



EU GLOBAL ACTION ON SPACE

Asia

Climate change and EU space data: exploring opportunities for ASEAN countries

 Online

 07 June 2022,
1:30 – 3:30 pm (UTC+7); 2:30 – 4:30 pm (UTC +8) 8:30 – 10:30 am (CEST)



Funded by the European Union



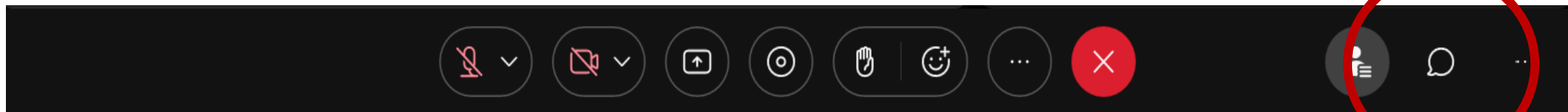
Promoting the European Union Space Programme





Housekeeping rules

- The webinar will start soon
- Use the chat below on the right to ask questions





EU GLOBAL ACTION
ON SPACE

Opening

Andreas Becker

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Promoting the European Union Space Programme





EU GLOBAL ACTION
ON SPACE

Opening remarks

Jolanda Van Eijndthoven

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Opening remarks

Tatiya Chuentragun

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EU GLOBAL ACTION
ON SPACE

The EU Space Programme and the EU Global Action on Space

Luis Cuervo Spottorno

Funded by the European Union



Promoting the European Union Space Programme





EU GLOBAL ACTION
ON SPACE

The EU Space Programme and its components

*Luis Cuervo Spottorno
Principal Administrator – Global Action
Directorate General for Defence Industry and Space
European Commission - Brussels*

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1

Promoting the European Union Space Programme





The EU Space Programme

The EU Space Programme and the services and applications that it supports, help to advance the European Union's objectives and to achieve its key policy goals and priorities

Budget for EU
Space investment
between 2021-2027

€14.88bn

>250.000

Jobs supported by
EU Space

Flagship components



10% of the EU GDP is enabled by satellite navigation



Operational in 360+ airports & helipads in 23 countries



No.1 global provider of space data and information

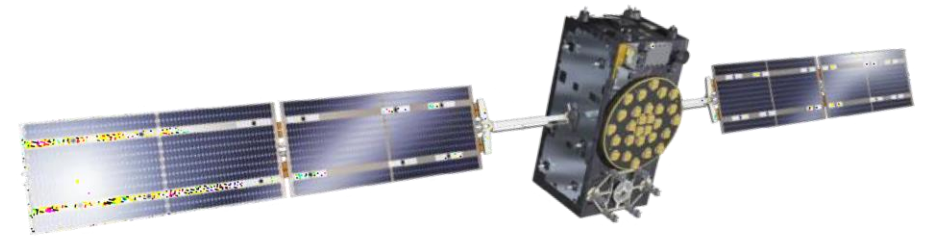




Galileo and EGNOS

Galileo is the **Global Navigation Satellite System (GNSS)** of the European Union. It offers **high-precision timing, positioning and emergency services** to citizens, private companies and public authorities. Galileo also features a **Search & Rescue service** to assist individuals in distress. Galileo is able to provide up to **20cm high accuracy positioning**.

The **European Geostationary Navigation Overlay Service (EGNOS)** is a satellite-based **augmentation system** operating in the European region. EGNOS currently enhances the positioning data of the US GPS. In the future, it will improve the performances of Galileo



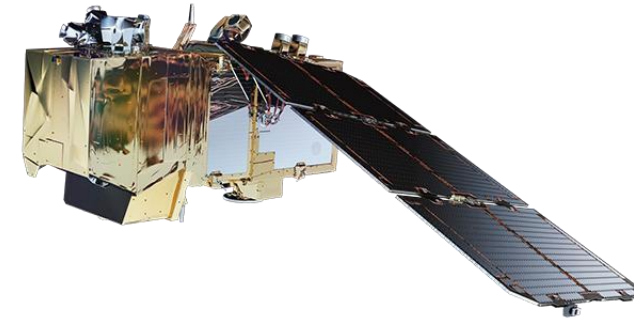
Number of satellites, control centres and sensor stations	Value of the Global GNSS market	Estimated revenue from services relying on GNSS technology by 2029
30	€175 billion	€166 billion





Copernicus

Copernicus provides high quality and free Earth Observation data through a **free, full and open data policy** to a wide range of stakeholders. It builds upon a space component (observation satellites) and an in-situ component (ground, airborne and seaborne stations). The data and imagery collected are channelled into **six thematic services: land, marine, atmosphere, climate change, emergency, and security**



Entrusted Entities: ESA, Eumetsat, ECMWF, Mercator, EEA, EMSA, FRONTEX, Satcen, JRC

