WP9 User communication & reproducible research

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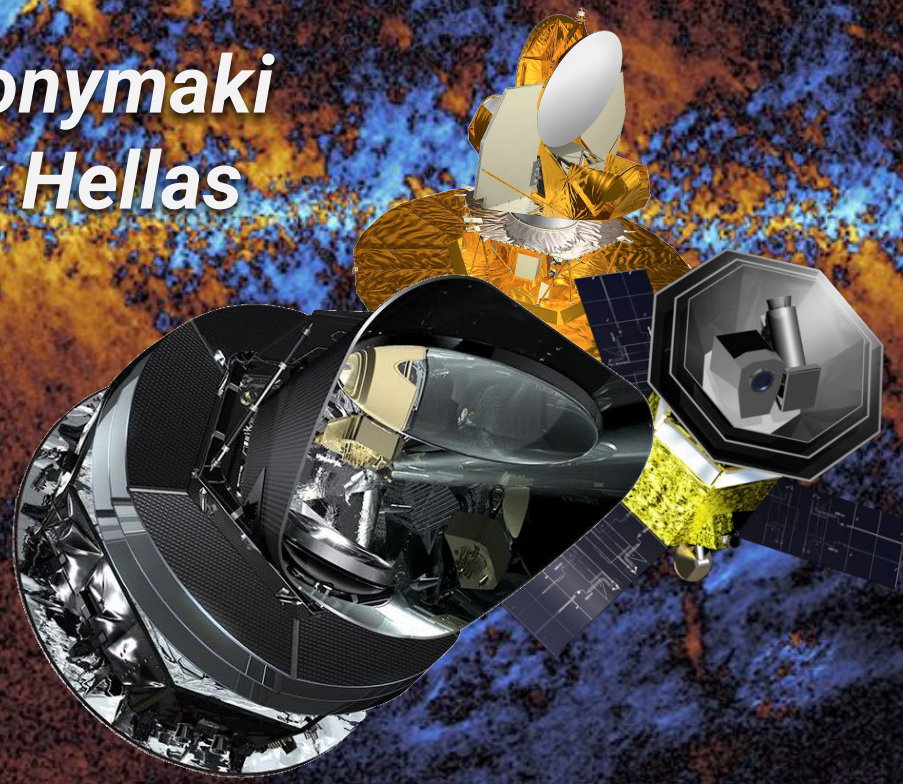
Planetek Hellas



BeyondPlanck Final Review, December 10, 2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776282

