Applied Sciences

- **Partnering** with public and private organizations
- **Discovering** innovative NASA Earth science applications
- **Supporting** environmental decision-making activities
- **Demonstrating** practical benefits of NASA Earth science
- **Helping** improve the quality of life and strengthen the economy

**Lines of Business**

- Innovative & Practical Applications
- Capacity Building
- Mission Planning
Capacity Building

- Engages current and future decision makers
- Improves skills and capabilities to access and apply NASA Earth science
- Three lines of business: trainings, product co-development, and relationship brokering
- Works through both program and element activities
- Identifies partnership opportunities to reach new end users
- Participates in both domestic and international capacity building groups, such as GEO and CEOS
- Supports three Elements (ARSET, DEVELOP, and SERVIR) and initiatives focused on indigenous peoples in North America and an interactive mapper

2017 Achievements
Programmatic Engagement:

- 6,622 Individuals
- 2,369 Institutions
- 104 Trainings
- 142 Countries

World map showing impacted and not impacted areas.
Applied Remote Sensing Training Program
Provides online and in-person trainings for:
• Policy Makers
• Regulatory Agencies
• Applied Environmental Professionals
Increases the use of NASA Earth Science models and data for environmental applications
Thematic areas addressed:

Disasters
Health & Air Quality
Ecological Forecasting
Water Resources

https://arset.gsfc.nasa.gov
DEVELOP

- Bridges the gap between NASA Earth Science and society
- Addresses environmental and public policy issues around the globe
- Conducts 10-week long interdisciplinary feasibility studies (3 terms per year)
- Builds capacity to use Earth observations in both participants (students, recent grads & transitioning career professionals) and partner organizations
- Works within all 8 thematic areas

Disasters
Health & Air Quality
Energy
Agriculture & Food Security
Ecological Forecasting
Urban Development
Water Resources
Transportation & Infrastructure
SERVIR

- Joint development initiative of NASA & USAID
- Works in partnership with leading regional organizations world-wide
- Helps developing countries use information provided by Earth observing satellites and geospatial technologies for managing climate risks and land use
- Empowers decision-makers with tools, products, and services to act locally on climate-sensitive issues
- Works within thematic topics such as:
  - Disasters
  - Agriculture & Food Security
  - Ecological Forecasting
  - Water Resources

https://www.servirglobal.net/
CBP Health & Air Quality
FY18 Portfolio Overview
CBP FY18 Health & AQ Portfolio

ARSET – 4 Trainings
- Advanced Webinar: Tools for High Resolution Datasets
- Air Quality Applications for Southeast Asia
- Air Quality Applications for the Northwest United States
- Air Quality Measurements for Geostationary Platforms

DEVELOP – 6 Projects
- Fall 2017: 1) Phoenix, AZ, 2) Western Europe I
- Spring 2018: 1) California, 2) Western Europe II
- Summer 2018: 1) Intermountain West, 2) Richmond, CA
DEVELOP FY18 Overview & FY19 Plans
FY18 Health & Air Quality Portfolio

6 Projects
75% Domestic
25% International

17 Partners

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10 States & 5 Countries Impacted
Richmond Health & Air Quality

Synthesizing Temperature, Reflectance, and Socioeconomic Data to Provide Spatial and Temporal Temperature Analyses in Richmond, Virginia

Meg Fredericks (Project Lead)
Simeon Brown
Patricia Abduragimova
Josh Turner
Project Context

- The **urban heat island effect** in Richmond, Virginia
  - Hottest areas of the city & populations most impacted by extreme heat

- Project Partner: **Groundwork RVA**
  - Prioritization of **green infrastructure** projects in the city by location
  - Inform **policy and decision-making** within Richmond’s Planning and Development Office
Methodology and Data Processing

Landsat 8 OLI/TIRS

Landsat 5 TM

Terra ASTER

NAIP Imagery (2016) → False Color Composite → Land Cover


Identify Social Variables → Data from CDC and US Census Bureau (2016) → Percentile Rank Data to Create Index → Aggregate & Join to Census Tracts

LST Time Series

Areas of Heat & Social Vulnerability
Results: Land Surface Temperature

- **Land Surface Temperature (°F)**
  - 75 and under
  - 75 - 77
  - 77 - 79
  - 79 - 81
  - 81 - 82
  - 82 - 84
  - 84 - 86
  - 86 - 90
  - 90 - 97
  - 97 - 104

- **Miles**
Results: Land Cover Overlay

2003 vs 2016

- Water
- Impervious
- Barren
- Forest
- Scrub/Shrub
- Turf/Grass
- Tree Cover (2003)
- Impervious Surfaces (2003)
- Tree Loss
- Impervious Loss
- Tree Gain
- Impervious Gain
- James River
Results: Heat Vulnerability Assessment

Overall Vulnerability

- 0.6 and lower
- 0.6 – 0.7
- 0.7 – 0.8
- 0.8 – 0.9
- 0.9 – 1
- 1 – 1.2
- 1.2 – 1.35
- 1.35 – 1.5
- 1.5 – 1.6
- 1.5 – 2