DIAS platforms: Data and Information access services

<p>Cumulative economic value generated</p> <p>€16.2 – 21.3 billion</p>	<p>Earth Observation Companies in Europe exploiting Copernicus Data</p> <p>72%</p>	<p>Volumes of downloads from Data Access Systems</p> <p>+20 TB of data daily</p>
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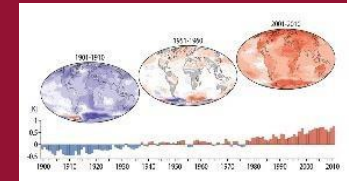




Consistent Estimates of the Essential Climate Variables (ECVs)



Global and Regional Reanalyses

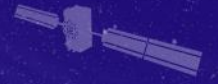


**Seasonal Forecasts
And Climate Projections**

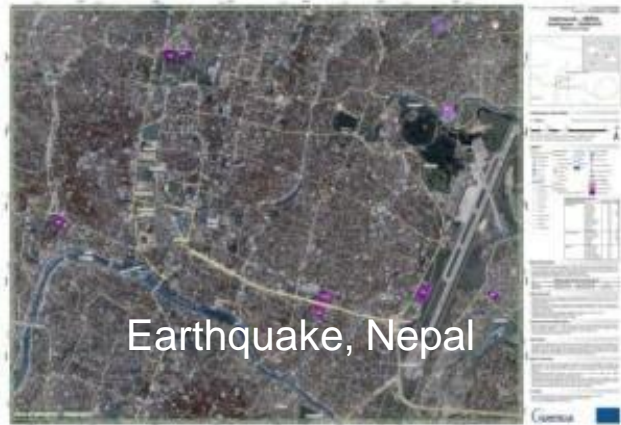


**Support to Mitigation and
Adaptation Strategies**

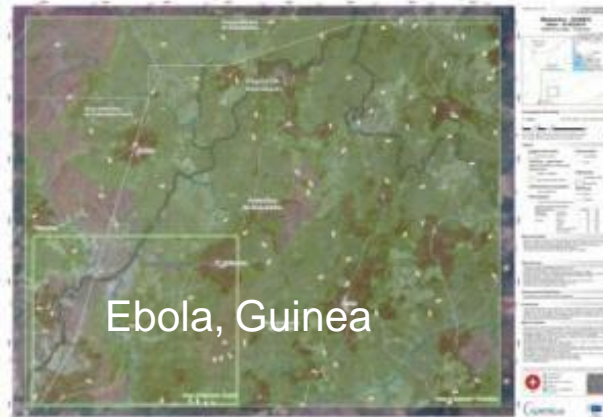




On demand Risk mapping, Rapid mapping and Recovery mapping linked to disasters



Earthquake, Nepal



Ebola, Guinea

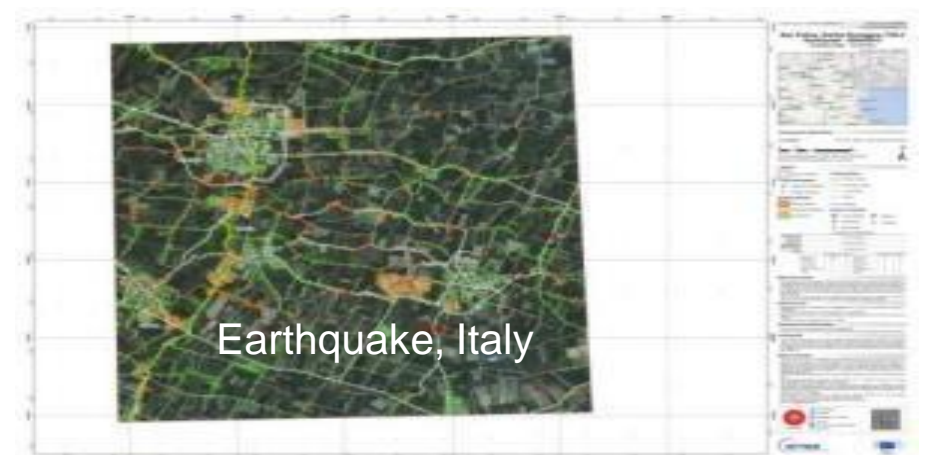
ID	Activation name	Status
EMSN019	Germany - Detailed mapping of major chemical industry for selected sites	Completed
EMSN020	Portugal - Multiple natural hazard risk assessment - Planning and Recovery	Completed
EMSN021	Austria - Earthquake risk assessment for three areas	Completed
EMSN022	Bulgaria - Post-disaster analysis Flood	Completed
EMSN023	Poland - Risk maps World Youth Day (Krakow)	Completed
EMSN024	Germany - Nationwide assets mapping	Completed
EMSN025	Greece - Forest fire damage assessment	Completed
EMSN026	Spain - Post disaster assessment of toxic cloud dispersion	Completed
EMSN027	Somalia - Monitoring of drought mitigation measures	Completed
EMSN028	France - flood delineation and damage assessment	Completed
EMSN029	Spain - forest fire damage assessment using UAV imagery	Completed
EMSN030	Ukraine - ground deformation mapping and monitoring using DInSAR technique	Completed
EMSN031	Portugal - Forest fire damage assessment and landslide risk Madeira Island	Ongoing
EMSN032	Portugal - Forest fire damage assessment	Ongoing
EMSN033	Libya - Urban Profiling major cities	In preparation



