

# LCLUC PROGRAM: WRAPUP

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# OVERVIEW

- Hotspots
- Early Career Scientists
- Sectors/Processes
  - Forest
  - Agriculture
  - Savanna
  - Urban
  - Wetlands
  - Extractive Industry/Mining
  - Fires



- All over the globe: Madagascar, Mongolia, Colombia, etc.
- Programmatic
  - Research  Applications projects
  - Connection to regional GOF-C-GOLD networks
  - Budget this year
- LCLUC-19 (ECS) posters (4:30)

# DATA ASPECTS

LCLUC PIs must provide metadata on data products generated under NASA-funded projects

- NASA LCLUC program expects its PIs to make their data and products available to the community for free and **open access**

- LCLUC metadata page

- Very High-Resolution (VHR) data for NASA-affiliated scientists

## Metadata

Displaying 1 - 35 of 35

Search by Keywords

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Metadata Title	Project name	Team	Institution	Project Start Date	Project End Date
Land-Use Status, Change and Impacts in Vietnam/Cambodia/Laos	Land Use Status, Change and Impacts in Vietnam, Cambodia and Laos	<u>Son Nghiem</u> , Andrea Gaughan Forrest Stevens	Jet Propulsion Laboratory	05/01/2018	12/31/2021
Understanding the Role of Land Cover/Land Use Nexus in Malaria Transmission Under Changing Socio-Economic Climate in Myanmar	Understanding the Role of Land Cover/Land Use Nexus in Malaria Transmission Under Changing Socio-Economic Climate in Myanmar	<u>Tatiana Loboda</u> , Mark Carroll Julie Silva Myaing Nyunt Christopher Plowe Kathleen Stewart	University of Maryland	05/01/2017	03/01/2020
Complex Forest Landscapes and Sociopolitical Drivers of Deforestation - The Interplay of Land-use Policies, Armed Conflict, and Human Displacement in Myanmar	Complex Forest Landscapes and Sociopolitical Drivers of Deforestation - The Interplay of Land-use Policies, Armed Conflict, and Human Displacement in Myanmar	<u>Peter Leimgruber</u> , Qiongyu Huang Melissa Songer Joseph Sexton Min Feng Saurabh Channan Enze Han Kevin Woods	Smithsonian Institution	05/01/2017	05/01/2020

## Commercial Smallsat Data Acquisition (CSDA) Program Update

The commercial data currently distributed by NASA are available under different scientific use licenses and various access portals. The Commercial Smallsat Data Acquisition (CSDA) program evaluates and procures data from commercial vendors that advance NASA's Earth science research and applications activities. Currently, data acquired during the evaluations of Planet, Maxar (formerly DigitalGlobe, Inc.), and Spire Global are available. Data from the Teledyne Brown Engineering, Inc., DLR Earth Sensing Imaging Spectrometer (DESI) also are available through a separate collaboration with the International Space Station (ISS).

More Info: <https://earthdata.nasa.gov/esds/csdap/commercial-datasets>

PDF file:

 CSDA\_ROSES\_data\_access\_overview[1].pdf

# OPEN SCIENCE

- The White House Office of Science and Technology Policy (OSTP) declared **2023 as the Year of Open Science**
- Open Science is the principle and practice of making **research products and processes available to all**, while respecting diverse cultures, maintaining security and privacy, and fostering collaborations, reproducibility, and equity

<https://www.whitehouse.gov/ostp/news-updates/2023/01/11/fact-sheet-biden-harris-administration-announces-new-actions-to-advance-open-and-equitable-research/>

# OPEN SCIENCE @NASA

- The Transform to Open Science (**TOPS**) mission is a NASA initiative designed to rapidly transform agencies, organizations, and communities to an inclusive culture of open science
- **TOPS** is part of NASA's Open-Source Science Initiative
- <https://science.nasa.gov/open-science/transform-to-open-science>



# ROSES OPEN SCIENCE AND DATA MANAGEMENT PLAN

- The requirements regarding archiving of data, software, and publications have been strengthened
  - Publications, data and software developed using ROSES funding in support of a peer-reviewed publication shall be made **publicly available at the time of publication**
  - Scientifically useful data and software developed during the award that was not already published must be made **available by the end of the award**
  - LCLUC proposers to ROSES-2023 **must provide an "Open Science and Data Management Plan"** (formerly called the Data Management Plan) or an explanation of why one is not necessary given the nature of the work proposed
    - <https://science.nasa.gov/researchers/sara/faqs/OSDMP>



