

**ESA Council at Ministerial level  
(Paris, 22-23 November 2022)**

**Presentation of the Programmes to  
the Belgian actors**

**Belgian Science Policy Office**

**Antwerp Expo  
30 September 2022**

# Introduction

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# Science and Exploration - The Science Programme

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# Science and Exploration

-

## Human Spaceflight, Microgravity and Exploration

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# Applications

-

## Earth Observation

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# Earth Observation Programmes

## Proposed Belgian participations

### Future EO:

- ✓ different kind of opportunities for BE players: Scientific & Industrial
- ✓ BE over-returned in previous periods
- ✓ BE strongly support to the programme

### EarthWatch:

- ✓ ALTIUS Completion: operations, validation and scientific products
- ✓ Climate-Space: potential collaboration BE Climate Center, institutes & universities
- ✓ Digital Twin Earth (DTE): bringing together different disciplines, prepare BE-actors for DestinE
- ✓ InCubed+: implement commercial activities in a fast way with an engagement of ESA EO team

### Copernicus Space Component 4 phase 2:

- ✓ Sentinel-1 NG, Sentinel-3 Topographic NG
- ✓ Return on investment (recurrent units by EC)

### Aeolus-2:

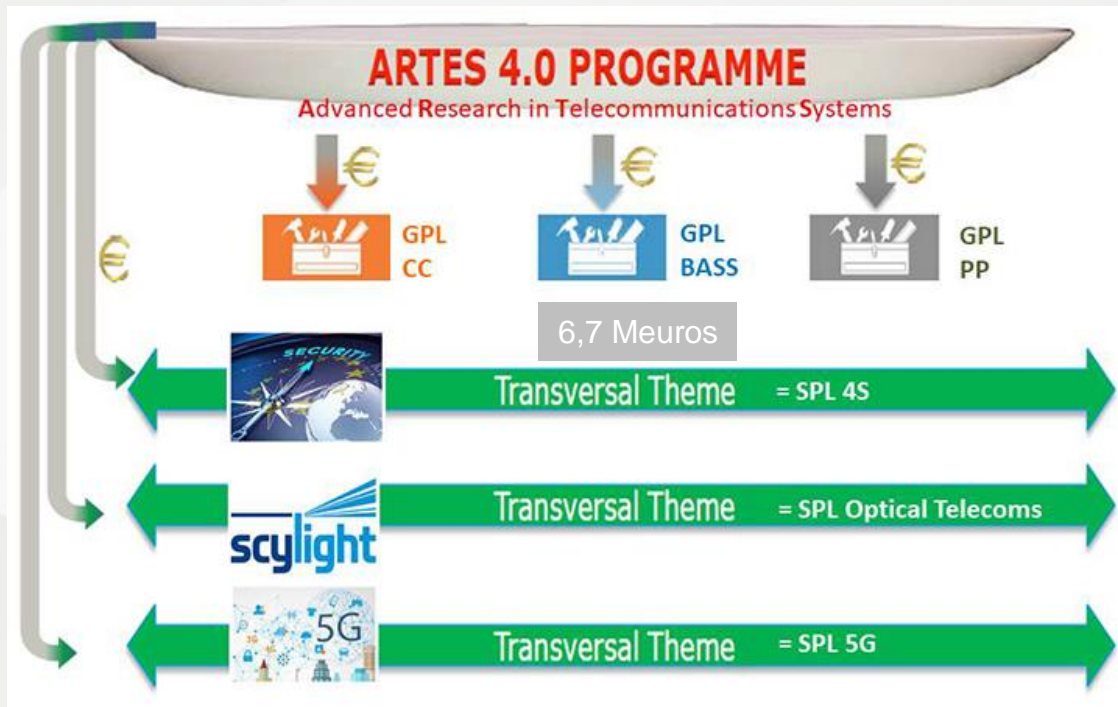
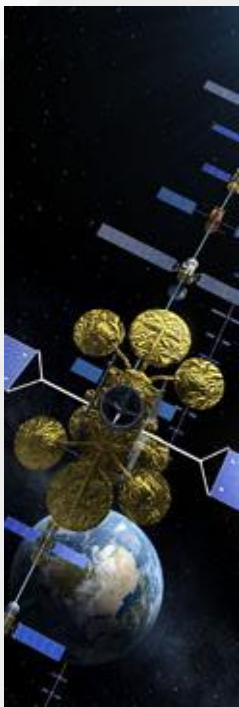
- ✓ Development of an operational doppler wind Lidar mission
- ✓ Return on investment (recurrent units by EUMETSAT) (+ EUMETSAT contribution )