Floods, Norway



Tropical Cyclone, Vanuatu



Earthquake, Italy

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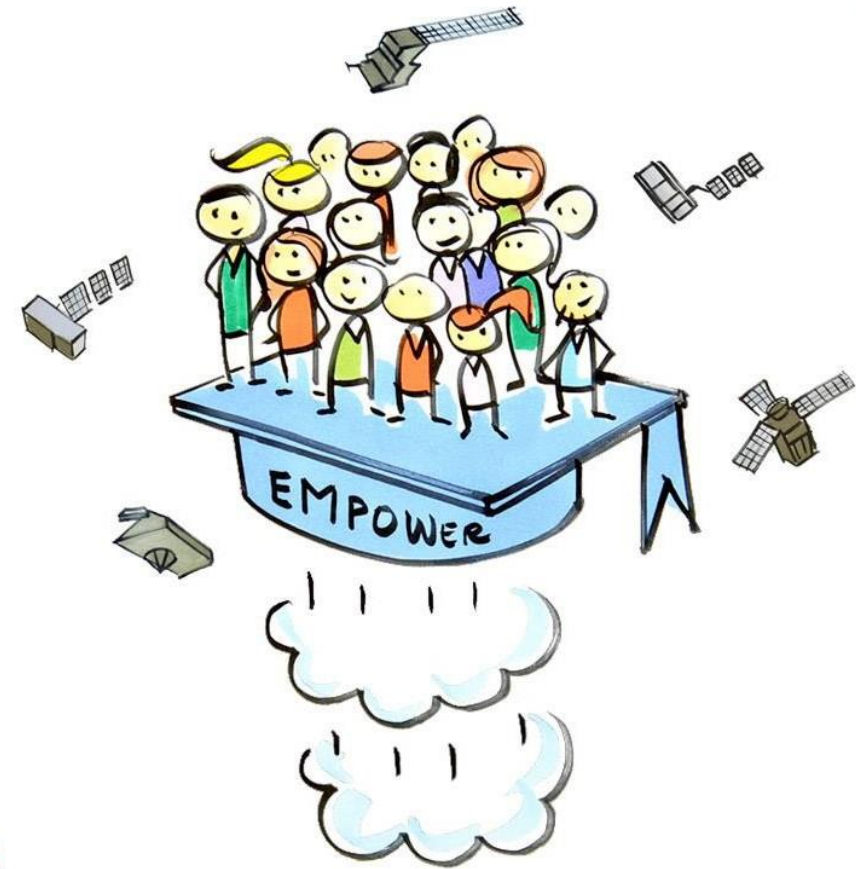
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Copernicus Academy

- Reaching academic institutions worldwide
- Enabling global Earth Observation research network
- Promoting space in education
- Accelerate research to market link
- Building skills

JOIN THE COPERNICUS ACADEMY



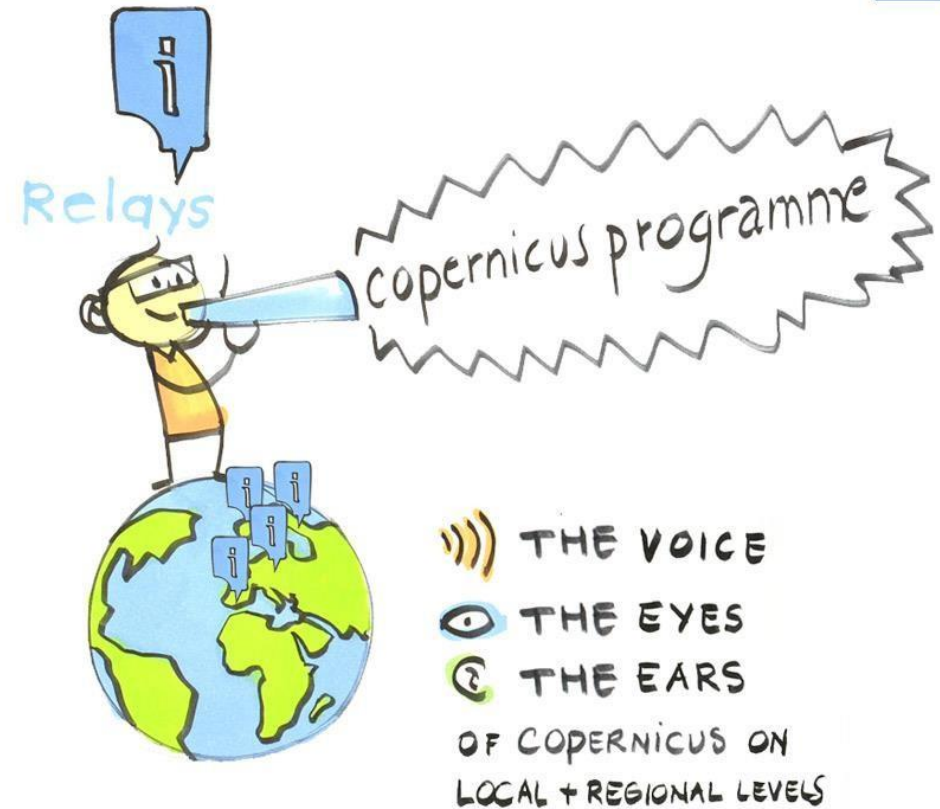
THE MEMBERS OF THIS NETWORK ENSURE THAT SKILLS ARE DEVELOPED TO ENABLE COPERNICUS TO UNLEASH ITS FULL POTENTIAL

