

A guide to open source earth observation mission science

Stefanie Lumnitz, Clement Albinet, Bjoern Frommknecht, Henri Laur, Klaus Scipal

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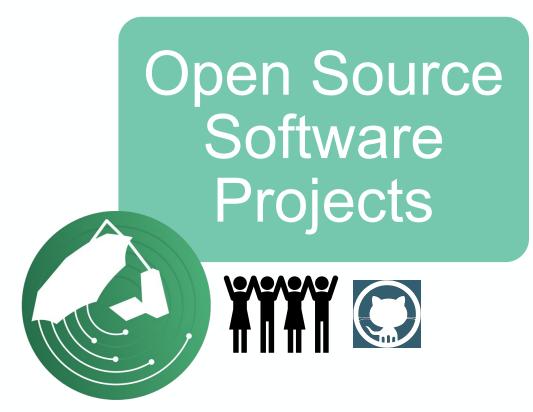
Towards open source software projects



Open Data Products

Towards open source software projects







Open Data Products





Open Source Algorithms

Open Source Software Projects







Open Source Algorithms

Open Reproducible Supporting documentation

> Open to collaboration Ongoing maintenance & development Community guidlines

Open Source Software Projects







Open Source Algorithms

Git & Version Control

Open License/ Open repository

Documentation

Continuous integration & testing

Outreach

Best-coding principles

Reproducible environment

Governance structures

Packaging & distribution

Improvement/ Maintenance

Open Source Software Projects





BioPAL

BIOMASS Product Algorithm Laboratory



- biopal@esa.int
 - biopal.org
- github.com/BioPAL



- = Open Source Software Project
- = official BIOMASS algorithms & python
- = first time that official algorithms are made publicly accessible

Banda, F.; Giudici, D.; Le Toan, T.; Mariotti d'Alessandro, M.; Papathanassiou, K.; Quegan, S.; Riembauer, G.; Scipal, K.; Soja, M.; Tebaldini, S.; Ulander, L.; Villard, L. "The BIOMASS Level 2 Prototype Processor: Design and Experimental Results of Above-Ground Biomass Estimation" Remote Sensing, 2020, 12, 985. doi.org/10.3390/rs12060985