# NASA Earth Sciences Research Results Portal

- Researchers feel their results are going unnoticed by leadership and communication teams
- Leadership finds it challenging to use research examples for their presentations, reports, meetings, etc.
- Communications and outreach teams are constantly searching for content
- NASA Earth Sciences created the **Research Results Portal** <https://esdresearch.nasa.gov>
- **We invite** all NASA center civil servants, contractors and Earth Sciences funded PIs **to share their results with ESD Leadership** via the Communications team by **creating an entry in the Portal**



For more information, contact Megan McGroddy ([megan.e.mcgroddy@nasa.gov](mailto:megan.e.mcgroddy@nasa.gov))

# LCLUC 2023-MUSLI

- Proposals on the enhanced use of MuSLI methods, which would combine **infrared data (from SWIR to TIR)** with optical and/or microwave data, to study LCLUC
- Does NOT require the incorporation of a socio-economic research it but may be included
- Two-step procedure

Step-1: 48 submitted  
26 encouraged

05/23/2023  
Step-2 due date

- Anticipated 10 selections for 2.5M/year for three years



# FOREIGN PARTICIPATION ISSUES

•“I am the grant officer assigned to the above award. During my review, I noted that there is foreign involvement for Fieldwork in Thailand and India. Please see the below information from the NASA GCAM regarding Proposals Involving Non-U.S. Organizations”

•“Can XXX University please confirm whether this foreign involvement includes actively participating in the research or is this a direct purchase of supplies and/or services?”

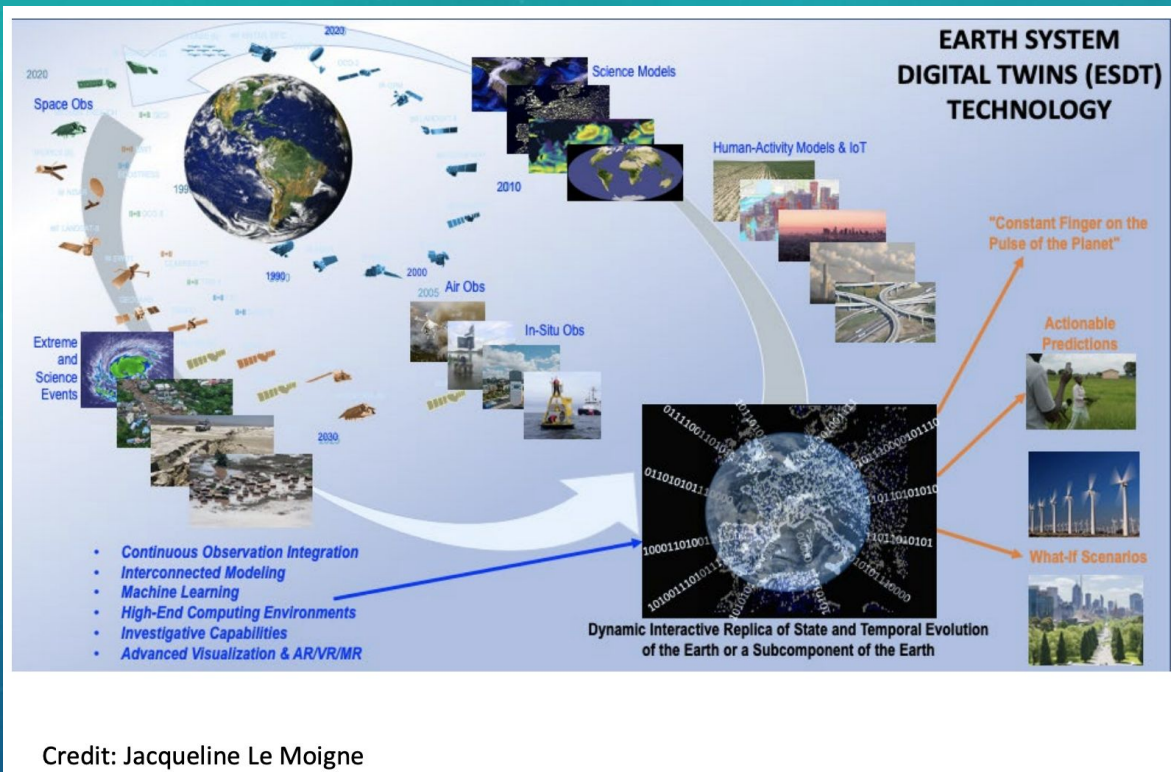
## 5.4 Proposals Involving Non-U.S. Organizations