g u i d e s

Copernicus Relays

- Reaching end-users in different countries and regions worldwide
- Content localization
- Local and global cooperation
- Support to local users
- Organizing promotional events and training

JOIN THE COPERNICUS RELAYS NETWORK !



THE MEMBERS OF THIS NETWORK ARE BRIDGES BETWEEN COPERNICUS AND THE END-USERS OF THE PROGRAMME INCLUDING BUSINESSES, START-UPS AND THE EU CITIZENS



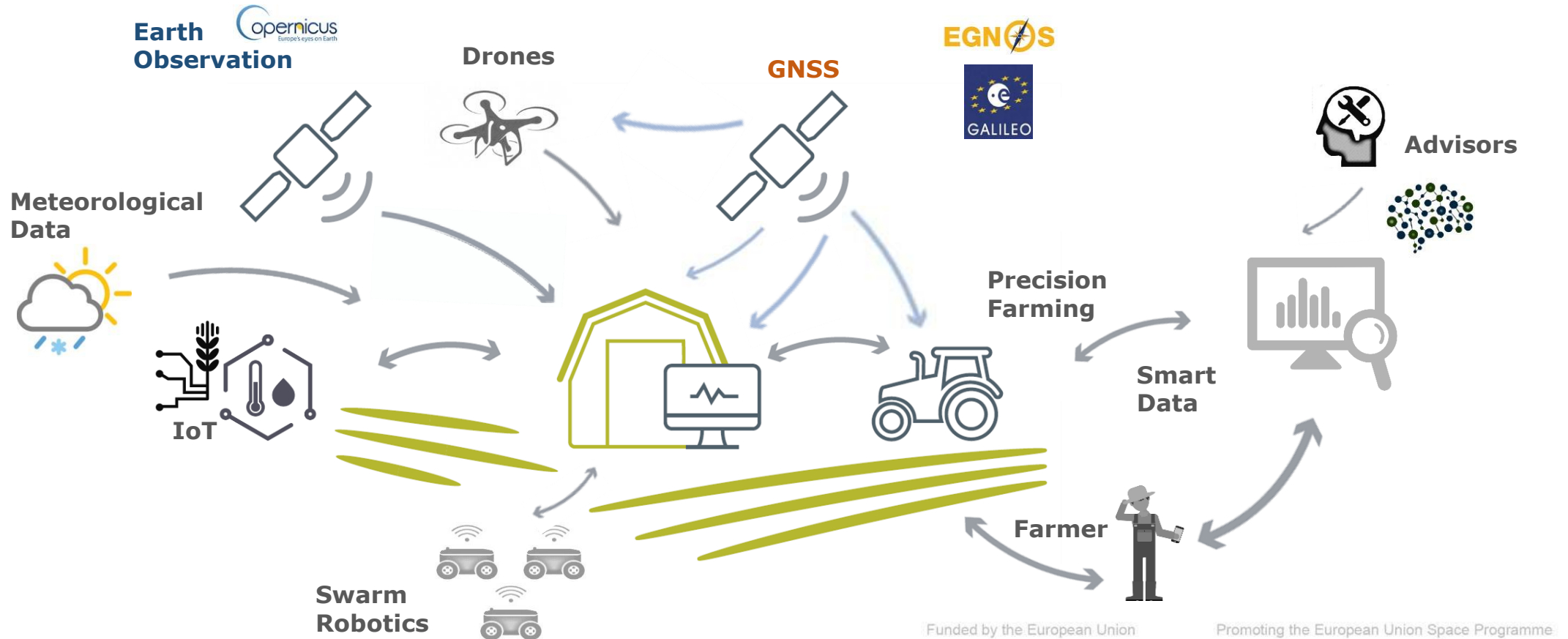
European Commission





EU Space Programme Synergies

GNSS and Copernicus are core components in digital farming



Funded by the European Union

Promoting the European Union Space Programme





The EU Global Action on Space supports the Union Space Programme globally

Context

- The European Union is the **second Space economy in the world**
- **Copernicus, Galileo and EGNOS** have positioned the EU as a **global leader on Space**
- EU Space capabilities and services are **available worldwide**
- We seek to **provide opportunities globally for EU space around the world**, to maximize benefits to society whilst contributing to EU priorities