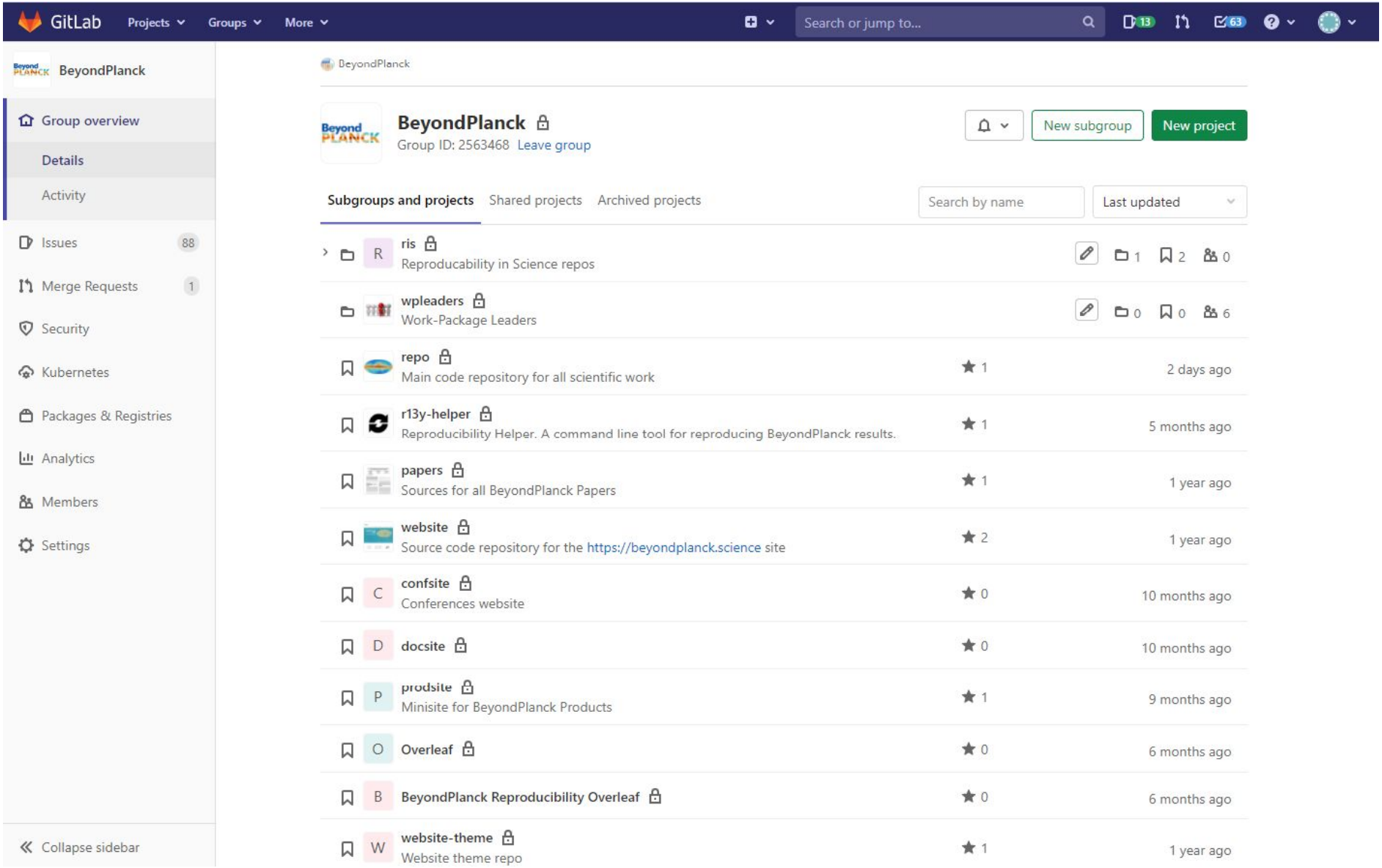
WP9 Objectives

Objectives The main objectives of this WP are as follows:

- Disseminate the results of the rest of the work packages
- Investigate how the scientific work performed in the previous work packages can be reproducible.
- Implement a system that will be able to capture and recreate the scientific operations performed in this project.

- ➢ Code organization and distribution
- ➢ Reproducible research
- ➢ GPU activities
- ➢ Dissemination

Code organization & distribution



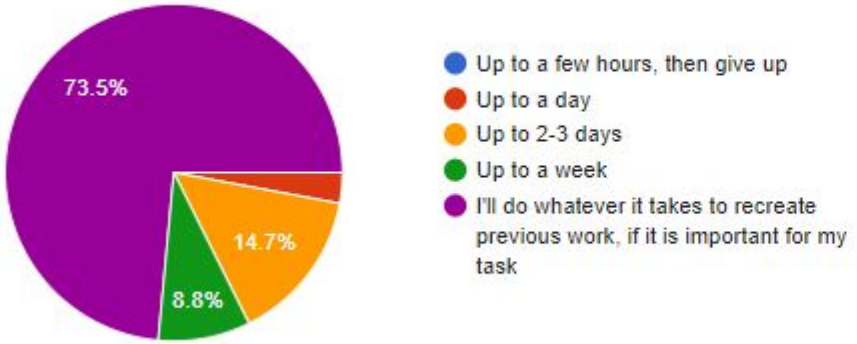
Reproducible Research - Reproducibility Theory

The subject of Reproducibility and the ability of scientists to exactly reproduce and confirm a given result, is central to Science in general

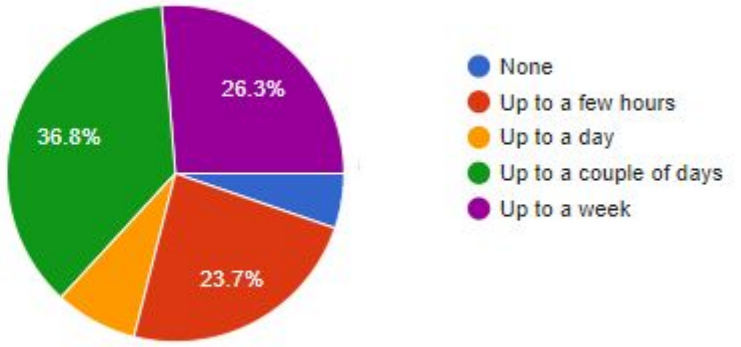
- Workflow Tools
- Online services
- Traditional online development platforms

