using Synthetic Aperture Radar

This training includes theoretical portions for each disaster as related to the SAR signal interaction with surface conditions and demonstrations using Google Earth Engine, Jupyter Notebooks, and the SNAP Toolbox, all freely and openly available tools.

Intermediate
Bilingual
2022

Radar Remote Sensing for Land, Water, and Disaster Applications



This webinar series builds on ARSET's previous webinar, Introduction to Synthetic Aperture Radar. The training will focus on different techniques such as time-series', polarimetry, and interferometry for mapping and monitoring disasters, water, and land cover applications such as deforestation, crops, flooding, and earthquakes.

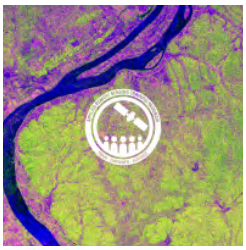
Advanced
Bilingual
2018

SAR for Landcover Applications

This webinar series will build on the knowledge and skills previously developed in ARSET SAR trainings. Presentations and demonstrations will focus on agriculture and flood applications. Participants will learn to characterize floods with Google Earth Engine and learn to analyze synthetic aperture radar (SAR) for agricultural applications, including retrieving soil moisture and identifying crop types.

Advanced
Bilingual
2019

SAR for Disasters and Hydrological Applications



This training builds on the skills taught in previous ARSET SAR trainings in terms of the use of Google Earth Engine for flood mapping with radar data. This training presents two new topics; the use of InSAR for characterizing landslides and the generation of a digital elevation model (DEM).

Advanced
Bilingual
2019

Disasters - Urban Heat Islands

Satellite Remote Sensing for Urban Heat Islands

This training will address the use of remote sensing in determining where "hot spots" of land surface temperature are located in urban areas, why these areas are experiencing increased temperature, which populations are most vulnerable, and ways to mitigate the effects through adaptive land use planning.

Introductory
2020

(Click for Top Menu)

Disasters - Urban Heat Islands

Satellite Remote Sensing for Measuring Urban Heat Islands and Constructing Heat Vulnerability Indices

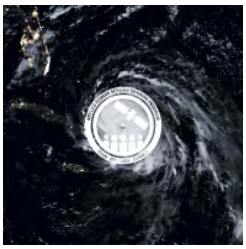
Once UHIs have been mapped, incorporating socioeconomic data pertaining to population, demographics, and health information into heat vulnerability indices (HVI) can help guide interventions to manage heat related risks to public health. This four-part, advanced webinar builds on ARSET's urban heat island training held in November 2020 with hands-on exercises for participants to measure UHI and construct HVIs for their areas of interest.

Advanced

2022

Disasters - Other

Monitoring Tropical Storms for Emergency Preparedness

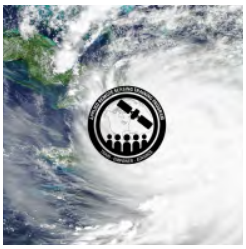


Tropical storms have major impacts, including loss of life and destruction of property. In 2017 alone, the United States experienced three tropical storms with more than $1 billion in losses. Open source satellite data can be used before, during, and after a storm for monitoring and response. A storm's intensity, path, wind, precipitation, storm surge, and flooding can be derived from historical and near real-time satellite observations. In this introductory webinar, participants will learn about the NASA data and tools they can use to monitor tropical storms.

Introductory

2018

Overview of the Global Disasters Alert and Coordination System (GDACS)

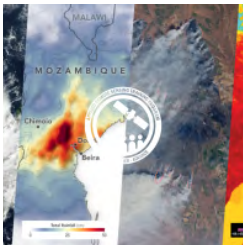


The Global Disaster Alert and Coordination System (GDACS) provides near real-time data, alerts, and impact assessments that can be accessed online. In this two-hour webinar, participants learn how to use GDACS to monitor real-time disasters, assess the impacts of an event, and develop response strategies for both national and international events.

Introductory

2017

Earth Observations for Disaster Risk Assessment and Resilience



This webinar series will focus on Earth observation (EO) data useful for disaster risk assessment. The series will cover disasters including tropical cyclones, flooding, wildfires, and heat stress. The training will also cover access of socioeconomic and disaster damage data. Sessions 3 & 4 will cover case studies and operational applications of EO for disaster risk assessment.