Objectives

- 1. Promote the EU Space Programme worldwide and boost market uptake of its components i.e. Copernicus, Galileo and EGNOS*
- 2. Provide targeted space market information to facilitate the internationalisation of the EU Space sector*
- 3. Enable concrete business opportunities for the EU space sector in new markets*





Benefits for SMEs



Tailored business and technical support



Access to the specific markets analyses



Participate in 50+ networking and education events



Conclude international commercial agreements



Access to pool of international experts

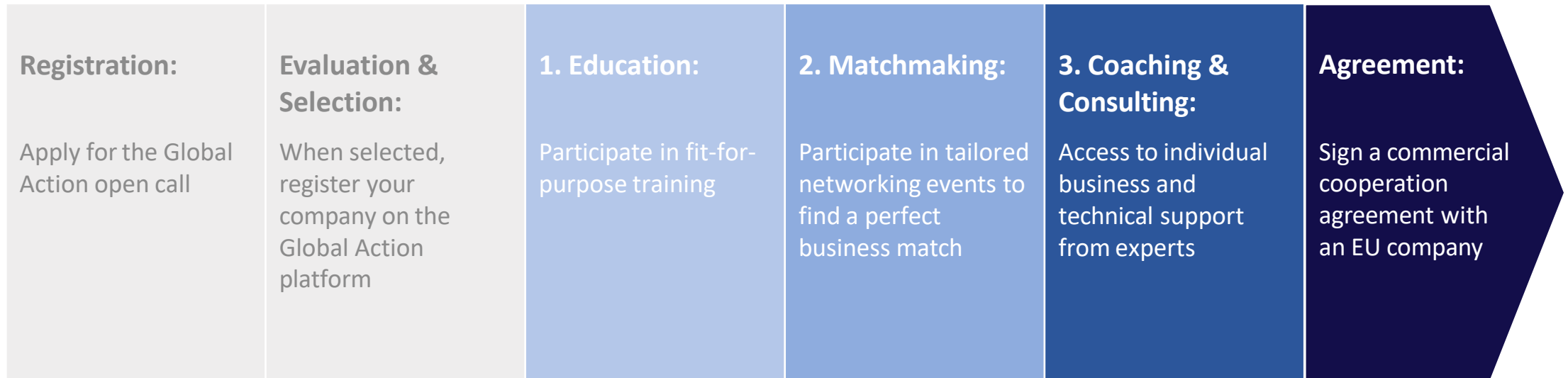


Discover the benefits of the EU Space Programme and its components





Business coaching services



www.eu-global-space.eu





Business coaching - eligibility criteria



Open Calls for EU and non-EU Entities

December 2021 – November 2023

www.eu-global-space.eu

- Must be a **legally established** company or organisation
- **Private or public companies of all kinds and sizes**, including entities related to the space sector, space agencies, research organisations, universities, and technology centres not subject to restrictive measures by the EU
- Must demonstrate **financial figures for 3 last years** (turnover, net profit, total balance)





THANK YOU!

Luis.Cuervo-Spottorno@ec.europa.eu

www.copernicus.eu

www.ec.europa.eu/galileo

www.ec.europa.eu/egnoss

www.eu-global-space.eu





EU GLOBAL ACTION
ON SPACE

Copernicus Climate Change Service

Carlo Buontempo

Funded by the European Union



Promoting the European Union Space Programme





Climate
Change

Copernicus Climate Change Service

Carlo Buontempo
and the C3S team

Climate change and EU space data: exploring opportunities for ASEAN countries
07/06/2022



PROGRAMME OF
THE EUROPEAN UNION



implemented by  ECMWF

FULL, FREE AND OPEN
ACCESS TO DATA



-  ATMOSPHERE MONITORING
-  MARINE ENVIRONMENT MONITORING
-  LAND MONITORING
-  CLIMATE CHANGE
-  EMERGENCY MANAGEMENT
-  SECURITY