James River

Age

Minority Status

Socioeconomic Status

Health
Acknowledgements

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Jonathan O’Brien, Center Lead – NASA DEVELOP, LaRC
Washoe County Urban Development Team – Summer 2018 DEVELOP, AZ

Team Members

Meg Fredericks
Project Lead
Simeon Brown
Patricia Abduragimova
Josh Turner
Fall 2018 Health & Air Quality Projects

2 Projects

1. **New Orleans Health & Air Quality:** Monitoring the Urban Heat Island Effect on the Health of Residents of the New Orleans, Louisiana Metropolitan Area with Landsat, Sentinel, and MODIS Land Surface Temperature Products

2. **Intermountain West Health & Air Quality II:** Utilizing NASA Earth Observations to Help the National Park Service Monitor and Address Visibility in Intermountain Region National Parks

**Project Partners**
Louisiana Public Health Institute
National Park Service, Intermountain Region

**9 States Impacted**
AZ, CO, LA, MT, NM, OK, TX, UT, WY
New Orleans Health & Air Quality

Community Concern: The Urban Heat Island (UHI) effect can directly impact the health of urban residents. New Orleans’ paved surfaces, dark roofs, and grey infrastructures contribute to increases in temperature throughout the city. This phenomenon can increase the rate of hospitalization, stroke, respiratory difficulties, tiredness, fainting, and the risk of mortality.

Partners:
- Louisiana Public Health Institute

Earth Observations:
- Landsat 8 OLI/TIRS
- Landsat 5 TM
- Sentinel-2 MSI
- Sentinel-3 SLSTR
- Terra MODIS

Impact & Benefit: The project aims to contribute to the LPHI’s current clinic monitoring system by recognizing and monitoring severe urban heat levels in New Orleans, LA, and identifying the relationship between New Orleans’ urban heat island, the city’s land cover characteristics, and health-outcome disparities.
Community Concern: Clean air supports natural resources including soils, water, vegetation, and visibility. Over the past 30 years, 90% of park visitors surveyed say that scenic views are extremely important to their visit. Park units have inadequate ground monitoring stations for to use for decision making related to air quality.

Partners:
- National Park Service, Intermountain Region

Earth Observations:
- Aqua & Terra MODIS
- Suomi NPP VIIRS
- Aura OMI
- Sentinel-5P Tropomi
- CALIPSO CALIOP

Impact & Benefit: This project will build upon previous work measuring pollutant trends and concentrations in the Intermountain Region by providing a vertical profile and measuring aerosol optical depth. This information could identify pollutant sources, allowing the NPS to better prioritize mitigation strategies.
ARSET FY19 Plans
**Satellite Remote Sensing of Air Quality**

**Description:** In-person training held as a pre-conference event for the ISPRS Technical Commission V Symposium on “Education & Outreach - Geospatial technology – Pixel to People.” This training will fill some of the gaps in skills required to access, analyze and interpret satellite data sets for various air quality applications including, dust and smoke monitoring, urban pollution monitoring, and long term trend analysis.

**Motivation:** continue ongoing relationship with ISRO, high demand for flood-related training in India

**Target Audience:** Air quality professionals and decision makers from local, state, and federal agencies, NGOs, and the private sector.

**Earth Observations**
- Aura
- CALIPSO
- Suomi-NPP (VIIRS)
- Terra/Aqua (MODIS)

Training Level:  
- [ ] Fundamental  
- [ ] Introductory  
- [x] Advanced
NO$_2$ and SO$_2$ Data

**Description:** Introductory, online series. This webinar series will provide an overview of NO$_2$ and SO$_2$ data products from OMI and TROPOMI, present data access and tools to analyze the data products, and discuss how to appropriately use these observations to evaluate model simulations.

**Motivation:** One of our most frequent questions during both webinars and in-person trainings is how to appropriately compare model and satellite observations.

**Target Audience:** End-users who are familiar with satellite observation capabilities and have used online image archives or analysis tools at basic to intermediate levels for air quality applications.

**Earth Observations:**
- OMI
- TROPOMI (ESA)
Air Quality Monitoring in the Southeast U.S. Using Low Earth Orbiting and Geostationary Satellite Data

**Description:** Advanced, in-person training. The workshop will detail the application of NASA and ESA’s resources to decision-making activities as they relate to air quality monitoring, forecasting, smoke, fire and PM$_{2.5}$ monitoring, image interpretation, and data access for inclusion in modeling efforts.

**Motivation:** This is a potential region to explore a domestic, in-person training opportunity, possibly by collaborating with HAQAST PIs and end-users in the region.

**Target Audience:** National and state air quality agencies in the Southeast U.S.

**Earth Observations:**
- GOES-R
- OMI
- Suomi-NPP (VIIRS)
- Terra/Aqua (MODIS)

Training Level: 
- Fundamental
- Introductory
- Advanced
Engage with CBP

**ARSET**
- Sign up for a training

**DEVELOP**
- Propose a project idea to DEVELOP National Program Office
- Volunteer as a Science Advisor on a project

**SERVIR**
- SERVIR Applied Sciences Team solicitation (10/25)
- Coordinate projects in SERVIR regions with Science Coordination Office
THANK YOU