Goals





Collaborative space to improve BIOMASS operational algorithms





Goals





Collaborative space to improve BIOMASS operational algorithms







Bridge between scientific discovery and BIOMASS operational algorithms

Goals





Collaborative space to improve BIOMASS operational algorithms





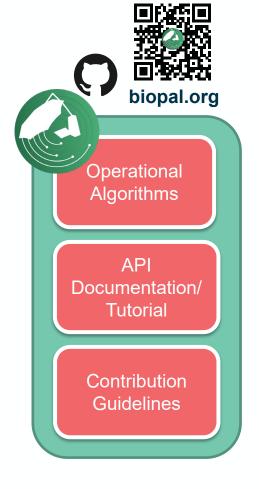


Bridge between scientific discovery and BIOMASS operational algorithms

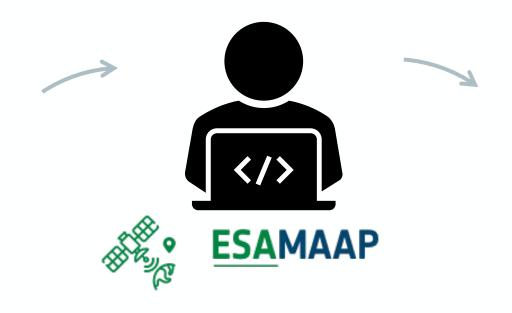


Promote Best Practices for open scientific code development





BIOMASS data



Algorithm Improvement

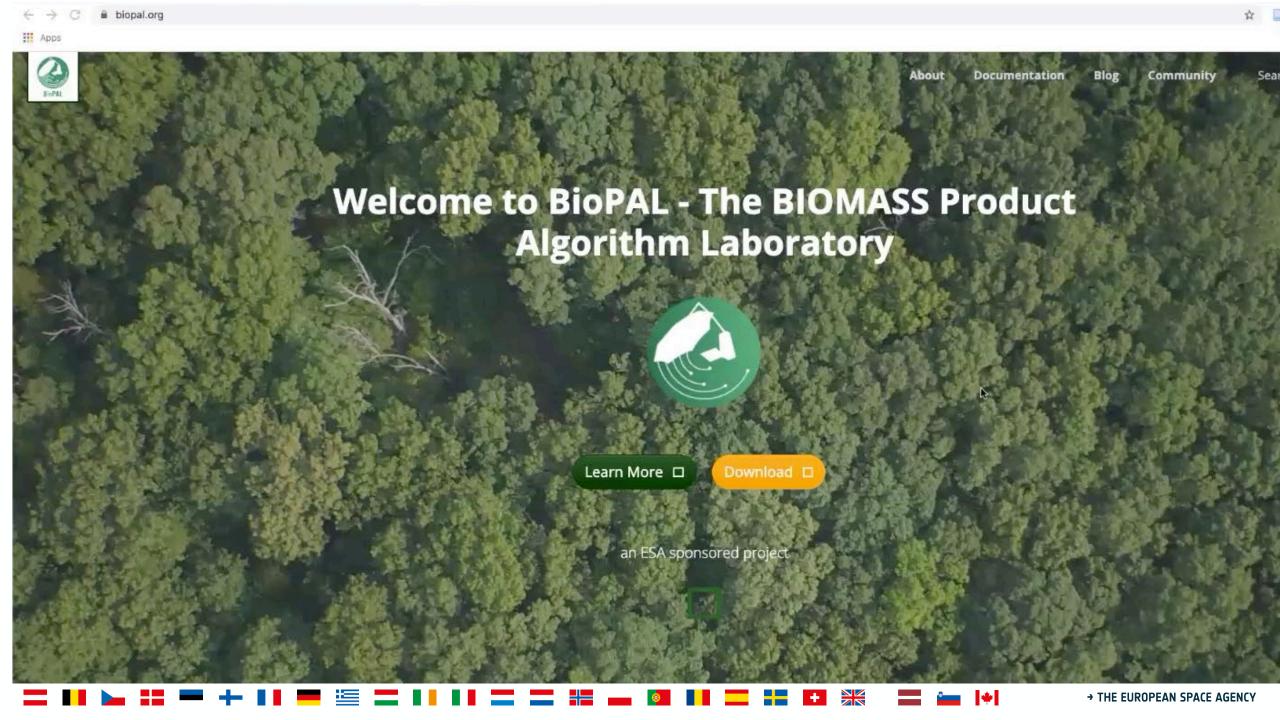
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Community Contributior

Jupyter notebool example

Change Approval by ESA & BioPAL devs







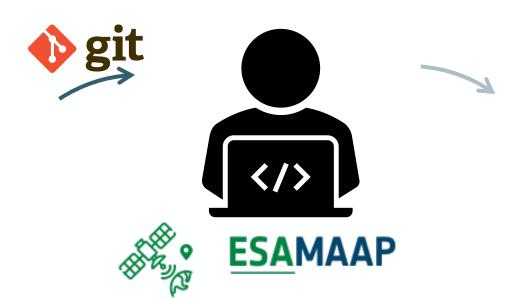


Operational Algorithms

API
Documentation/
Tutorial

Contribution Guidelines Testing/Validation
Data

BIOMASS data



Improvement

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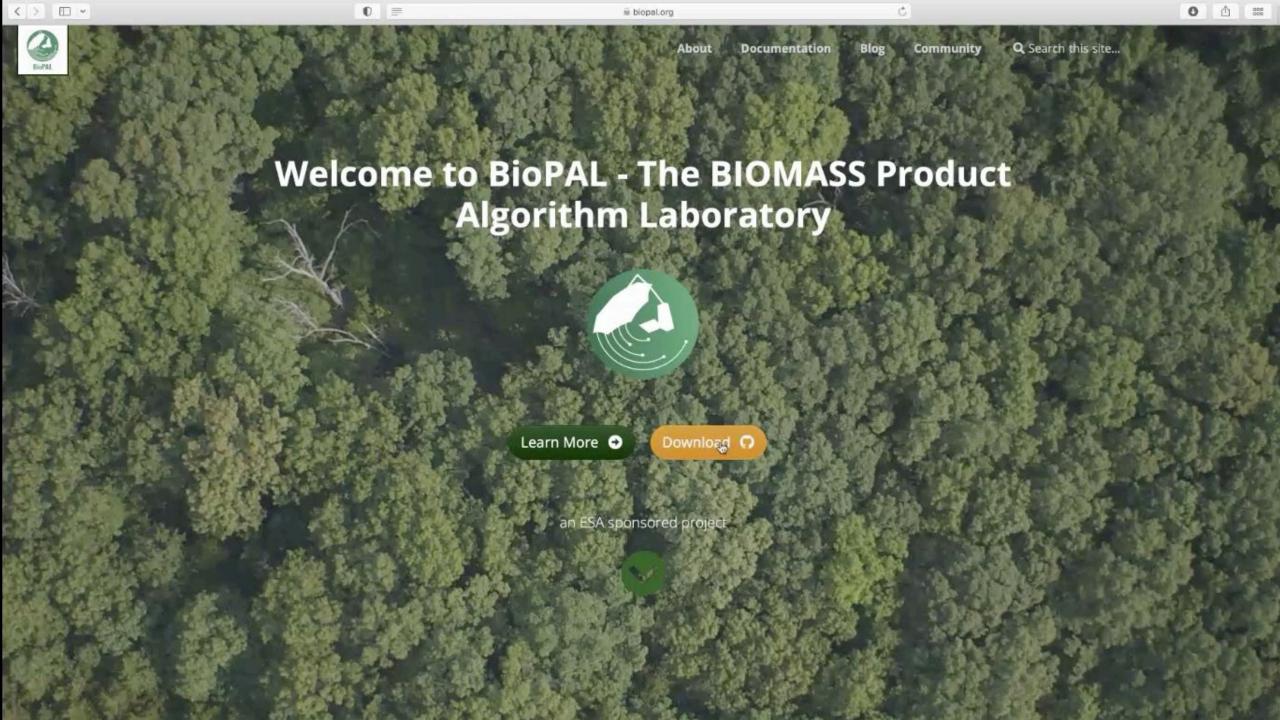
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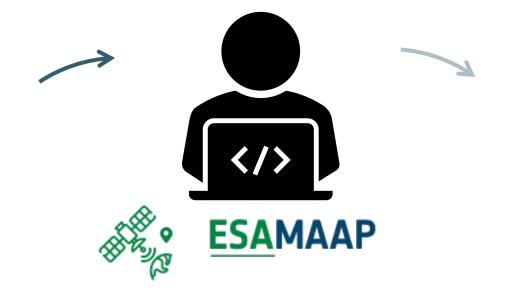