Introductory

2019

Introduction to NASA's "Black Marble" Night Lights Data

This webinar will focus on building the skills needed to choose the appropriate night lights product, acquire and understand Black Marble data, and how to use the data in analyses for tracking urbanization, electrification, and disaster monitoring.

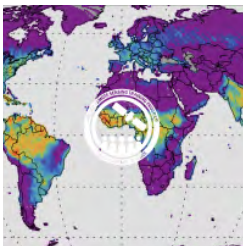
Introductory

Bilingual

2020

Disasters - Other

Use of Solar Induced Fluorescence and LiDAR to Assess Vegetation Change and Vulnerability



This introductory webinar series will cover the fundamentals of Solar Induced Fluorescence (SIF) and LIDAR, their applications, and an overview of different satellite data sources that are openly available. In addition, it will also include a step-by-step guide on how to access, open, and interpret SIF and LIDAR data.

Introductory
Bilingual
2021

Introduction to Population Grids and their Integration with Remote Sensing Data

This 2-part training, developed and presented by members of the POP-GRID Data Collaborative, will focus on the different global population grids and their application to a range of topics related to development planning and monitoring of the SDGs (e.g., environment, hazards, and access to resources). Attendees will be exposed to the latest data and methods used to produce global grids, how the grids incorporate remote sensing inputs, and how population grids can be used in conjunction with other types of data.

Introductory
2021

Humanitarian Applications using NASA Earth Observations

This four-part introductory training will focus on using NASA data products for monitoring human settlements and landscapes during armed conflict and forced displacement. This ARSET training is the first dedicated to humanitarian applications of NASA satellite imagery with topics including monitoring urban damage, mapping refugee settlement dynamics, and gauging climate hazards at refugee settlements.

Introductory
2022

Using NASA Remote Sensing for Disaster Management

NASA remote sensing and modeling resources are useful for managing a variety of disasters - including earthquakes, tsunamis, volcanoes, floods, landslides, wildfires, and oil spills - particularly in regions with very little in situ data. This intermediate course will provide an overview of NASA remote sensing data and applications for disaster management.

Intermediate
2016

Remote Sensing for Disasters Scenarios

According to the WHO, every year disasters "kill around 90,000 people and affect close to 160 million people worldwide." This training will show participants how NASA remote sensing data can be used to characterize and monitor disaster-related events and support relief efforts. Each session will cover a different disaster and its supporting data. Disaster scenarios include tropical storms, flooding, earthquakes, and landslides.

Intermediate
Bilingual
2019

(Click for Top Menu)

Disasters - Other

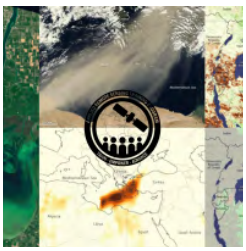
Satellite Observations for Analyzing Natural Hazards on Small Island Nations

This three-part training series will focus on small island nations while introducing the data, methods, and tools useful for monitoring natural hazards. Case studies will be used to demonstrate methodologies applying satellite and model data and open access tools to analyze storm impacts, sea level rise, and landslides on small island nations.

Intermediate
Bilingual
2021

Health & Air Quality

Fundamentals of Satellite Remote Sensing for Health Monitoring



This introductory course will provide an overview of environmental parameters available from NASA Earth Science useful for monitoring and predicting health for decision support. There are many different data sources from different satellite missions, sensors, and models, and sessions will outline their features, strengths, and limitations. It will also cover easily-accessible NASA data, web-based tools, analysis, visualization, and examples of data usage.

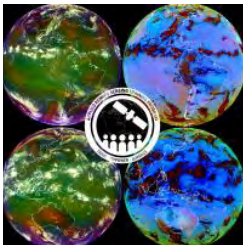
Introductory
2016

Introduction to Satellite Remote Sensing for Air Quality Applications

This introductory webinar series provides a brief overview of some of the fundamentals essential to understanding the remote sensing process, data products, and their use in air quality applications. This training was specifically targeted at participants of the in-person workshops at the 17th IUAPPA World Clean Air Congress and the 9th CAA Better Air Quality Conference and the Atmospheric Optics: Aerosols, Visibility, and the Radiative Balance Conference.