Reproducible Research - Survey

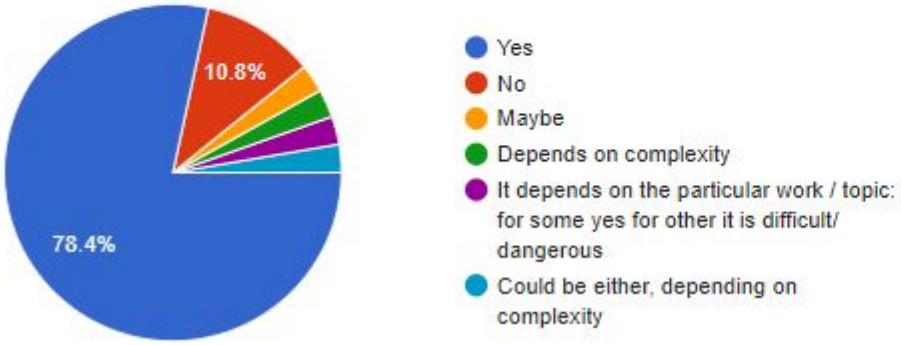
Time spent recreating work



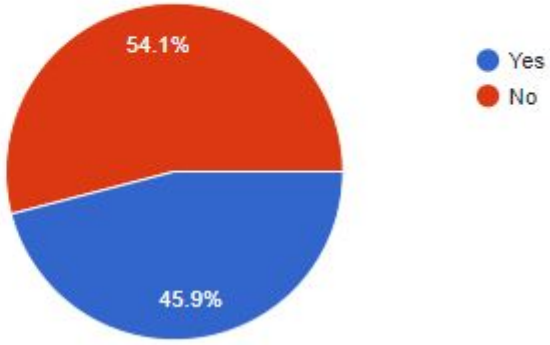
Time Allocated



Reproducability workflow desirability



Actively Seeked Reproducability workflows



Reproducible Research - Reproducibility in BeyondPlanck

- Definition of initial input files.
- Process that programmatically manipulates the input files
- Not excessive computational requirements for the execution of the above programmatic code, preferably able to be executed in a modern laptop or even a high end desktop machine.
- Modest file system requirements
- Produces some results (files, diagrams, tables etc) that is the output of the computational phase.

Reproducible Research - Docker Environment

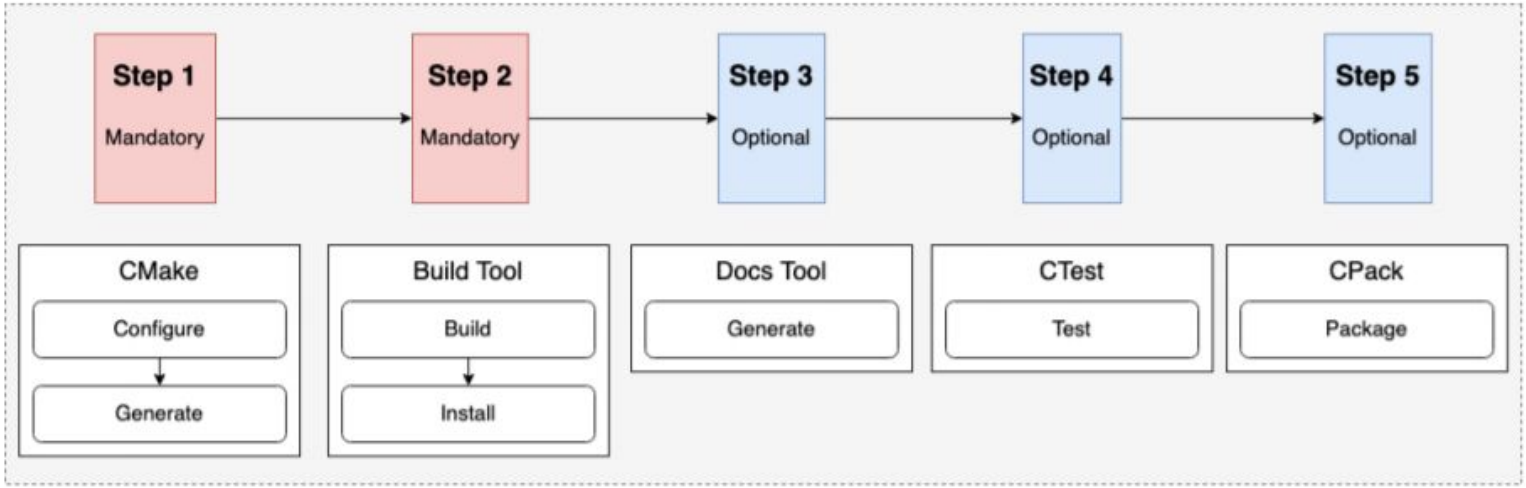
Docker environment for user-friendly data access and code exploration

