ABoVE Survey for Archived Products 2017

ABOVE APPLICATIONS TEAM

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4TH ABOVE SCIENCE TEAM MEETING, SEATTLE, WA
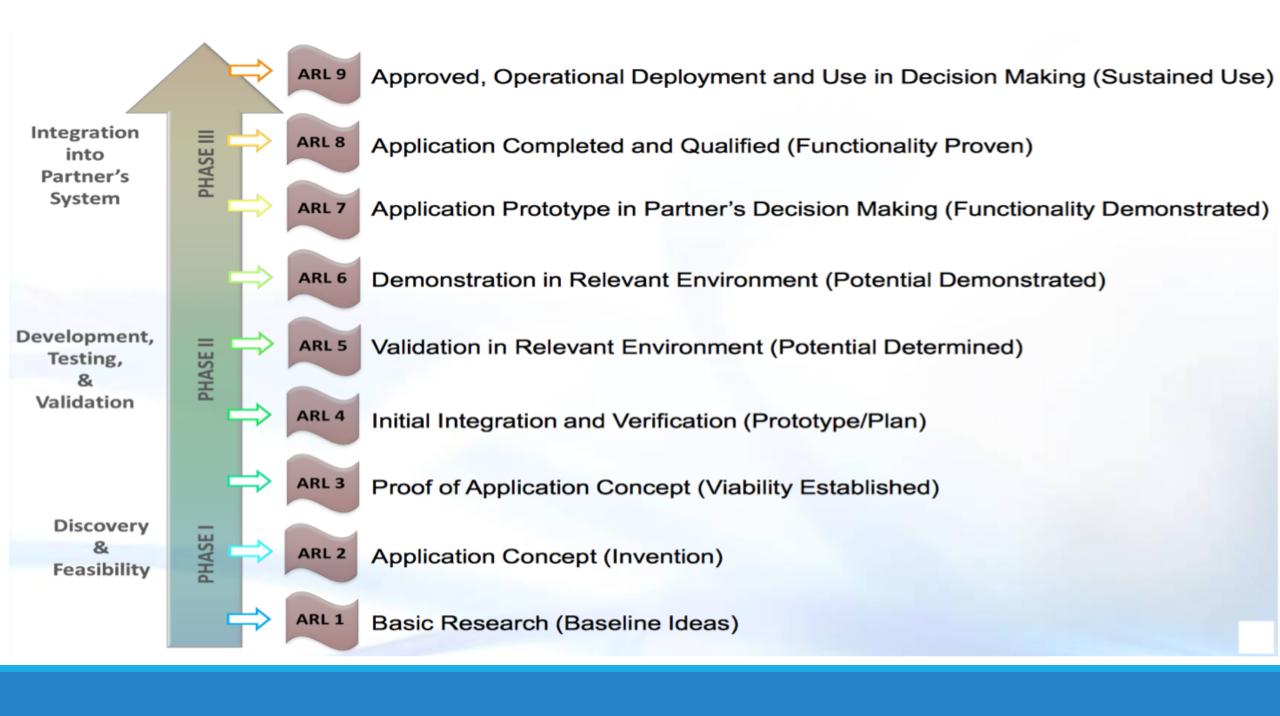
Goals of the Survey

❖ Identify the maturity of each **archived** data product in regards to their application capability, and gather information about the levels of engagement with stakeholders, if any.

❖ The information collected will help the ABoVE Applications Team understand the value of the archived data products for current and potential end users.

❖ The results will be useful for highlighting the importance of applications efforts and stakeholder engagement activities throughout the ABoVE funding period, as well as identify PIs that want more help with their engagement efforts.
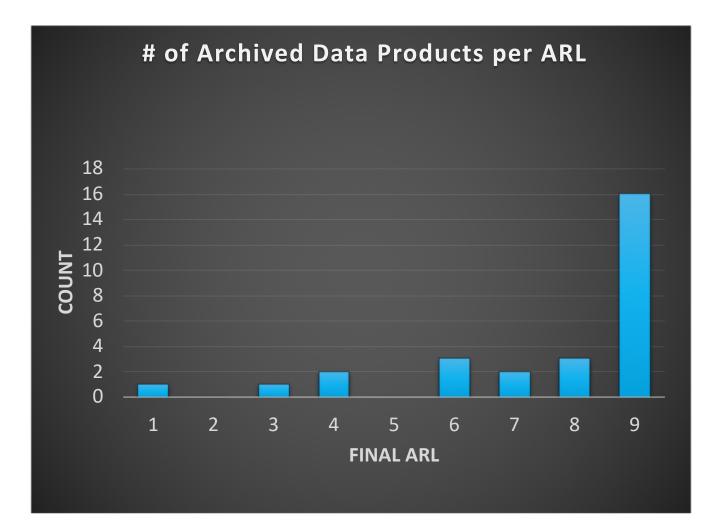
ARL Refresher

❖ ARLs are an adaptation of NASA's Technology Readiness Levels (TRLs) used for managing technology and risk and reflects the three main tiers of a project: research, development and deployment.