Introductory
2016

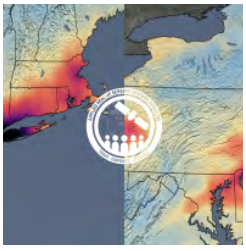
High Temporal Resolution Air Quality Observations from Space



For certain applications, some satellites take too long to revisit the same spot. Some satellites are capable of consistent monitoring of the same area. This webinar series will cover satellites with a high temporal resolution for air quality applications. Attendees will learn about new and upcoming geostationary satellites, what data is available, and how to access them. The training will cover satellites over the Americas, Asia, and Africa, and feature speakers from NOAA, Yonsei University, and the Indian Institute of Remote Sensing.

Introductory
2018

An Inside Look at How NASA Measures Air Pollution



This training is tailored to those interested in learning how to access and visualize NASA satellite imagery. With the world's eyes and media coverage turned to recent global changes in air pollution, this two-part webinar series provides a primer for the novice and a good refresher course for all others. Participants will learn which pollutants can be measured from space, how satellites make these measurements, the do's and don'ts of interpreting satellite data, and how to download and create your own visualizations.

Introductory
Bilingual
2020

Health & Air Quality

Satellite Derived Annual PM2.5 Datasets in Support of UN SDGs

Recently, annual mean PM2.5 maps have been developed using MODIS, MISR, and SeaWiFS observations from 1998-2015 and have been used by organizations, such as the World Health Organization (WHO) and Greenpeace, to assess global air quality and health impacts. In this webinar, participants learn how to use this database to analyze PM2.5 over cities using satellite observations. This training covers data access, analyzing long-term trends, and combining PM2.5 and population datasets to understand long-term exposure.

Intermediate

2017

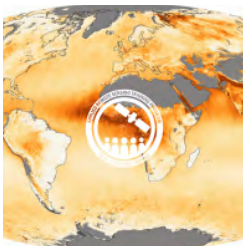
Accessing and Analyzing Air Quality Data from Geostationary Satellites

This three-part webinar series a) provides an overview of geostationary capabilities for monitoring air quality around the world; b) introduces geostationary aerosol datasets from GOES-East, GOES-West, Himawari 8, and the Geostationary Environment Monitoring Spectrometer (GEMS); and 3) presents data access and python tools to read and analyze the datasets.

Intermediate

2022

Satellite Remote Sensing of Particulate Matter Air Quality



Through a combination of presentations from experts in the field and hands on exercises, this advanced webinar series will cover specific details on the data sets, available tools, and various methods used to address particulate matter air quality.

Advanced

2015

Methods in Using NASA Remote Sensing for Health Applications

In this advanced webinar, participants learn how to access and apply NASA data relevant to public health. The webinar includes a presentation on tools available for evaluating the relationship between environmental conditions and health outcomes, followed by lectures on pollen dispersal and heat stress mitigation. Two homework assignments will give participants an opportunity to review and practice what they have learned during the presentations.

Advanced

2017

Data Analysis Tools for High Resolution Air Quality Satellite Datasets

High resolution air quality data is helpful for monitoring urban air pollution. In this webinar, participants will learn how to use Python scripts to map and analyze air quality data through hands-on exercises. The training will cover MODIS aerosol optical depth data and OMI NO2 and SO2 data.

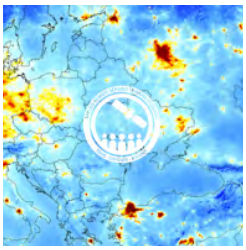
Advanced

2018

(Click for Top Menu)

Health & Air Quality

High Resolution NO2 Monitoring From Space with TROPOMI



The TROPOMI instrument onboard Sentinel-5P, launched in 2017, represents a significant improvement in spatial resolution over OMI. It will be better-suited for many applications currently using OMI data, including monitoring air pollution. In this advanced webinar, attendees will learn how to access and analyze TROPOMI data and learn about its applications.

Advanced

2019

MODIS to VIIRS Transition for Air Quality Applications

This training will teach users how to access VIIRS data products, the differences involved in using VIIRS as opposed to MODIS, and how to apply VIIRS aerosol optical depth observations for air quality applications.

Advanced

2020

Introduction and Access to Global Air Quality Forecasting Data and Tools

This first of its kind ARSET training focuses on NASA and European Center for Medium-Range Weather Forecasts (ECMWF) global air quality (AQ) forecasting capabilities. Delivered in collaboration with the Copernicus Atmosphere Monitoring Service (CAMS), this training will discuss the basics of AQ forecasting and will teach users how to access and interpret global air quality forecasts. Anyone who is interested in learning about AQ forecasting will benefit from this training.

