Presentation Overview

• CMS Applications Efforts Overview
  • CMS Applications Program Framework
  • Overview of CMS Data Products & ARLs
  • CMS Stakeholder Survey for Science Team
  • CMS Stakeholder Surveys Results

• Stakeholder Engagement Approach

• Resources & Opportunities

• Potential Stakeholders for CMS Flux Projects

• Upcoming Applications Events in 2020
Goals of CMS Applications Efforts:

- Link Stakeholders to CMS science products.
- Provide a path for feedback and lessons learned for CMS PIs so CMS is more accessible and user friendly.
- Inform NASA HQ of the needs and requirements of the carbon end user community.
- Leverage opportunities between NASA CMS and stakeholders in an effort to expand the knowledge and familiarity of CMS data products to help improve decision processes.

Stakeholder feedback and engagement provides a link to science development, that helps a product move from a research effort... 

...to a user friendly decision support system.
CMS Applications Program Framework

**Policy Speaker Series**
Brings stakeholders to NASA to explain how carbon science data are applied to specific policies. Informs CMS science community of specific stakeholders data needs and collaboration opportunities.

**Applications Workshops**
Annual event with CMS Science Team and end users for a better understanding of stakeholder uses, needs and challenges for carbon monitoring and MRV as well as lessons learned.

**Data Products Fact Sheet**
Collection of CMS metadata and policy data for each product (e.g., spatial extent, resolution, uncertainty, application areas, relevant policies). Integrated into CMS website database.

**Application Readiness Levels (ARLs)**
Provide transparency to HQ and user community on the maturity of each CMS product. Used as a communication tool for stakeholders to assess product maturity.

**Surveys & Community Assessments**
Evaluate thematic user challenges within the CMS. Assess impact of CMS data products for end user organizations.

**Socioeconomic Studies**
Development of socioeconomic case study addressing the social value of CMS Lidar in MD DNR policy, and an ongoing assessment of the contribution of CMS flux products to the reduction of uncertainty in the carbon cycle.

**Feedback to CMS Science Community and NASA HQ ESD**
CMS Applications Efforts Examples. Tri-State Area Applications Workshop & Tutorial in Newtown Square, PA: CMS Application workshops and tutorials provide an opportunity for CMS Science Team members and stakeholders to engage on thematically detail objectives that help advance CMS science into appropriately scaled policy arenas.
Overview of CMS Data Products

Where can CMS datasets be found?

- Annual Burned Area from Landsat, Maws, Central Kalimantan, Indonesia, 1987-2015
- DART-E Annual On-road CO2 Emissions on a 1-km Grid, Continental USA, 1980-2017
- Forest Carbon Stocks and Flows After Disturbance, Southeastern USA, 1980-2010
- Ecosystem Functional Type Distribution Map for Mexico, 2001-2014
- Ocean Surface CO2 and Air-Sea CO2 Flux in the Northern Gulf of Mexico, 2006-2010
- CMS Mangrove Forest Cover Extent and Change across Major Rivers Delta, 2000-2010
ARL Refresher

- Serve as a guide to user community
- Set expectations to user on how to use products and what feedback to provide
- ARL designated by the CMS PI
- Update as needed
- Intended to guide HQ and user community on the maturity of products
CMS Stakeholder Survey for Science Team

Main stakeholders: USDA Forest Service, US EPA, NOAA, CA ARB
Not all stakeholders are using CMS data products at this moment
All products, be research or operational products, have feedback potential

25 PIs responded
86 stakeholders identified

Current or Expected Use of CMS Products

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Purposes</td>
<td>56</td>
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<tr>
<td>Reference Purposes</td>
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<tr>
<td>Report/Document</td>
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<tr>
<td>Modeling and Analysis</td>
<td>39</td>
</tr>
<tr>
<td>Policy</td>
<td>23</td>
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</tbody>
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Stakeholder Engagement Need
43% Need more engagement with the stakeholder
57% No need for more engagement

25 PIs responded
Stakeholder Feedback

Principal Applications
GHG Inventories
Forestry
Ecological Forecasting
Air Quality & Public Health

What are some of the applications you address with the carbon products?
Where do you search for carbon data products?

- 0 (Organization website)
- 1 (Distributed Active Archive Centers (better known as DAACs))
- 2 (Served directly to your organization)
- 3 (Google)
- 4 (Other)

What prevents you from accessing CMS data products?

- 0 (Do not know where to access product)
- 1 (Do not know how to use product)
- 2 (Not interested in available products)
- 3 (Format challenges)
- 4 (Not applicable)
- 5 (Other)
CMS Science Theme

Which CMS science theme is most relevant to your work? (Check all that apply)

- 0 (Global Surface-Atmosphere Flux)
- 1 (Land-Atmosphere Flux)
- 2 (Ocean-Atmosphere Flux)
- 3 (Ocean Biomass)
- 4 (Land-Ocean Flux)
- 5 (Land Biomass)
- 6 (Measurement, Reporting, and Verification (MRV) | Decision Support)
Spatial Extent

What is your geographical area of interest? (Check all that apply)

0 (Global) 1 (National) 2 (Country) 3 (State) 4 (County) 5 (City)

0 (Global) 1 (Country) 2 (State) 3 (County) 4 (City) 5 (Other)
Temporal Frequency

What is the ideal frequency of carbon information updates that you need in your work? (Check all that apply)

- 0 (Daily)
- 1 (Weekly)
- 2 (Monthly)
- 3 (Quarterly)
- 4 (Annually)
- 5 (Every 2-3 Years)
- 6 (Every 5 Years)
- 7 (Every 10 Years)
- 8 (Other)
Data Format

With regards on data modeling and processing for your organization, what is the ideal data format for your work? (Check all that apply)
Engaging Stakeholders in CMS Flux Projects