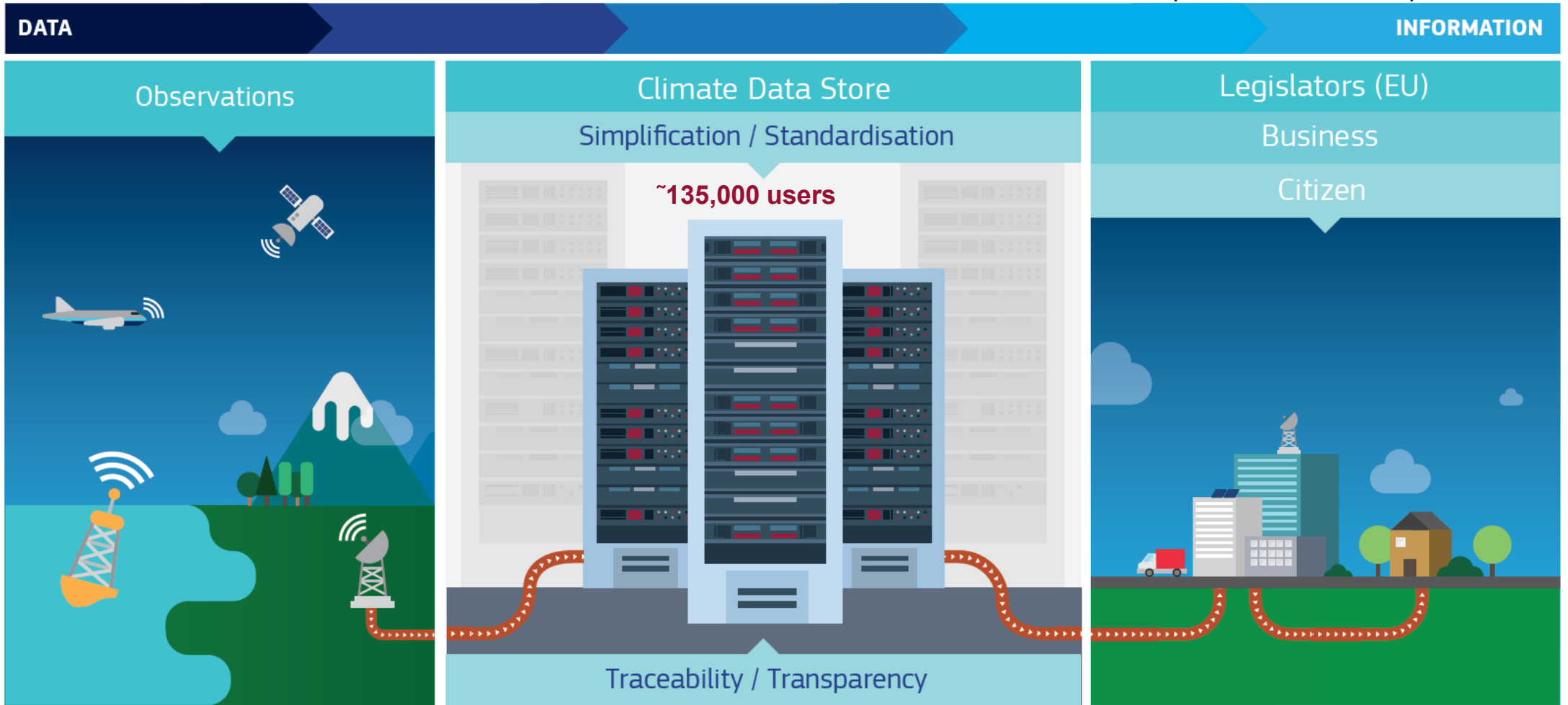
 **opernicus**
Europe's eyes on Earth



Climate Change

C3S key mission

<https://cds.climate.copernicus.eu>



PETABYTES

KILOBYTES

Typical download: **80 TB/day**



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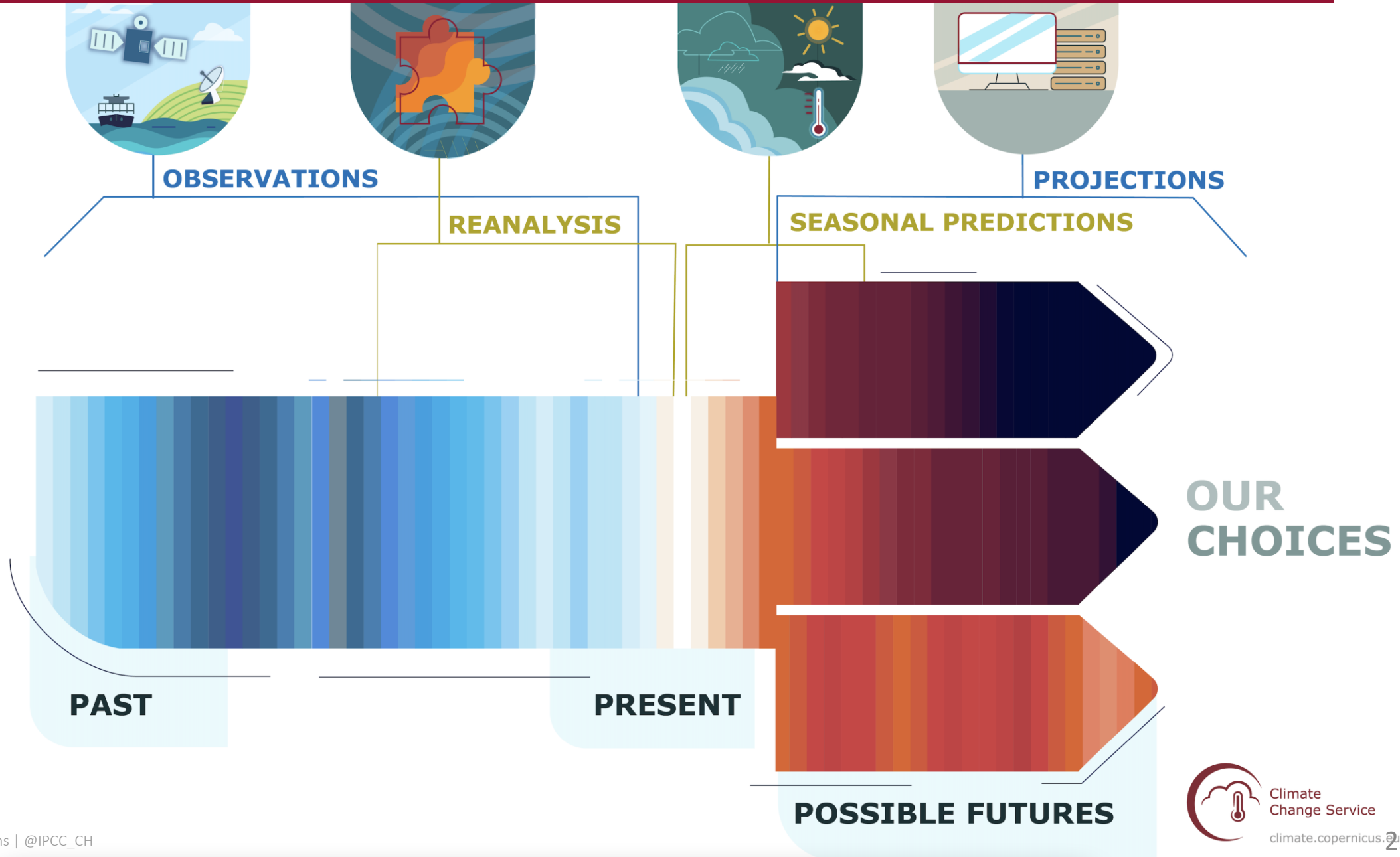