Advanced

2021

Tools for Analyzing NASA Air Quality Model Output

This advanced webinar series will build the capacity to apply Python codes and other online tools to read, map, and analyze datasets from NASA Goddard Earth Observing System (GEOS) air quality forecasts as well as products from the second Modern-Era Retrospective analysis for Research and Application (MERRA-2) reanalysis. The training will run three sessions, with each session two hours long. The sessions will include lectures and hands-on activities, including exercises, interacting with web-based and offline python tools, and time to perform analyses.

Advanced

2022

Ecological Conservation - Biodiversity & Ecosystems

Introduction to Remote Sensing for Conservation Management

This webinar series focuses on regional and global observation resources for conservation management. It provides a basic overview of remote sensing, tools for accessing and visualizing relevant NASA Earth science data, and case study applications for utilizing these tools for conservation management. The target audience for this series are NGOs (national and international) focused on conservation and biodiversity issues.

Introductory

2015

Ecological Conservation - Biodiversity & Ecosystems

Remote Sensing for Conservation and Biodiversity

Conservation and biodiversity management play important roles in maintaining healthy ecosystems. Earth observations can help with these efforts. This online webinar series introduces participants to the use of satellite data for conservation and biodiversity applications. The series will highlight specific projects that have successfully used satellite data.

Introductory

2019

Evaluating Ecosystem Services with Remote Sensing

This training outlines the basics of ecosystem services and natural capital accounting. It also provides an overview of how Earth Observations (EO) can be used to support global frameworks and initiatives such as standards set by the United Nation's System of Environmental Economic Accounting (UN-SEEA). Case-study examples are provided to highlight locally specific efforts such as valuation of native pollinators, urban ecosystem accounts, valuation of coastal resilience and coral reef habitats, and forest conservation and carbon sequestration.

Introductory

2022

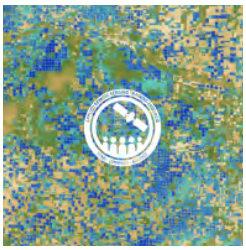
Hyperspectral Data for Land and Coastal Systems

The ability of hyperspectral data to characterize chemical, physiological, and morphological traits allows decision-makers to better understand critical components of ecosystem dynamics such as invasive species encroachment, forest decline and pest infestation, and ocean dynamics. This training is also an opportunity to build capacity in a large user community prior to the launch of the highly anticipated global hyperspectral SBG mission.

Introductory

2021

New Sensor Highlight: ECOSTRESS



This webinar will focus on a NASA instrument that was launched and installed on the International Space Station in Summer 2018. Designed to study terrestrial ecosystems and plant water stress from the ISS, ECOSTRESS can also be used to better understand crop health, volcanoes, urban heat, wildland fires, coastal systems, and much more.

Introductory

2019

Understanding Phenology with Remote Sensing

This training will focus on the use of remote sensing to understand phenology: the study of life-cycle events. Phenological patterns and processes can vary greatly across a range of spatial and temporal scales, and can provide insights about ecological processes like invasive species encroachment, drought, wildlife habitat, and wildfire potential.

Introductory

2020

Ecological Conservation - Biodiversity & Ecosystems

Earth Observations for Indigenous-Led Land Management

This introductory webinar series will share lectures, case studies, and demonstrations with representatives of indigenous peoples' organizations and will focus on how Earth observations (EO) data and tools can provide spatial information for forest monitoring, mapping, and responding to ecosystem threats. This series will help attendees strengthen their technical capacities to use EO data and tools to enhance their sustainable land management practices.

Introductory
Bilingual
2019

Introduction to Remote Sensing for Scenario-Based Ecoforecasting

Assessing the ecological impacts of a changing climate is crucial for natural resource management decision-making. NASA Earth observations can be used to help make these decisions. This four-week webinar series, in collaboration with the USGS North Central Climate Center, will include an overview of the satellites, sensors, and tools relevant to ecological forecasting; available climate products and data for ecological modeling; scenario planning; and the application of modeling for species distribution and state-and-transition simulations.

Introductory
2017

Using the UN Biodiversity Lab to Support National Conservation and SDGs

There is a global demand for more NASA ARSET trainings focused on biodiversity, conservation, the UN Sustainable Development Goals (SDGs), and how to link NASA satellite data to ecological and human-influenced systems. This training aims to fill that gap by extending the influence of this NASA-supported tool and increasing its dissemination, use, and overall success. UN Biodiversity Lab makes global datasets on biodiversity and sustainable development easily accessible, supporting our broad audience.