The command line tool offers three fully automated major functionalities:

- Allows the automated retrieval of required input data files from various online sources
- Allows the execution of required computational tasks that operate in the input data files
- Recreates the exact BeyondPlanck results, or allows execution of similar products by altering configuration files.

Reproducible Research - CMake Compilation System

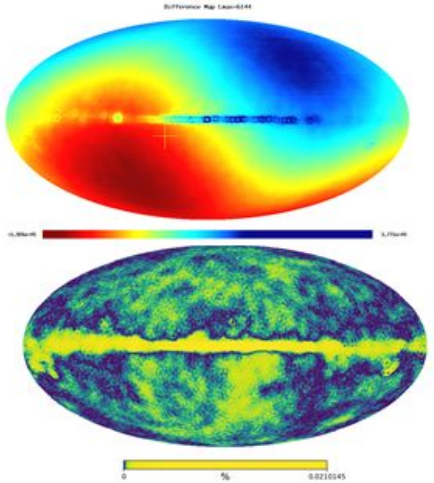
- The default installation process is fully automated through **CMake:** a set of tools, Open Source, cross-platform, which covers the entire process starting from build/compilation up to package distribution while supporting a range of compilers and platforms. Open Source, cross-platform

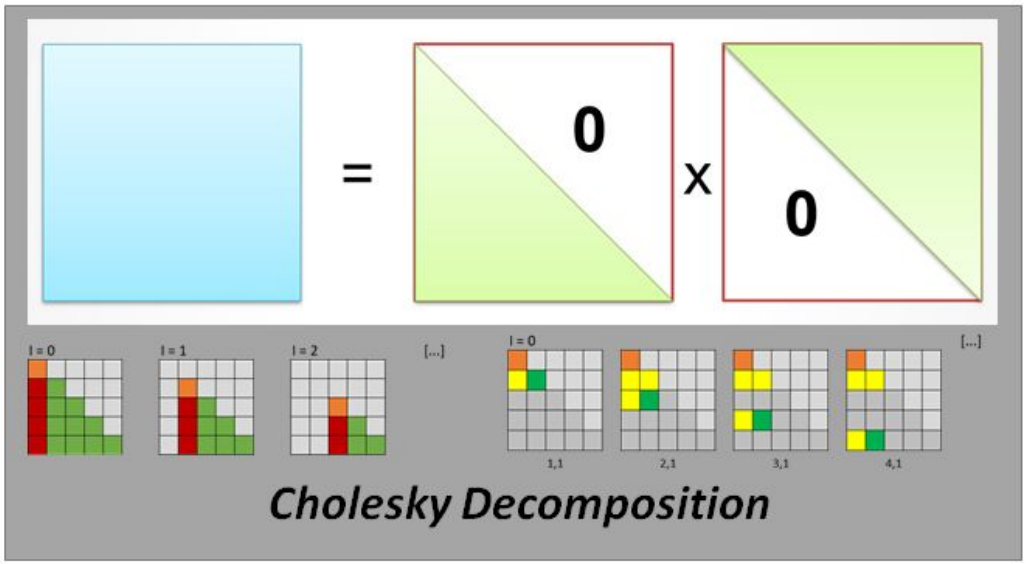


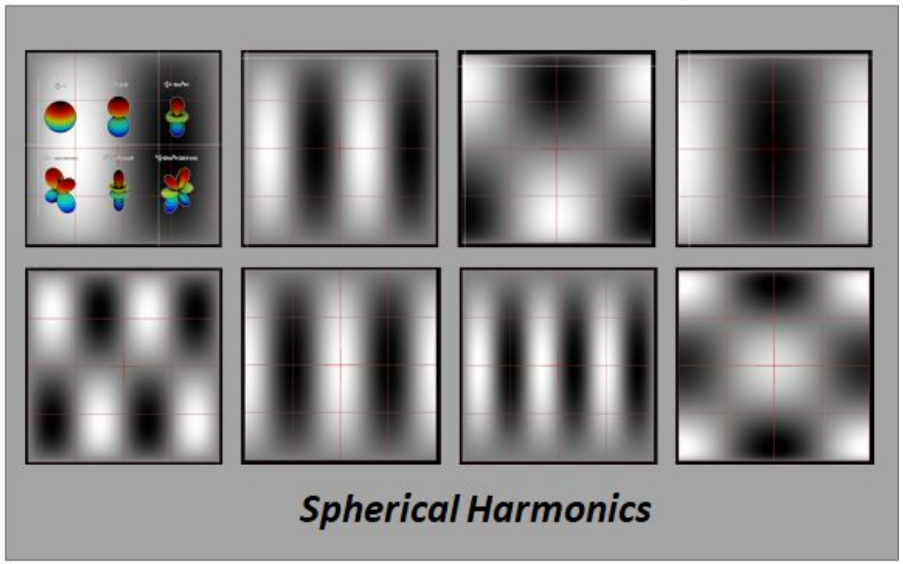
GPU Activities

Element of investigation for potential use of desktop and notebook GPUs in the project, as highlighted by the Consortium:

- **Generic algebra operations;**
- **Spherical harmonics transformations;**







GPU Activities - Outcomes

Desktop GPU not suitable for this project due to:

- Very demanding memory requirements
- Highlighted algorithms too complex for being parallelized on GPU
- Their actual state-of-the-art implementations quite efficient and effective
- Alternate assessed GPU implementations too limited for project's requirements

Dissemination

- Code organization and distribution
  - Several Git repositories
- Main BeyondPlanck website
  - https://beyondplanck.science.page
- Commander and BeyondPlanck reference guide
  - https://docs.beyondplanck.science
- Online Conference Support