implemented by **ECMWF**



Climate Change

Smart data for smart decisions





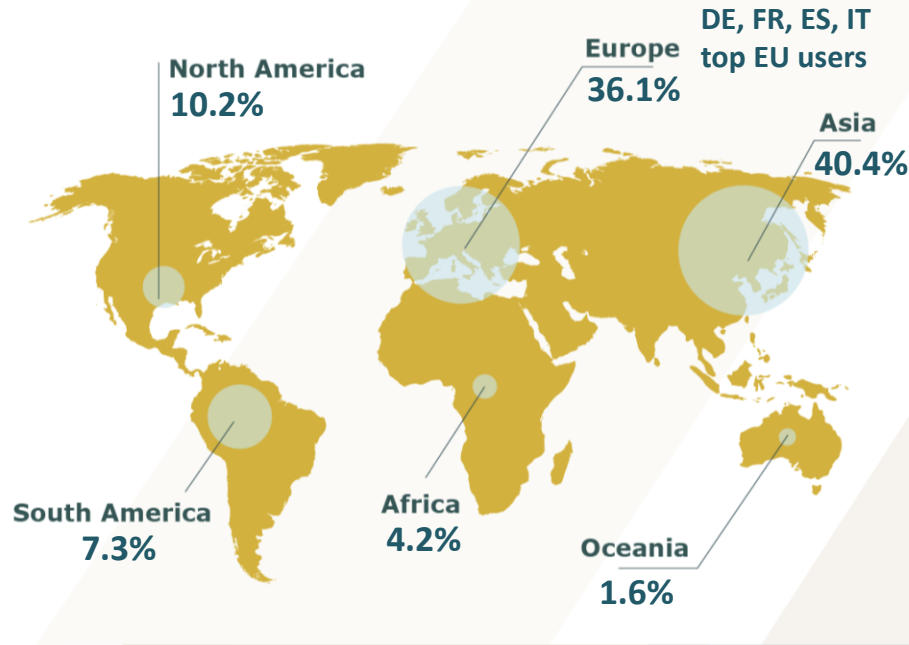
Climate Change



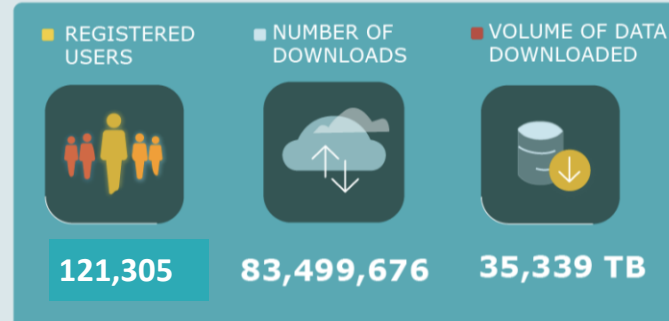
C3S success in numbers

→ WORLDWIDE USERS

500k Daily requests
92.3 TB /day



IMPACT



* March 2022

→ AND **MILLIONS MORE ACCESS** OUR DATA THROUGH OUR HERO USERS AND AMPLIFIERS E.G. GLOBAL MEDIA PARTNERS

119 Datasets | **22** public applications



Open climate data has never been more important

Quarterly Journal of the Royal Meteorological Society



RESEARCH ARTICLE | Open Access | CC BY

The ERA5 global reanalysis

Hans Hersbach, Bill Bell, Paul Berrisford, Shoji Hirahara, András Horányi, Joaquín Muñoz-Sabater, Julien Nicolas, Carole Peubey, Raluca Radu, Dinand Schepers, Adrian Simmons ... See all authors