Per 2 CFR § 1800.3(c), NASA does not normally fund foreign research proposals from foreign organizations, nor research efforts by individuals at foreign organizations as part of U.S. research proposals. This includes subawards from U.S. organizations to investigators at foreign organizations and travel by individuals at foreign organizations to conduct research, fieldwork, and present at conferences. Rather, each country agrees to bear the cost of discharging their respective responsibilities (i.e., the work to be done by team members affiliated with organizations in their country). *The direct purchase of supplies and/or services, which do not constitute research, from non-U.S. sources by U.S. award recipients is permitted.*

# FUTURE PLANS

- Integrate satellite data with models and ground observations, such as [Google Street View](#) or [Google Crop View](#)
- Standardize 3D urban satellite products (e.g., urban volume) using SAR, Lidar, and stereo methods, and develop new capabilities in hyperspectral data for studying land use
- Develop data fusion methods under MuSLI, including data from the sensors onboard ISS and future missions, e.g., NISAR, Landsat Next, upcoming IR sensors and VHR commercial data, using artificial intelligence/machine learning for fine-scale monitoring
- Extend the Harmonized Landsat-Sentinel data set to Landsat 9 and Sentinel 1 data, as well as developing product validation and accuracy assessment methods
- **Jointly with ESTO, focus on incorporation of land-use data and processes in numerical weather forecast and climate models towards the development of the Earth System Digital Twins for Land**

# NASA ESTO ADVANCED INFORMATION SYSTEMS TECHNOLOGY (AIST) EARTH SYSTEM DIGITAL TWINS (ESDT)



• an interactive and integrated multidomain, multiscale, digital replica of the state and temporal evolution of Earth systems. It dynamically integrates:

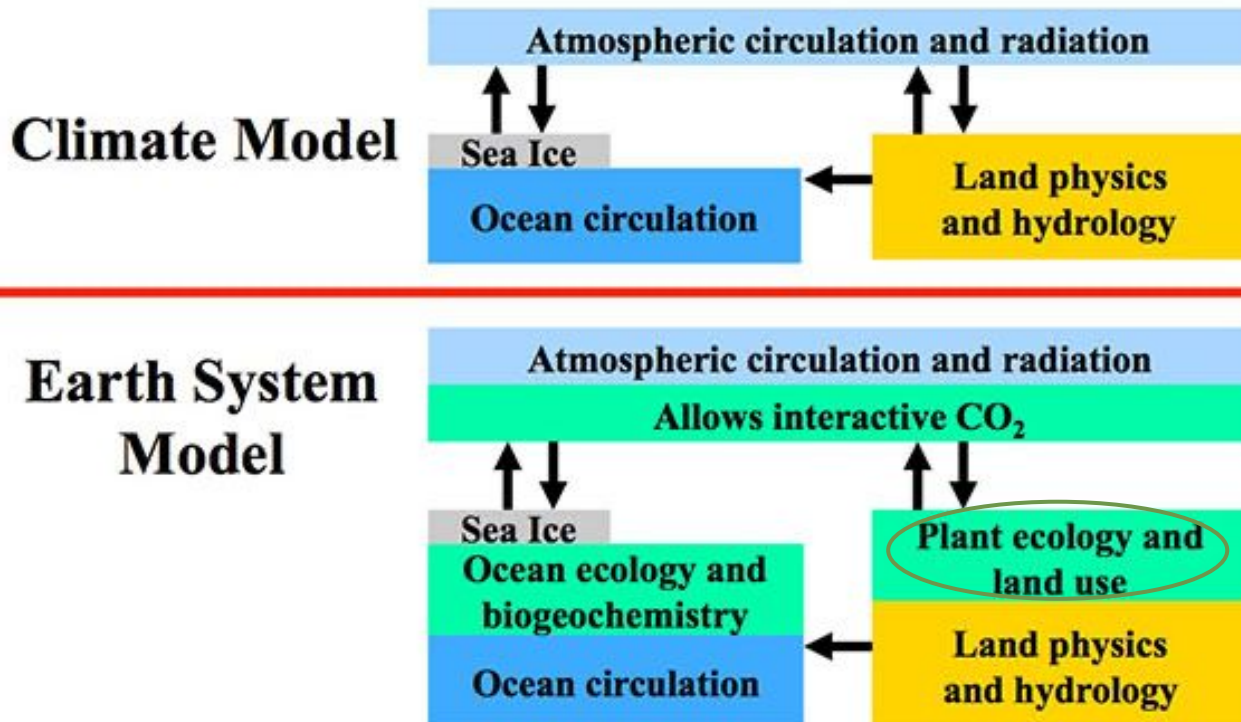
- relevant Earth system models and simulations;
- other relevant models (e.g., related to the world's infrastructure);
- continuous and timely (including near real time and direct readout) observations (e.g., space, air, ground, over/underwater, Internet of Things (IoT), socioeconomic);
- long-time records;
- analytics and artificial intelligence tools