# Applications - Telecommunications and Integrated Applications

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# ARTES 4.0 Programme



Contribution BE

130 Meuros @CMIN19

@CMIN22:

- Satellite constellation + digitalization
- Strong ARTES CC participation while being active in new Telecom programs related to EU
- New participation to 5G -> 6G
- Greener space & space4green
- New: ARTES 4.0 Hubs, vs Belgian interests in cybersecurity and 5-6G

**CHALLENGE**





# ARTES 4.0

## Generic Programmatic Lines (GPLs)

**FP = Future Preparation** (ARTES entry ticket)  
for knowledge building, preparatory studies, standardisation  
according to an ESA workplan



**CC = Core Competitiveness**

**BE usual strong a la carte use**

**BASS = Space Solution Center XL** (including Hubs)  
& **Business Applications**  
& **Ambassadors, Investors**

**PP = Partner Projects**

**BE careful occasional use as sub**

# ARTES 4.0

## Strategic Programmatic Lines (SPLs)

Transversal Themes



- **4S (Secure Systems for Safety and Security):**  
Secure Satcom for key infrastructures or in support to crisis management, maritime safety, border control and other security domains; in agreement with policies/regulations/specifications under authority of institutional/public bodies

**BE FOCUS**



- **Scylight – Optical Comms and Quantum:**  
optical and QKD telecom technologies in space are expected to achieve major impacts on the satcom sector in the next decade (high transmission rates, data security and resilience)



- **5-6G and Green Space:**  
new generation of telecom is key to support the Digital (Green) Transformation with integration of satellite with terrestrial telecom networks

**BE NEW INTEREST**





# NEW Telecom Programmes for CMIN22



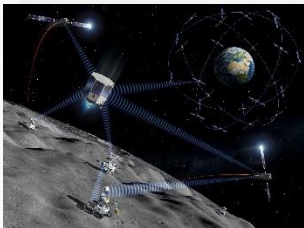
- **ESA Programme Related to EU Secure Connectivity:** ESA Memberstates will develop and validate elements to provide secured telecom (hard-gov, light-gov and commercial). ESA will be partnering with the EC and contribute directly to the EU Secure Connectivity Initiative.

**BE STRONG INDUSTRIAL INTEREST**



- **'Civil Security from Space' (CSS):** a federated solution interconnecting space and ground systems and services, existing, planned and future. The solution will include Earth observation systems, space-based positioning & navigation, enhanced telecommunication system and Internet of Things (IoT) resources

**BE INTEREST**



- **Moonlight (Navigation and Telecoms for the Moon):** involves expanding satnav coverage and communication links to the Moon. The first stage involves demonstrating the use of current satnav signals around the Moon. This will be achieved with the Lunar Pathfinder satellite in 2024.

# Applications - Navigation

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# Enabling and Support - Commercial

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# Enabling and Support - Technology

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matthias.piens@belspo.be

# Enabling and Support - Space Transportation

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matthias.piens@belspo.be

# Space Transportation Systems

@ ESA CMIN 22



- Ariane 6            405 M€
- P120C+            202 M€
- Vega                505 M€
  
- Transition        195 M€
- Exploitation      493 M€
  - Ariane: 302 M€
  - Vega: 91 M€

**Total                    1700 M€**



- Boost!             140 M€
- FLPP                668 M€
- *Technology disruptors & space logistics*    116 M€
- *Prometheus*        230 M€
- *Themis reusability*   212 M€
- *Reusable upper stage*                            80 M€
- *Human Space Transport*                        30 M€

**Total                    828 M€**



- Completion & Services Improvements                            100 M€
- Evolution    10 M€

**Total                    110 M€**



- CSG 2023-2027    593 M€
- *Reference MCO*    485 M€
- *Flexible, digital, sustainable*    69 M€
- *Core Launch Range Renewal (CLRR)*                                    39 M€

**Total                    593 M€**



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## Pillar II. Future preparation

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**Total 828 M€**

## Pillar III. Space Rider

- Completion & Services Improvements 100 M€
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## Pillar IV. Infrastructure

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**Total 593 M€**

# Space Safety and Security

-

## Space Safety

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# Space Safety Programme (S2P)

## Proposed Belgian participations

(in red: participation if constant overall space budget)

### COSMIC:

- ✓ SWE Core: Service Network and Data Centre continuation and evolution, modelling, Proba-2, Proba-1, hosted payloads (strongly decreased)
- ✓ AURORA small mission: mission prime, instrument components (--)
- ✓ NANOSAT mission: subcomponents (--)
- ✓ NEO Survey System: elements (--)
- ✓ APOPHIS study: study lead -> mission prime in CMin2025 (idem)
- ✓ DRACO mission: re-entry capsule (idem)