❖ The PI makes the judgement as of the current ARL for each product. ARLs 1-3 are at a research and feasibility phase; ARLs 4-6 are being integrated, validated and demonstrated in relevant environments; and ARLs 7-9 are being applied and approved by end users.

❖ It is important to note that Application Readiness Levels (ARLs) are **not** a grading scheme or a metric for success.

Integration into Partner's System

Development, Testing, & Validation

Discovery & Feasibility

PHASE III
PHASE II
PHASE I

ARL 9 — Approved, Operational Deployment and Use in Decision Making (Sustained Use)

ARL 8 — Application Completed and Qualified (Functionality Proven)

ARL 7 — Application Prototype in Partner's Decision Making (Functionality Demonstrated)

ARL 6 — Demonstration in Relevant Environment (Potential Demonstrated)

ARL 5 — Validation in Relevant Environment (Potential Determined)

ARL 4 — Initial Integration and Verification (Prototype/Plan)

ARL 3 — Proof of Application Concept (Viability Established)

ARL 2 — Application Concept (Invention)

ARL 1 — Basic Research (Baseline Ideas)
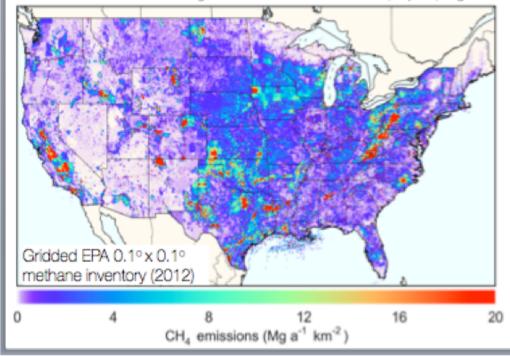
# of Archived Data Products per ARL

❖ Some of the uses of the products include: to estimate land-atmosphere methane emissions; for smoke transport modeling and fire management prioritization; and for remote sensing/GIS research.

Some skepticism

A gridded national inventory of US methane emissions
for use in inverse analyses of atmospheric methane observations

Top-down inverse analyses of atmospheric methane data to constrain methane emissions require high-quality prior information on source patterns. These have not been available so far. Here we spatially disaggregated the US EPA national greenhouse gas emissions inventory for methane using a large ensemble of local datasets, and including scale-dependent error statistics. The resulting EPA-sanctioned gridded inventory enables a new partnership between bottom-up inventories and atmospheric observations to advance our understanding of methane emissions. This project progressed from ARL 1 to ARL 9 under CMS funding.

A contribution from the NASA Carbon Monitoring System (CMS)

NASA PI: Daniel Jacob (Harvard)
EPA PI: Melissa Weitz
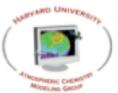Publication: Maasakkers, J.D., D.J. Jacob, M. Weitz, et al., Gridded national inventory of U.S. methane emissions, Environ. Sci. Technol.,
DOI: 10.1021/acs.est.6b02878, 2016.
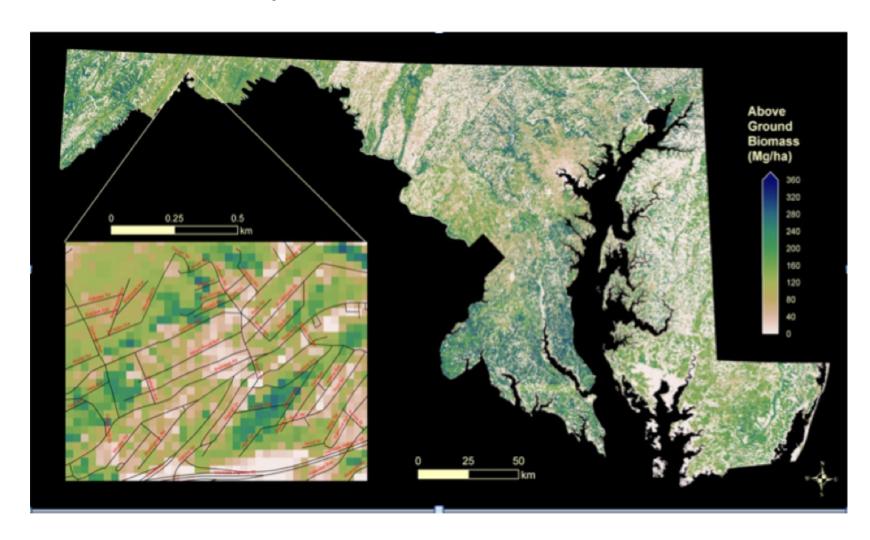Inventory website: www.epa.gov/ghgemissions/gridded-2012-methane-emissions