- Stakeholder Engagement Approach
- Resources & Opportunities
- Potential Stakeholders for CMS Flux Projects
- Upcoming CMS Applications Events in 2020
Stakeholder Engagement Approach

1. Develop an Engagement Strategy
   • Lessons learned from past efforts will inform the current strategy
   • Overall vision and level of ambition

2. Do a Stakeholder Mapping
   • Identify stakeholders
   • Analyze and rank stakeholders
   • Map to identify key stakeholders
   • Select engagement approaches

Stakeholder Engagement Approach

3/4. Preparation & Engagement
- Develop an Internal Stakeholder Engagement Team, if possible
- Develop short-term and long-term goals for the engagement
- Engagement should be focused, timely, and respectful
- Engagement Options: Joint research, workshop, survey, virtual conferences
- Document the Engagement

5. Action Plan = Research Paper
- Develop an action plan (publication) whose key aim is to translate the findings, insights, and agreements from the engagement, and then communicate these to the general public.

CMS Stakeholder Engagement In Practice
{Applications Effort for Hurtt (CMS 2016) Project}

- We developed an Internal Stakeholder Engagement Team, comprise of PI, grad student with knowledge on policy and economics, colleague with experience on decision-making, and CMS Applications Coordinator – Step 3 First!

- We reviewed lessons learned from previous engagement efforts and leveraged past relationships (Stakeholder Working Group), we determined that this would be an ongoing iterative process, and we developed short-term and long-term goals – Steps 1 & 3

- We researched and identified key stakeholders, and selected engagement mechanisms (Multi-State Working Group Quarterly Meetings & Regional Workshop) – Step 2

- We held quarterly meetings and presentations, and document the engagement through meeting reports – Step 4

- We are writing a paper on the findings to be published in the near-future – Step 5
Resources & Opportunities

• Leverage the work of the CMS Applications Team!

• CMS Policy Speaker Series Talks
  • We can invite any policy stakeholder you would like to learn more of, or engage with

• Applications Workshops & Data Tutorials
  • CMS Applications Workshop, Thematic Workshops, Stakeholder Workshops, Stakeholder Working Groups, DAACs Data Tutorials, ARSET Trainings

• Surveys & Community Assessments
  • To better understand the data needs, interests, and challenges of your potential stakeholders

• Other Resources/Opportunities
  • NASA Goddard Applied SciencesEfforts & Working Groups (Interagency Chesapeake Bay Group, Disasters, Food Security, Air Quality & Health, Climate, Mission Applications)
    • Contact Stephanie Uz – stephanie.uz@nasa.gov
  • NASA Applied Remote Sensing Training (ARSET) Program
Potential Stakeholders of CMS Flux Projects

Deborah Gordon
Senior Fellow at Watson Institute for International & Public Affairs, Brown University
Former Director of the Energy and Climate Program at the Carnegie Endowment for International Peace

Data Needs

• Timely satellite reports and updates, including TROPOMI methane

• Finer-tuned methane estimates beyond North America

• Methane measurements over water (where a lot of oil and gas activity takes place)

• Better understanding of plumes, wind, and background methane concentrations for guidance on attribution to equipment

• CMS products for black carbon (from the oil & gas lifecycle)
Potential Stakeholders of CMS Flux Projects

Ritesh Gautam
Senior Physical Scientist at Office of Chief Scientist, Environmental Defense Fund (EDF)

Data Needs

• Within the US, Permian Basin is a priority area of methane science and policy efforts
• One of the questions they are presently trying to address globally relates to characterizing methane emissions linked to gas flaring
• Also highly interested in building an oil & gas infrastructure database, in support of MethaneSAT
Potential Stakeholders of CMS Flux Projects?

Sylvia Wilson
Physical Scientist, USGS Land Resource Mission Area
SilvaCarbon Steering Committee Co-Chair

Data Needs

• Wall to wall products that integrate radar and optical data – applicable in the tropics.
  • Latin America Pacific coast (Colombia, Ecuador, Peru)
• Emission Factors derived from Earth Observation
• Models that integrate Activity Data and Emission Factors
• Monitoring of other Land covers besides Forest
  • Regeneration, differentiate palm from forest

More information available at www.SilvaCarbon.org
Other Potential Stakeholders of CMS Flux Projects

• Alden Meyer, Director of Strategy & Policy at Union of Concerned Scientists
  • Principal advocate for UCS on national and international policy responses to the threat of global climate change.

• Sue Biniaz, Senior Fellow for Climate Change at United Nations Foundation
  • For more than 25 years, Sue Biniaz served as the lead climate lawyer for the U.S. State Department.

• Laurence Tubiana, CEO of European Climate Foundation
  • France’s Climate Change Ambassador and Special Representative at the Paris Accord

• Global Carbon Project
• International Ocean Carbon Coordination Project
• Intergovernmental Oceanographic Commission
• International Carbon Action Partnership (ICAP)
• U.S. Department of State Office of Global Change
• Secretariat of United Nations Framework Convention on Climate Change (UNFCCC)
Upcoming CMS Applications Events in 2020

• CMS Policy Speaker Series in 2020 at NASA GSFC
  • Special Panel on Covid-19 & Impact on Global Carbon Emissions – May 2020
  • CMS PIs are welcome to provide speaker recommendations

• USFS-NASA Virtual Pitch Fest – June 2, 2020

• USFS-NASA Joint Applications Workshop – September 1-3, 2020

• 2020 CMS Applications Workshop & Data Tutorial – November 17, 2020
  • Data Tutorials for CMS Stakeholders
    • How to use CMS datasets and scenario-based exercises (DAACs & ARSET)

• CMS Thematic Workshops: Carbon Removal Workshop – Fall/Winter 2020

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