### VIGIL phase 2:

- ✓ Spacecraft and/or instrument components (main instrument contribution in PRODEX) (--)

### HERA phase 2:

- ✓ Mandatory participation to finalisation of ongoing activities, launch, operations (idem)

### ADRIOS phase 2:

- ✓ No subscription (idem)



# Other - Education

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julien.beclard@belspo.be

**EU**

-

**Nationally co-funded projects  
Waiver for participation to EU space  
activities**

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jean-françois.mayence@belspo.be

# Bilateral

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# National - Terrascope and Stereo

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jean-christophe.schyns@belspo.be

# TERRASCOPE



- Manages Belgian RS heritage data
- Belgium's **collaborative ground segment** since 2017



**Operated by VITO**

- complementary access to Sentinel data and/or to specific data products or distribution channels
- funded by third parties
- enhance and facilitate the Sentinel missions' exploitation



**Requirements**

- Data acquisition and production
- Complementary products and algorithms definitions
- Specific tailoring for regional coverage or specific applications
- Data dissemination and access
- Development of innovative tools and applications
- Support to cal/val

**Countries with CollIGS**

# TERRASCOPE DATA & PRODUCTS



## Sentinel-1

### Benelux area

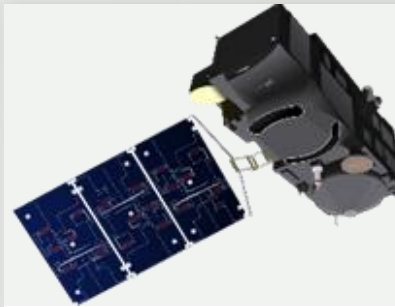
- Full archive
  - GRD
  - Coherence



## Sentinel-2

### Europe/selected regions

- Full archive for Benelux
- 2Y rolling archive for EU
  - L2A TOC
  - Vegetation indices
  - Water indices



## Sentinel-3

### Global

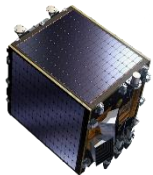
- Full archive
  - SYN-VGT
    - To be released



## Sentinel-5p

### Global

- 2018 - present
  - NO2
  - CO



## PROBA-V

### Global

- Full archive
  - L1C
  - L2A
  - L3 products



## SPOT VEGETATION

### Global

- Full archive
  - P products
  - Level 3 products



## Global Land Service

### Global

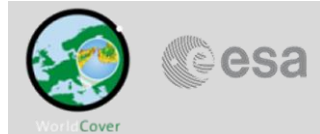
- Full archive
  - LAI
  - FAPAR



## Copernicus DEM

### Global

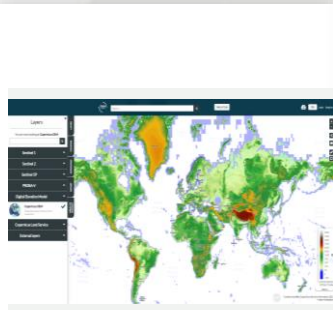
- 30 m
- 90 m



## ESA WorldCover

### Global

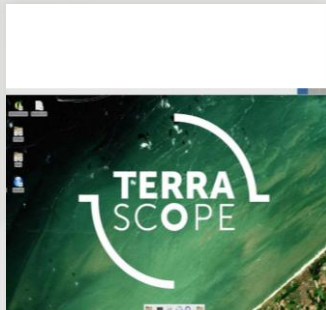
# TERRASCOPE SERVICES & USERS



## Terraviewer

### Novice users

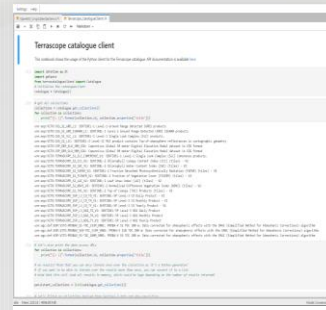
- Viewing
- Comparing
- Time lapses
- Downloads
- Time series analysis



## Virtual Machines

### Expert users

- NFS File access
- Wide Open source toolset
- Access to HPC



## Jupyter Notebooks

### Expert users

- Use Python/R/Scala
- Access to HPC



## Web Services

### Expert users

- WMT/WMTS
- OpenSearch Catalogue



## OpenEO API

### Expert users

- Platform independent
  - Datacube technology
  - Processing capabilities
  - Custom scripting on R/Python/JS
  - Connection to other back-ends

- **Open for everyone:** scientists, public authority, industry, citizens – expert and lay users
- **Free to use for everyone**
- **8000 + registered users**



