

Design Concepts of the ESA-NASA Multi-Mission Algorithm and Analysis Platform (MAAP)

Laura Alisic Jewell¹, Hook Hua¹, Manil Maskey²,
George Chang¹, Kaylin Bugbee³, Aimee
Barciauskas⁴, Chris Lynnes⁵, Rahul
Ramachandran², Ian Schuler⁴, Alireza Jazayeri⁴,
Jennifer Cruz¹, Marco Lavallo¹, Paul Rosen¹,
Clément Albinet⁶, Björn Frommknecht⁶, Amanda
Whitehurst⁷

¹ Jet Propulsion Laboratory, California Institute of Technology

² NASA Marshall Space Flight Center

³ University of Alabama Huntsville

⁴ DevelopmentSEED

⁵ NASA Goddard Space Flight Center

⁶ European Space Agency

⁷ ASTS / NASA HQ



What is MAAP?

ESA-NASA Multi-Mission Algorithm and Analysis Platform (MAAP)
for improving aboveground terrestrial carbon dynamics

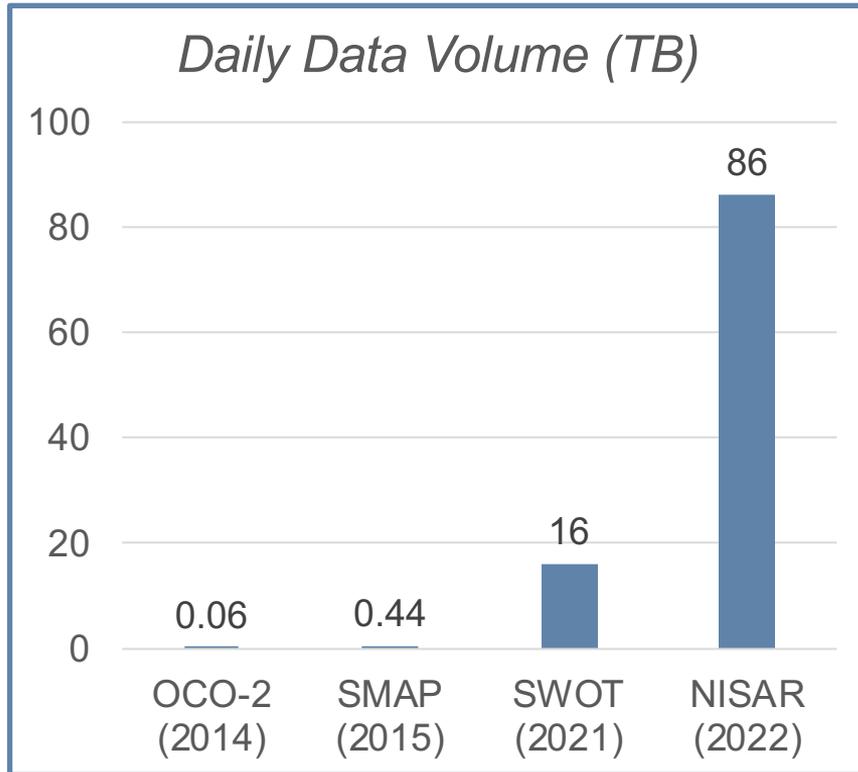
- Science-focused virtual environment to share, process, and analyze data from ESA and NASA field, airborne and satellite measurements
- ESA-NASA collaboration focused on GEDI, BIOMASS, NISAR missions



biomass



Why do we need MAAP?



- **Large data volumes** produced by new satellite missions being launched
- Need **scaling up** of algorithms and processing for large datasets
- Need **co-location** of complementary data from multiple missions
- Scientific community needs improved data and algorithm **sharing and collaboration** across users and organizations