28 Projects Awarded Under the Advanced Information Systems Technology (AIST) Program

I counted 5 ESDT ongoing projects

# FROM CLIMATE MODEL TO EARTH SYSTEM MODEL

**An Earth System Model (ESM) closes the carbon cycle**



Courtesy: GFDL/Princeton U.

# ESA Initiative: Destination Earth (DestinE)

To provide services for non-expert decision and policy makers

## WHAT IS A DIGITAL TWIN?

Driven by high-performance computing, advanced Earth-system simulations are fused with a continuous flow of observations to create the most accurate digital replica.

The replica includes water, energy, food and health components to link the physical with the human world.

This allows us to revisit the past, understand and explain change, and predict the future in support of decision making.

PHYSICAL WORLD

Planet Earth

DIGITAL TWIN

Computer model

Aims to develop – on a global scale – a highly accurate digital model of the Earth to **monitor and predict the interaction between natural phenomena and human activities**

ECMWF

## Timeline

2024:

- the core service platform,
- the data lake
- the first two digital twins on extreme natural events and climate change adaptation.

2027:

- DestinE system enhancement
- integration of additional digital twins and related services.

2030:

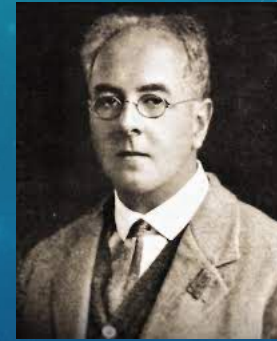
- A 'full' digital replica of the Earth.

- Will support the European Commission's Green Deal priority actions on climate change, biodiversity and deforestation.
- Will help monitor food security, changes in the polar regions and global sea level rise

# Great Minds on Weather Forecasting and Atmospheric Predictability

“The atmosphere resembled London for in both there were always far more things going on than anyone could properly attend to.”

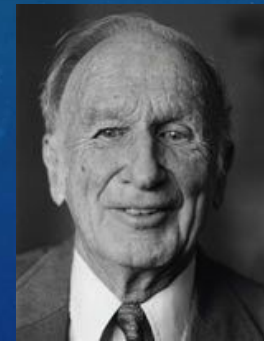
Lewis Fry Richardson



1881 – 1953

“When a butterfly flutters its wings in one part of the world, it can eventually cause a hurricane in another.”

Edward Lorenz



1917 – 2007

# THE NASA LCLUC PROGRAM CONTRIBUTION TO THE DEVELOPMENT OF EARTH SYSTEM DIGITAL TWINS

## Objective

- To contribute to Earth System Digital Twins' development by providing near real-time data on human land uses at the highest spatio-temporal resolution, useful in simulations of the ongoing interactive processes in the Earth's System, that would help operational decision making, mitigate the negative impacts on the system and improve its sustainability

## Three basic components

- **Digital Replica** of Global Land-Cover/Use Change (continuously updated), powered by Data Assimilation and Fusion, and which incorporates continuous and targeted multi-source, multi-resolution observations
- **Forecasting Capabilities**, including Seasonal to Annual Agricultural Land Use, and Annual to Decadal yearly projections of Land-Use Change driven by Changes in Climate and Socio-Economics
- **Impact Assessment** uses the *Digital Replica* and *Forecasting Capabilities* with associated societal impacts with ML, causality, uncertainty quantification and advanced computation and visualization capabilities for running large amounts of simulated predictions quickly and at various spatial and temporal scales