# TERRASCOPE NEXT PHASE

Duration: 2023 - 2028

## Tasks:

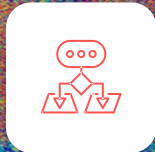
- Maintenance and operation of the **platform**
- Addition of **additional datasets**
- Provide **Proof-of-Concepts** for specific use cases
- Make bi-directional use of federated European networks of data portals and DIAS (Data and Information Access Service) **cloud environment** to **complement data and service offering**
- Support of **Belgian institutional 3rd parties** to develop a service onboarding
- Provide support to the **Belgian Climate Center** and lay the groundwork for a Belgian role in Europe's future **Green Information Factories** initiative and **DestinE** programme
- Increase **stakeholders** and intensify stakeholder interaction
- Roll out of **EOPlaza**



# EOPLAZA

## A platform for delivery of on-demand EO services

- Valorization of prototype algorithms/project outcomes on EO data
- Exposure to full Terrascope user base, including international network
- Allowing (Belgian) players to expose their knowledge/services
- Supported by federated Terrascope datasets and orchestrators
- Supported by EO and IT expertise



A parametrized processing block containing an algorithm



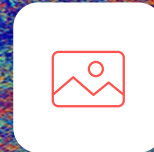
Based on EO & ancillary data



Operational through state-of-the-art orchestrators



Adds value -



Produces **an** output -  
An image or a vector file

# STEREO IV



# STEREO IV

- **STEREO IV:** *Support to exploitation and research in EO*
  - Duration: **2022-2029**
  - Budget: **28,15 M€** - *First call for proposals 2022*
  - **Objective:** Building of topnotch, dynamic and visible RS community

## STEREO projects:

Highly varied and flexible in terms of:

- Type
- Duration and budget

## *Eligible for project funding:*

- universities, public and non-profit research institutions

<https://eo.belspo.be>

## *Thematic priorities:*

- Impact of climate change on terrestrial/marine environments
- Advanced Monitoring and Assessment of Hazards
- Environmental health and biodiversity
- Sustainable and Green Cities

## *Methodological priorities*

- AI and deep learning
- Big data exploitation
- Use of multimission and multi-scale data

**Scientific Support**  
-  
**PRODEX**  
**and Scientific Data Exploitation**

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# *PROgramme for the Development of scientific EXperiments*

- Provide funds through ESA for **payload**:
  - ✓ hardware and software development
  - ✓ science operations
  - ✓ data exploitation
- Cooperation among **scientific institutes/universities** and between those (in the driving seat) and **industry**
- **Implementation**:
  - ✓ ESA selects the projects
  - ✓ BELSPO determines the level of financial support
  - ✓ ESA issues the contracts with institutes and industry
  - ✓ Joint follow-up by ESA and BELSPO
- Guaranteed **georeturn** of one

## 5 Fields of Research:

- ✓ Space Sciences (~ Science Programme)
- ✓ Life and Physical Sciences (~ ISS Programmes)
- ✓ Earth Observation (~ EO Programmes)
- ✓ Space Exploration (~ Robotic Exploration Programmes)
- ✓ Space Safety (~ Space Safety Programme)

Belgian Guidelines for the PRODEX Programme

Templates for project submission

[http://www.belspo.be/belspo/space/esa\\_prodex\\_en.stm](http://www.belspo.be/belspo/space/esa_prodex_en.stm)

## Belgian subscription for 2024-2026

If **constant** space budget:

- decrease of PRODEX with respect to CMin 2019
- further saving on data exploitation and on non-ESA missions

If **proposed increase** of space budget:

- Increase in Prodex for a stronger Belgian participation to payloads
- Transfer data exploitation from PRODEX to:
  - for EO (atmosphere): add to STEREO + special effort in relation to the Centre of Excellence for Climate
  - for SS, Expl, ESO: new national programme 'Scientific Data Exploitation'

**ESEC**  
**@**  
**national R&I system**

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# Wrap up

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**THANK YOU**

# The Space Department of BELSPO

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**Jan VERBESSELT**  
**Danielle COOSEMANS**  
**Pierre COQUAY**  
**David COX**  
**Pascal DERMINE**  
**Isabelle MEREAU**  
**Matthias PIENS**

**Sophie PIREAUX**  
**Pieter ROTTIERS**  
**Jean-Christophe SCHYNS**  
**Martine STELANDRE**  
**Peter VAN GELOVEN**  
**Joost VANDENABEELE**  
**Hendrik VERBEELEN**  
**Tom VERBEKE**  
**Werner VERSCHUEREN**

**+ Frank MONTENY, Alain HEYNEN and Jean-François MAYENCE**