Introductory
Multilingual
2020

Using the UN Biodiversity Lab to Monitor the Pulse of the Planet

This training will focus on using remote sensing and geospatial data within the NASA-supported UN Biodiversity Lab (UNBL) to take action on national conservation and sustainable development priorities. With over 400 of the world's best global data layers on biodiversity, ecosystem services, and sustainable development, UNBL enables decision-makers and policymakers to access essential global data, upload national datasets, and calculate dynamic indicators for any area of interest - all without any background in remote sensing and GIS.

Intermediate
Multilingual
2022

Species Distribution Modeling with Remote Sensing

SDMs contextualize future scenarios based on known or projected ecological parameters and are the cornerstone for adaptive management planning around short- and long-term changes to complex landscapes. This training will provide an overview of SDMs, show how to use remote sensing data for landscape characterization, and highlight multiple Applied Sciences projects that have developed tools for conducting SDM for a variety of ecosystems.

Intermediate
2021

(Click for Top Menu)

Ecological Conservation - Biodiversity & Ecosystems

Remote Sensing for Freshwater Habitats

This webinar series will guide participants through using NASA Earth observations for habitat monitoring, specifically for freshwater fish and other species. This training will also provide a conceptual overview, as well as the tools and techniques for applying landscape environmental variables to genetic and habitat diversity in species.

Intermediate

2019

Ecological Conservation - Coastal & Oceans

Remote Sensing of Coastal Ecosystems

Coastal and marine ecosystems serve key roles for carbon storage, nutrients and materials cycling, as well as reservoirs of biodiversity. They also provide ecosystems services such as sustenance for millions of people, coastal protection against wave action, and recreational activities. Users, particularly those with little remote sensing experience, stand to benefit from this training covering some of the difficulties associated with remote sensing of coastal ecosystems, particularly beaches and benthic communities such as coral reefs and seagrass.

Introductory

Bilingual

2020

Monitoring Aquatic Vegetation with Remote Sensing

This training will combine basic information on the remote sensing of AVs, spectrometry of aquatic/coastal vegetation, and a demonstration of the NASA-funded Floating Forests citizen science tool.

Introductory

Bilingual

2022

Remote Sensing for Mangroves in Support of the UN Sustainable Development Goals

This training focuses on mapping and monitoring mangroves and how it relates to UN sustainable development indicator 6.6.1: Change in the extent of water-related ecosystems over time. Indicator 6.6.1 is used in determining progress toward meeting Sustainable Development Goal 6, which is to "Ensure availability and sustainable management of water and sanitation for all."

Introductory

2020

Introduction to Remote Sensing for Coastal and Ocean Applications

In this intermediate course participants will be provided with an overview of remote sensing for coastal and ocean applications. This includes a background in aquatic remote sensing, data access and tools for processing and analyzing imagery, and examples and live demonstrations of tools that have been developed for NASA and partner organizations. This course will cover data products from MODIS, VIIRS, HICO, and other sensors commonly used for ocean applications.

Intermediate

2016

Ecological Conservation - Land Cover & Change Detection

Remote Sensing of Land Indicators for Sustainable Development Goal 15

In this webinar, participants learn how to access and apply satellite data relevant to land indicators, such as estimating total forest area and forest change. The webinar includes an overview of the SDGs, as well as an introduction to image classification and change detection.

Intermediate

2017

Remote Sensing of Forest Cover and Change Assessment for Carbon Monitoring

In this intermediate course participants are provided with an overview of carbon monitoring for terrestrial ecosystems. This includes background information about the Intergovernmental Panel on Climate Change (IPCC), Greenhouse Gas (GHG) inventories, the United Nations Framework Convention on Climate Change (UNFCCC), and development of the Reducing Emissions from Deforestation and Degradation (REDD+) program. This course covers products from Landsat, MODIS, Sentinel, and other sensors commonly used for land management applications.

Intermediate

2016

Using Google Earth Engine for Land Monitoring Applications

This training will cover the GEE Code Editor, hands-on exercises on change detection, time series analysis, land cover classification, and accuracy assessment of optical imagery. These processes are an integral part of optical imagery analysis for many applications, including monitoring forest disturbance, wildfire mapping, identifying land cover degradation, mapping ecosystem connectivity, and identification of land surface changes due to urban growth.