BIOMASS data

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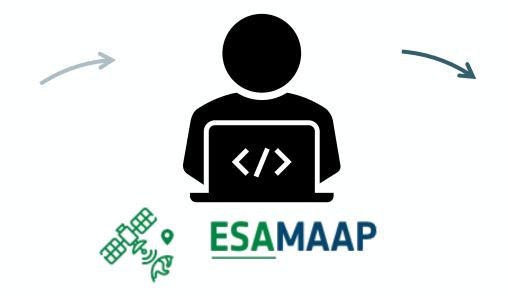


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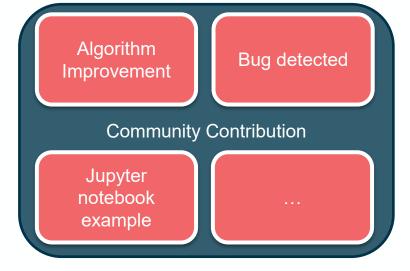
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Jupyter notebook example

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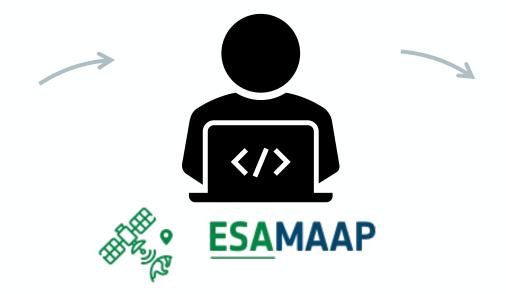


BIOMASS data

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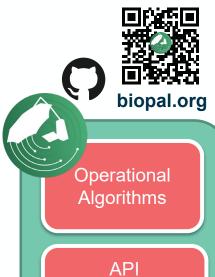
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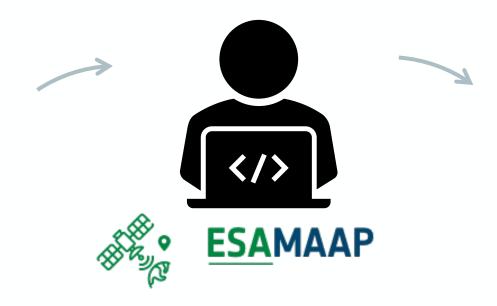


Documentation/ Tutorial

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Merge pull request

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Traditional Approach

ESA supported Under ESA Responsibility/Control

Science Community Proposes Ideas

Priorit ise

Prototype Implement PP Performance Validation

Recommendat

Operational Implementation

Processor Verification O ESA P FAT

PDGS

QWD (Quality Working Group)



Traditional Approach

Under ESA Responsibility/Control ESA supported **Science Community** Priorit Operational **ESA** Recommendat Processor Prototype Performance PP **PDGS** Proposes Ideas FAT Verification ise

- PP not open to everyone. OP is not open. Single Point Failure Risk.
- PP and OP are different and fully independent
- If an idea does not pass the initial evaluation by the QWG it will never be tested in the processor environment.

QWD (Quality Working Group)



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Open Source Approach

Science Community
Implements Ideas

DevB

Science CommunityPerf. Self Validation

Recommenda tion

DevB to OP

O P

ESA FAT

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ESA FAT

PDGS

- · Code is accessible to everyone.
- Enabling seamless integration of changes from Developer Branches to Master Branch
- Fosters direct collaboration between scientists and scientists and software engineers.
- Supports cross validation of different models (Intercomparison Experiments)

QWG (Quality Working Group)

Lessons learned on open source development

esa

- Open Source Software is not only about the License!
- Scientists have to familiarize themselves with git
- Benefits of establishing common guidelines and best practices as early as possible for teamwork
- Value of transparency and centralized software review
- Value of different backgrounds and diversity within our community for peer-review











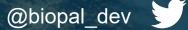
Thank you!

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