# Important LCLUC and GOFC-GOLD Meetings in 2023

- SCERIN (European Network) workshop + TAT sessions, Brno, Czech Rep. June 2023
- CARIN (Central Asia Network) workshop Issyk Kul, Kyrgyzstan, Sep 2023
- GOFC-GOLD Fire IT, Canada, Sep 2023

LCLUC-2023 international workshop  
In conjunction with GOFC-GOLD  
Latin American regional network,  
Aug 2023





# MESO-AMERICA ONGOING PROJECTS

<u>Grant Connette</u>	<u>Can Improved Stakeholder Representation Prevent Human-Caused Mangrove Loss in the Mesoamerican Reef Ecoregion?</u>	04/01/2023	03/31/2026
<u>Nicholas Cuba</u>	<u>Evaluating the drivers of international migration from the Northern Triangle of Central America and its implications for land systems in the region</u>	01/01/2021	01/01/2024
<u>Nicholas Magliocca</u>	<u>Making the Hidden Visible: Accelerated Land-Use Change and Degradation Caused by</u>	01/01/2021	12/31/2023
<u>Meha Jain</u>	<u>Policy, Market, and Climate Change Impacts on Maize Production in Mexico</u>	01/01/2021	01/01/2024

# SOUTH AMERICA ONGOING PROJECTS

<u>Robert Gilmore Pontius Jr</u>	<u>Irrigation as climate-change adaptation in the Cerrado biome of Brazil evaluated with new quantitative methods, socio-economic analysis, and scenario models</u>	05/15/2023	05/14/2026
<u>Gillian Galford</u>	<u>Land-cover and Land-use Change at the Frontier: Socioeconomic and Environmental Factors Influencing Land-Use Transitions in the Cerrado Biome</u>	02/01/2023	01/31/2026
<u>McKenzie F. Johnson</u>	<u>Land Cover Land Use Change, Conflict, and Peacebuilding in Colombia</u>	02/01/2022	01/31/2025
<u>Carlos Munoz Brenes</u>	<u>Impacts of Global Markets and National Policies on Forest Carbon Trajectories and Social Outcomes in the Guiana Shield Ecoregion</u>	06/01/2021	05/31/2024
<u>Robert Heilmayr</u>	<u>Mapping property values to understand land-use change in South America</u>	01/01/2021	01/01/2024
<u>Xiao-Peng Song</u>	<u>Soybean Expansion in South America: Quantifying Historical Land-Use Change, Modeling Socioeconomic Drivers and Projecting Future Trajectories</u>	01/01/2021	12/31/2023
<u>Christoph Nolte</u>	<u>Comparing the effectiveness of conservation instruments in the Colombian Andes biodiversity hotspot</u>	01/01/2021	12/31/2023
<u>David A. Lutz</u>	<u>Rapid Change from Alluvial Mining and Development in Madre de Dios, Peru: A Multi-Sensor Fusion Approach to Quantify Terrestrial and Aquatic</u>	01/01/2021	12/31/2023

# LAST REMARKS

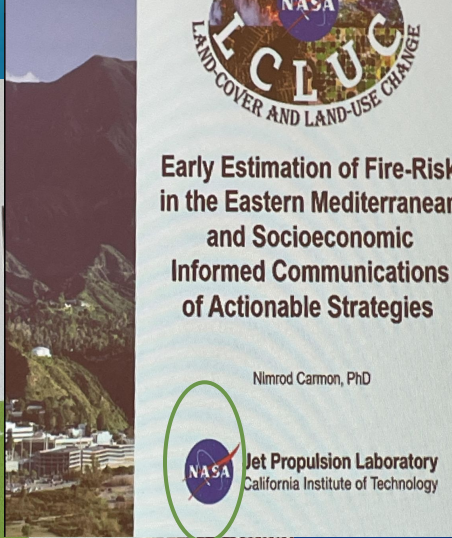
2000



2006



2023



STATE UNIVERSITY

# THANKS GO TO

- Organizers: C. J. and Co.
- Mary, Meghavi, Jack, Melanie, Rohan
- Our major, loyal sponsor



# Enjoy Spring Blossoms and Join the Plenary CC&E Sessions