Intermediate

2021

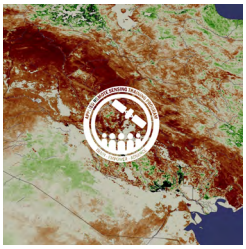
Creating and Using Normalized Difference Vegetation Index (NDVI) from Satellite Imagery

In this advanced webinar participants will learn how to acquire, use, and derive NDVI imagery from Landsat and MODIS. Weekly webinars include lectures, hands-on demonstrations of exercises, and written instructions on how to conduct the exercises. The exercises use QGIS, a cross-platform open source GIS application.

Advanced

2016

Remote Sensing of Drought



Prolonged drought can result in economic, environmental, and health-related impacts. In this webinar, participants learn how to monitor drought conditions and assess impacts on the ecosystem using precipitation, soil moisture, and vegetation data. The training provides an overview of drought classification, as well as an introduction to web-based tools for drought monitoring and visualization.

Advanced

2017

Ecological Conservation - Land Cover & Change Detection

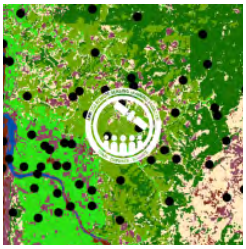
Land Cover Classification with Satellite Imagery

Land cover classification is an important first step to assessing land cover and land use. This advanced webinar provides lectures and hands-on activities focused on using satellite imagery for land cover classification. In two four-hour sessions, attendees will learn how to acquire Landsat imagery, display it in an open-source Geographic Information System (GIS), analyze spectral signatures of land cover types, and conduct a supervised land cover classification.

Advanced

2017

Accuracy Assessment of a Land Cover Classification



The next step to using land cover classifications is being able to evaluate the performance of a land cover map using accuracy assessments. This training will equip attendees with the skills necessary to conduct an accuracy assessment on a land cover map and identify which classes might be misrepresented.

Advanced

2018

Change Detection for Land Cover Mapping

This advanced series focuses on using satellite imagery to map changes in land cover. Attendees will learn change detection methods, including image subtraction and classification. They will also conduct their own change detection analysis. This training will use QGIS, the R statistical program, and the Random Forest algorithm.

Advanced

2018

Investigating Time Series of Satellite Imagery

This training will focus on two tools, AppEEARS from the LPDAAC, and LandTrendr via Google Earth Engine (GEE). AppEEARS enables users to integrate point or polygon ground-based data with satellite imagery. The GEE implementation of LandTrendr enables users to analyze land cover dynamics, including short-term disturbances and long-term trends.

Advanced

2019

Remote Sensing for Monitoring Land Degradation and Sustainable Cities SDGs

In this training, attendees will learn to use a freely-available QGIS plugin, Trends.Earth, created by Conservation International (CI), and includes special guest speakers from the United Nations Convention to Combat Desertification (UNCCD) and UN Habitat. Trends.Earth allows users to plot time series of key land change indicators. Attendees will learn to produce maps and figures to support monitoring and reporting on land degradation, improvement, and urbanization for SDG indicators 15.3.1 and 11.3.1.

Advanced

Bilingual

2019

(Click for Top Menu)

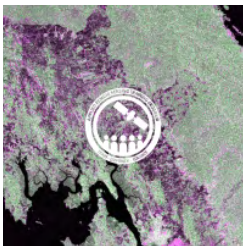
Ecological Conservation - SAR

A Q&A Session on Radar Remote Sensing

Previous ARSET online webinar series' focused on building the skills needed to acquire and understand SAR data, including polarimetric and interferometric SAR (PolSAR and InSAR), as well as their potential applications. The demand for guidance using SAR is extensive. The goal of this live, two-hour question and answer session was to provide participants with the opportunity to ask questions to a panel of experts.

Introductory
Bilingual
2019

Forest Mapping and Monitoring with SAR Data

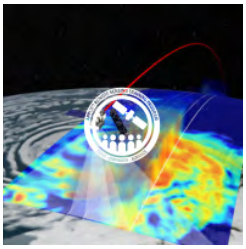


This advanced webinar series will introduce participants to 1.) SAR time series analysis of forest change using Google Earth Engine (GEE), 2.) land cover classification with radar and optical data with GEE, 3.) mapping mangroves with SAR, and 4.) forest stand height estimation with SAR.