  - https://conferences.beyondplanck.science
  - Presentation slides and videos for all the sessions are available at our conferences site.
- Discussion Forum
  - https://forums.beyondplanck.science/
- Internal site to track progress of papers
  - https://papers.beyondplanck.science/

WP9 Deliverables

- A skeleton GitHub repository for internal use (Month 1)
  - Delivered March 30th, 2018
- First public project web page (Month 6)
  - Delivered Sep 26th, 2018
- Reproducible Research Methodology Report (Month 12)
  - Delivered March 1st, 2019
- Reproducibility Framework tool and documentation (Month 24)
  - Delivered December 1st 2020

WP9 Timesheets

Institute	EU Funded Person Months	In-Kind Person Months
Planetek Hellas	58.64	0
Total	58.64	0
Budgeted	58	
Deviation	+0.64	

WP9 Timesheets - Further breakdown

Name	Project Administration	Code Maintenance & Web Presence & Dissemination	Reproducible Research	GPU Enhancements	Total
Stratos Gerakakis	1.5	3	8.75	5	**18.25**
Maria Ieronymaki	0	4.75	9.25	6.41	**20.41**
Ilias Ioannou	0	4.5	6.03	4.7	**15.23**
Stelios Bollanos	4.75	0	0	0	**4.75**
Total	**6.25**	**12.25**	**24.03**	**16.11**	**58.64**

Funding

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776282

- "*BeyondPlanck*"
  - COMPET-4 program
  - PI: Hans Kristian Eriksen
  - Grant no.: 776282
  - Period: Mar 2018 to Nov 2020

Collaborating projects:

- "*bits2cosmology*"
  - ERC Consolidator Grant
  - PI: Hans Kristian Eriksen
  - Grant no: 772 253
  - Period: April 2018 to March 2023
- "*Cosmoglobe*"
  - ERC Consolidator Grant
  - PI: Ingunn Wehus
  - Grant no: 819 478
  - Period: June 2019 to May 2024

Questions?

Beyond PLANCK

Commander

Cosmoglobe