Key concepts of MAAP

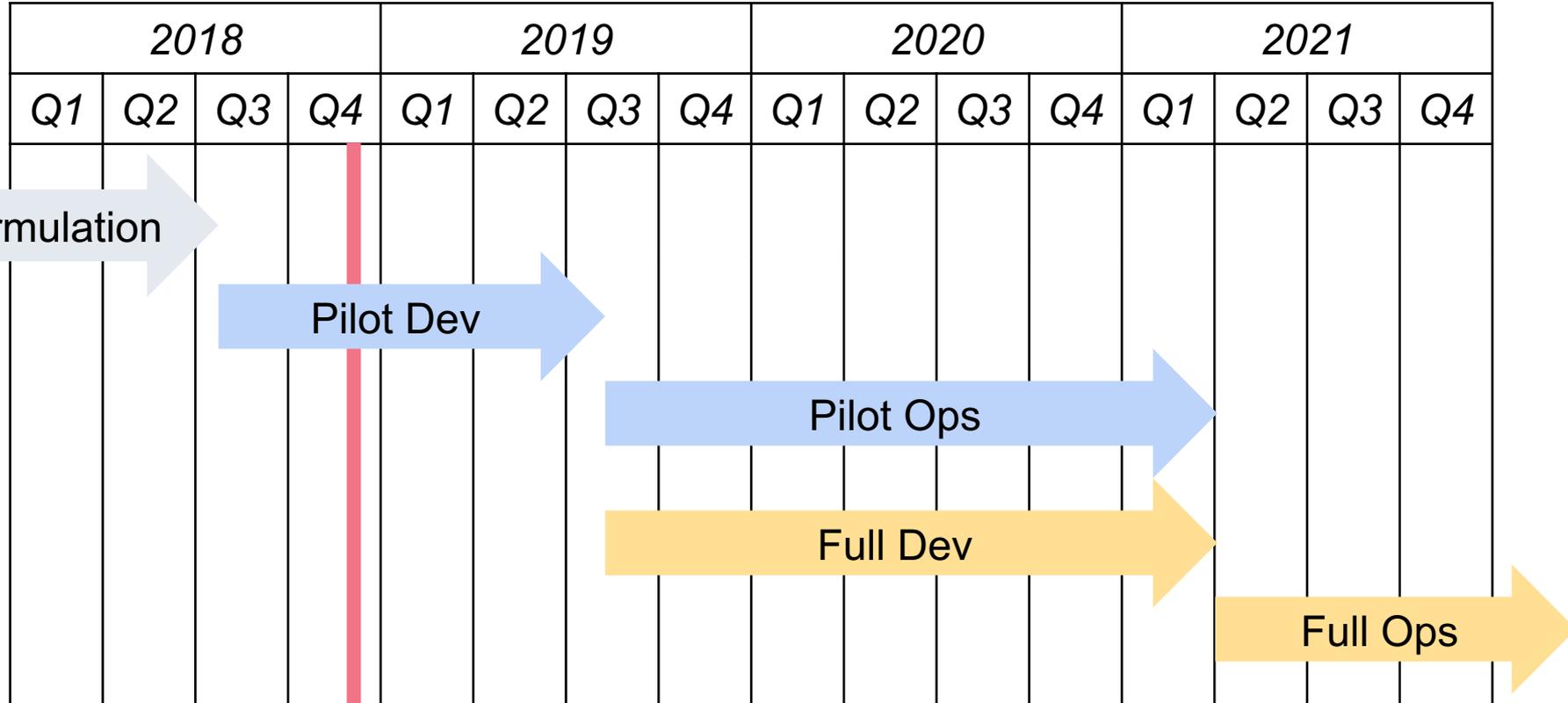
- Establish analysis **collaboration** framework to share data, algorithms and compute resources: **accelerate development cycle**
- **Decouple** algorithm development, cataloging, and deployment onto large-scale processing data systems
- Provide interfaces for developers to **develop, version and share** processing algorithms and data products
- Develop algorithms supporting **Analysis-Ready Datasets (ARDs)** for fast analysis
- Enable **on-demand analysis** on ARDs using multiple frameworks

OPEN-SOURCE

CLOUD-BASED

SOFTWARE RE-USE

MAAP Roadmap



MAAP Pilot: User stories

EXPLORE

Multi-sensor search
and comparison

Image visualization and exploration

Subsetting to different
formats and zonal statistics

Biomass product generation and
validation with user-provided *in situ* data

RUN

Algorithm code development

DEVELOP

ESA-NASA Pilot: Joint architecture & interoperability

Joint ESA-NASA Pilot

Common entry point

1

2

NASA platform

GUI

API

Services

Data & Algorithms

ESA platform

GUI

API

Services

Data & Algorithms

4

3

Pilot phase interoperability:

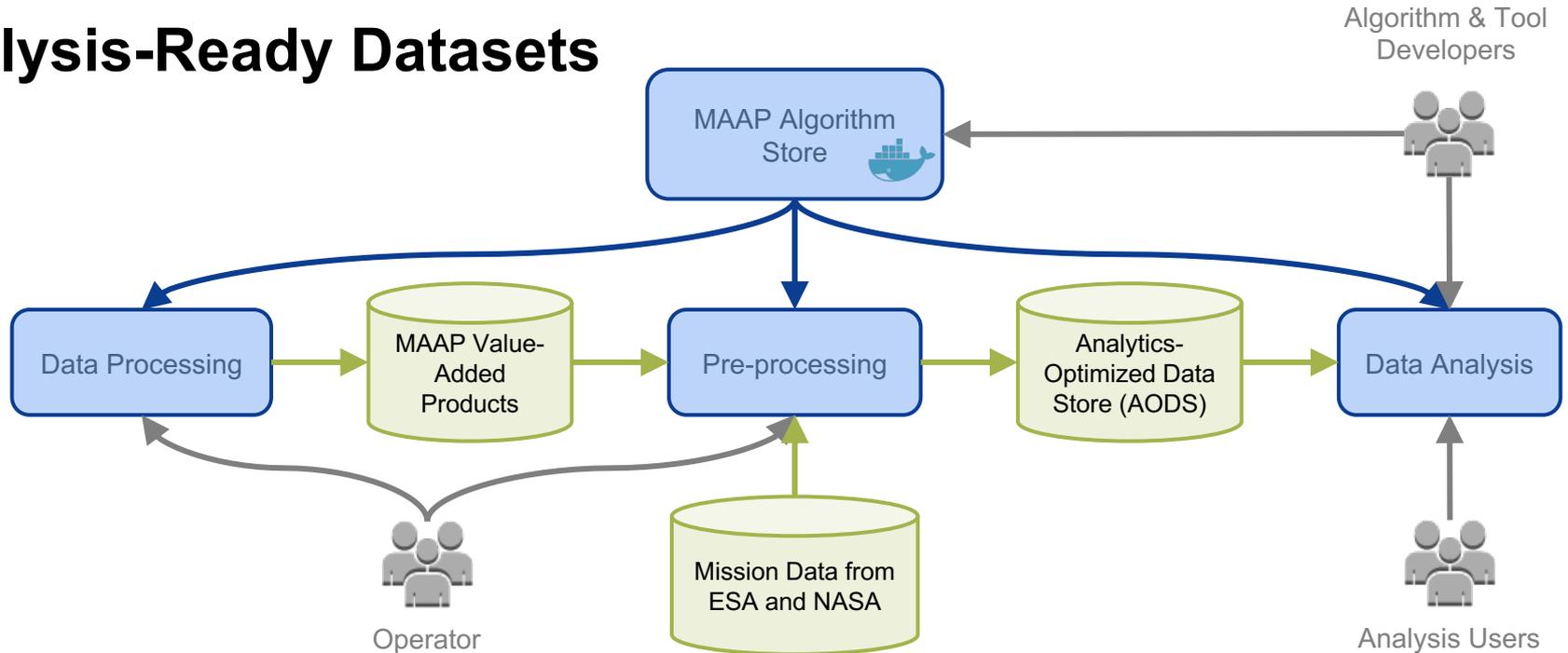
Explore architectures & interoperability strategies

1. Web front-end
2. User registration, identity and access management
3. Common catalog and data standards
4. MAAP API interoperability
5. Common repository for source code and documentation

Full phase:

Interoperability to be evaluated

Analysis-Ready Datasets



MAAP Algorithm Store:

- Interoperable set of analysis processing steps to transform data from raw to analysis results
- Catalogs processing algorithm code to generate Value-Added Products and ARDs
- Data processing, pre-processing, and data analysis all can invoke same set of execution units from the algorithm store.

Datasets slated for MAAP

- **Pilot MAAP:**

- Airborne and field campaigns to support Cal/Val for GEDI, NISAR, BIOMASS missions:
LVIS, UAVSAR, AfriSAR, BioSAR, TropiSAR, INDREX2, PALSAR, ALOS
- Ancillary data used in biomass algorithms: SRTM, Sentinel-2, GPM, GlobCover, Landsat 7

- **Full MAAP:**

- GEDI, NISAR, BIOMASS products
- Additional supporting data

*More information on data curation for MAAP:
Poster **IN53C-0617** (Bugbee et al.)*

Summary

ESA-NASA Multi-Mission Algorithm and Analysis Platform (MAAP) *for improving aboveground terrestrial carbon dynamics:*

- Cloud-based architecture to **co-locate** algorithms and analysis with the data, instead of bringing data to users
- **Interoperable** data and algorithms for multiple missions
- Potential blueprint for future ESA/NASA **collaboration and governance** of scientific data, algorithms, and software



Questions? Laura.A.Jewell@jpl.nasa.gov



Jet Propulsion Laboratory
California Institute of Technology

jpl.nasa.gov

Backup

MAAP high-level requirements: Summary

- **User interface** to access, search data and algorithms, explore and analyze data, develop algorithms, in on-demand setting
- **Collaboration** tools
- **Interoperable APIs**
- Access to official and user generated **data, algorithms**
- User **algorithm development environment** ('sandbox') as well as **data processing environment** (pipelines)
- **Computation and visualization** tools to analyze data
- **Sys admin** functionality and **change management**