Advanced
Bilingual
2020

Water Resources - Hydrology & Agriculture

Introduction to Global Precipitation Measurement (GPM) Data and Applications



This training introduces participants to the data and applications of the Global Precipitation Measurement (GPM) mission. GPM is an international satellite mission that provides next-generation observations of rain and snow worldwide every three hours.

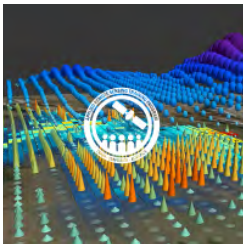
Introductory
2015

Water Resource Management using NASA Earth Science Data

This five week course covers precipitation (rainfall and snow fraction), soil moisture, evapotranspiratoin, runoff and streamflow, groundwater, and lake level heights. Attendees are introduced to a number of NASA data products.

Introductory
2015

Introduction to Using the VIC Hydrologic Model with NASA Earth Observations



The Variable Infiltration Capacity (VIC) Model uses inputs to better understand hydrological processes in near real-time. Many of the inputs are available from NASA remote sensing and Earth system models, allowing the model to provide soil moisture, evapotranspiration, and runoff as outputs. Together with precipitation data, these outputs provide quantitative assessment of a regional water budget. This introductory training will include an overview of the model, sources of satellite-derived input data, and implementation of the model.

Introductory
2018

Water Resources - Hydrology & Agriculture

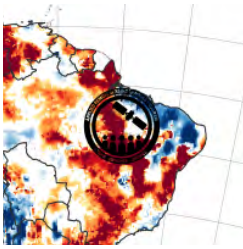
Satellite Remote Sensing for Agricultural Applications

This training addresses how to use remote sensing data for agriculture monitoring, specifically drought and crop monitoring. The webinar also provides end-users the ability to evaluate which regions of the world have agricultural productivity above or below long-term trends. This informs decisions pertaining to market stability and humanitarian relief.

Introductory

2020

Groundwater Monitoring using Observations from NASA'S GRACE Missions



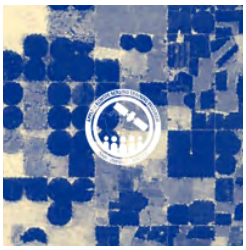
GRACE observations have been used for detecting groundwater depletion and for drought and flood predictions. This lightning-style training is designed to answer the demand and interest from the applications community in technologies that can be used to support water resources management. The webinar will provide an overview of the GRACE missions, groundwater data availability, and their applications in the monitoring and management of water resources.

Introductory

Bilingual

2020

Applications of Remote Sensing to Soil Moisture and Evapotranspiration



This webinar series was intended to help attendees learn about NASA soil moisture and evapotranspiration products and how to access and apply them for water resource management. Throughout the five sessions you will learn how to monitor and manage water resources with techniques learned in training.

Intermediate

2016

Agricultural Crop Classification with SAR and Optical Remote Sensing

This five-part, intermediate webinar series will focus on the use of synthetic aperture radar (SAR) from Sentinel-1 and/or optical imagery from Sentinel-2 to map crop types and assess their biophysical characteristics. The webinar will cover a SAR and optical refresher along with pre-processing and analysis of Sentinel-1 and Sentinel-2 data using the Sentinel Application Platform (SNAP) and Python code written in JupyterLab, a web-based interactive development environment for scientific computing and machine learning.

Intermediate

Bilingual

2021

Applications of Remote Sensing-Based Evapotranspiration Data Products

This three-part webinar series focuses on introducing newly available ET products derived from remote sensing observations. It will specifically cover a web portal called OpenET (https://openetdata.org/), which includes ET products estimated by using six models as well as Landsat satellite observations. These ET products cover the western United States. In addition, information about global ET products derived from ECOsystem Spaceborne Thermal Radiometer Experiment on the Space Station (ECOSTRESS) will also be covered.

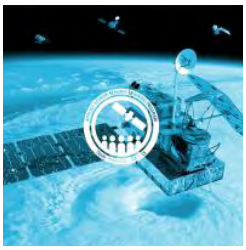
Intermediate

2022

(Click for Top Menu)

Water Resources - Hydrology & Agriculture

Applications of GPM IMERG Reanalysis for Assessing Extreme Dry and Wet Periods



Past ARSET trainings on water resources and flood management covered TMPA and IMERG data and their applications in detail. This advanced webinar will focus on analysis and interpretation of the new long-term IMERG data, focused on extreme dry and wet period monitoring and management. The webinar will include lectures and hands-on exercises to derive regional precipitation statistics.