Gridded EPA 0.1° x 0.1° methane inventory (2012)

CH_4 emissions (Mg a^{-1} km^{-2})

ARL 9

Approved, Operational Deployment & Use in Decision Making
(Sustained Use)

Actual operational, successful use of application by users in their decision making activities. To reach ARL 9, full integration and **repeated use** in the decision making organization's operations has been achieved.

Milestone:

❑ Sustained use of application system in decision making context

Some skepticism

From: Hurtt et al., Aboveground biomass with associated uncertainty maps. *In progress.* **ARL 5, target ARL 9**

Policies: FIA, Federal Land Policy and Management Act (FLPMA), Maryland Greenhouse Gas Emissions Reduction Act Plan, Maryland Climate Action Plan, Chesapeake Bay TMDL, Maryland Forest Preservation Act, Maryland No Net Forest Loss Act, Climate Framework for Delaware, Forest Legacy Program, Pennsylvania Climate Change Act, TreeVitalize Program, Improved FIA method over urban forests

ARL 5

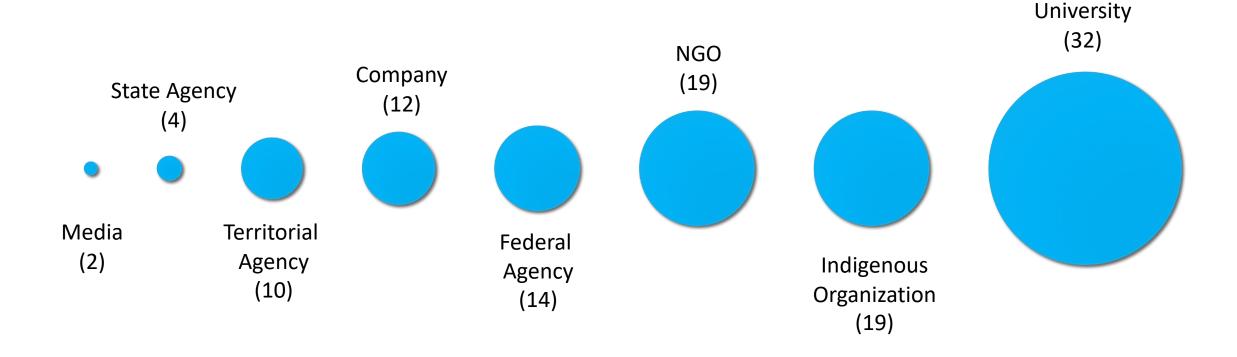## Validation in Relevant Environment
(Potential Determined)

Basic components are integrated with reasonably realistic supporting elements so application can be tested in a simulated decision making environment. Prototype implementations conform to the end-user's target environment and standard interfaces. Validation that the decision making activity both functions with the Earth science products and is projected to improve performance is achieved. Project team must **articulate the potential** for performance improvement in decision making to achieve this ARL.

Milestones:

- ☐ Application components integrated into a functioning prototype application system with realistic supporting elements
- ☐ The application system's potential to improve the decision making activity determined and articulated (e.g., projected impacts on cost, functionality, delivery time, etc.)

Stakeholder Engagement: ABoVE Office Database

University
(32)

NGO
(19)

Company
(12)

State Agency
(4)

Media
(2)

Territorial
Agency
(10)

Federal
Agency
(14)

Indigenous
Organization
(19)

Stakeholder Engagement: 2017 Activities

❖ Engagement activities in 25+ locations in AK and Canada

❖ 14 Project teams + CCE Office activities

❖ Activity types range from:

- Outreach and communication
- Citizen science
- Professional development
- Working with data end users
- Co-production of knowledge

Stakeholder Engagement: Moving Forward

❖ Find ways to coordinate activities across teams – avoid community (and scientist!) burnout

❖ Share materials, approaches, experiences

❖ Transition from discussing plans ➔ sharing results

❖ Join the working group!