Advanced

2020

Mapping Crops and their Biophysical Characteristics with Polarimetric SAR and Optical Remote Sensing

This four-part, advanced training builds on the previous ARSET agricultural training. Here we present more advanced radar remote sensing techniques using polarimetry to extract crop structural information. We also present Sen4Stat – an open source system demonstrating the potential of optical and SAR satellite Earth observations for monitoring and reporting of the SDG targets related to agriculture.

Advanced

Bilingual

2022

Water Resources - River Basins & Water Bodies

Mapping and Monitoring Lakes and Reservoirs with Satellite Observations

This training focuses on introducing remote sensing observations for monitoring the water level of lakes; a critical surface water component affecting the residential, economical, and recreational sectors in the area. Recent observations of lake bathymetry based on remote sensing observations will also be presented.

Introductory

2021

River Basin Delineation Based On NASA Digital Elevation Data

This lightning-style webinar will focus on describing NASA digital elevation data and its application in deriving river basin information by using Hydrological data and maps based on SHuttle Elevation Derivatives at multiple Scales (HydroSHEDS) database. Exercises with instructions for river basin delineation using HydroSHEDS will be provided.

Introductory

2019

Using Earth Observations to Monitor Water Budgets for River Basin Management

Rivers are a major source of freshwater. They support aquatic and terrestrial ecosystems, provide transportation, and generate hydropower. Managing river basin watersheds is critical for developing policies for sustainable water allocation and development. Over the course of four sessions, this introductory webinar series will address using satellite data and Earth system modeling data sources to estimate surface water budgets.

Introductory

2019

(Click for Top Menu)

Water Resources - River Basins & Water Bodies

Using Earth Observations to Monitor Water Budgets for River Basin Management II

Past ARSET trainings on monitoring water budgets for river basins focused on data sources relevant for river basin monitoring and management, and provided case studies for estimating the water budget of a watershed using remote sensing products. This advanced webinar will include lectures and hands-on exercises for participants to estimate water budgets for a given river basin.

Advanced

2020

Water Resources - Water Quality

Introduction to Remote Sensing of Harmful Algal Blooms

Harmful algal blooms (HABs) can have a negative impact on the ecosystem and human health. Satellite remote sensing is able to collect data frequently and over a large area to identify impaired water quality from HABs. This data can help decision-makers decide where to take water samples, determine what toxins are in the water, decide whether they need to change or move drinking water intakes, and decide whether a fishery needs to be closed.

Introductory

2017

Monitoring Coastal and Estuarine Water Quality: Transitioning from MODIS to VIIRS

This intermediate-level webinar will provide an overview of recent satellites and sensors used for extending the MODIS long-term water quality time series, specifically focusing on VIIRS image processing using the NASA Ocean Color software, SeaDAS. This webinar will point out similarities and differences between MODIS and VIIRS and demonstrate water quality monitoring procedures using these sensors in selected coastal and estuarine regions.

Intermediate

Bilingual

2021

Processing Satellite Imagery for Monitoring Water Quality

This webinar series will help attendees perform advanced image processing of satellite data and learn about using satellites to track indicators of harmful algal blooms. This will include monitoring water temperature and chlorophyll-a concentrations. Attendees can also use this information for reporting around UN SDG 6.

Advanced

Bilingual

2018

Integrating Remote Sensing into a Water Quality Monitoring Program

This webinar series will help attendees perform advanced image processing of satellite data and learn about using satellites to track indicators of harmful algal blooms. This will include monitoring water temperature and chlorophyll-a concentrations. Attendees can also use this information for reporting around UN SDG 6.

Advanced

2019

(Click for Top Menu)

Water Resources - Water Quality

Monitoring Coastal and Estuarine Water Quality using Remote Sensing and In Situ Data

This two-part, advanced webinar series is a follow-on to the training on coastal and estuarine water quality held in September 2021. It is a hands-on training with demos provided by instructors, followed by an hour of lab time for participants to use Level-1 MODIS and VIIRS data provided by the Ocean Biology DAAC (OB.DAAC) and SeaDAS and OCSSW software for deriving water quality parameters.

Advanced

2021

Capacity Building

Remote Sensing Training: Methods & Best Practices

This three-part webinar series shares the training best practices used by NASA's Applied Remote Sensing Training Program (ARSET). The skills taught in this webinar will enable participants to develop their own on-line or face-to-face remote sensing trainings for their organization or community of practice.

Intermediate

2016