First published: 17 May 2020 | <https://doi.org/10.1002/qj.3803> | Citations: 2,445

Funding information: European Union through the Copernicus Climate Change Service

- Paper by Hans Hersbach et al. about ERA5 published in 2020 and as of March 1st had **2445 citations** (3230 according to Google Scholar)

Climate Change 2021 The Physical Science Basis

Summary for Policymakers

- C3S is presented as an **exemplar of climate service in IPCC AR6 WG1** report where **ERA5 is mentioned over 240 times.**



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implemented by ECMWF



Climate Change

WMO-GCOS : Essential Climate Variables

CRYOSPHERE

COP1

- = satellite ECVs
- = ECVs from reanalysis

Snow	Ice Sheets and Ice Shelves	Glaciers	Permafrost
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SURFACE ATMOSPHERE

Surface Radiation Budget	Surface Pressure	Surface Temperature	Surface Water Vapour	Surface Wind Speed and Direction	Precipitation
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UPPER-AIR ATMOSPHERE

Upper-air Temperature	Upper-air Water Vapour	Upper-air Wind Speed and Direction	Lightning	Earth Radiation Budget	Clouds
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ATMOSPHERIC COMPOSITION

Precursors for Aerosols and Ozone	Aerosols	CO ₂ , CH ₄ , and other GHGs	Ozone
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SURFACE OCEAN PHYSICS

Surface Currents	Surface Stress	Sea Surface Temperature	Sea Ice
Ocean Surface Heat Flux	Sea Level	Sea Surface Salinity	Sea State

SUBSURFACE OCEAN PHYSICS

Subsurface Temperature	Subsurface Currents	Subsurface Salinity
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OCEAN BIOLOGY / ECOSYSTEMS

Plankton	Marine Habitats
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OCEAN BIOGEOCHEMISTRY

Ocean Colour	Transient Tracers	Inorganic Carbon	Oxygen	Nitrous Oxide	Nutrients
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BIOSPHERE

Soil Carbon	Albedo	Fire	FAPAR*	Leaf Area Index (LAI)	Land Surface Temperature	Above-ground Biomass	Land Cover
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*Fraction of Absorbed Photosynthetically Active Radiation

HYDROSPHERE

Soil Moisture	Lakes	Groundwater	River Discharge	Evaporation from Land
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ANTHROPOSPHERE

Anthropogenic Water Use	Anthropogenic Greenhouse Gas Fluxes
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Climate Change Service
climate.copernicus.eu



E.g., soil moisture

Soil moisture gridded data from 1978 to present

- Overview
- Download data
- Quality assessment
- Documentation

This is a new feature, work in progress. Should any inconsistency be found, please report to <https://support.ecmwf.int>

The CDS datasets are assessed by the Evaluation and Quality Control (EQC) function of C3S independently of the data supplier. EQC encompasses a framework of processes aimed to assure technical and scientific quality harmonized across all dataset types available through the CDS. During the EQC process, the documentation provided with the dataset is scrutinized and data are checked for usability and reliability.

Variable:

Volumetric surface soil moisture

Type of sensor:

Combined passive and active

Time aggregation:

Month average

Type of record:

CDR (Climate data record)

Version:

v202012.0.0

Variable: Volumetric surface soil moisture - Type of sensor: Combined passive and active - Time aggregation: Month average - Type of record: CDR (Climate data record) - Version: v202012.0.0

Last updated on 23/08/2021

INTRODUCTION	USER DOCUMENTATION	ACCESS	INDEPENDENT ASSESSMENT
Dataset overview	User guide	Toolbox compatibility	Data check
Temporal and spatial coverage and resolution	Scientific methodology	Archive	Expert evaluation
Providers	Uncertainty quantification		Dataset maturity
Dataset version	Validation		Key strengths and limitations
Data update	Inter-comparison		





Similar products exists for most ECVs

Global glaciers explorer

Overview Application Source code

Full screen

When country is set to "Global" the interactive map allows users to explore all the glaciers in the database. Clicking on a glacier (white regions) will produce a summary table and graphs of hypsometry for the glacier if such data is available for that glacier. Further clicks will append rows to the table and lines to the hypsometry graphs so that the glaciers can be compared.

Selecting a country allows users to explore the detailed survey records of elevation and mass change. Each glacier with elevation or mass change data is indicated with a blue (elevation) or red (mass) circle on the map. Users can still explore and compare glacier extent but now with added hover information, the glacier ID and area.

Country
People's Republic of China



849 ✕

The table provides the history of the change in glacier mass for the glacier: 849.

Not all records provide the month and day of the survey, and not all surveys have uncertainty estimates.

1 kg m⁻² is equivalent to 1 mm height of liquid water.

Reference date	Survey date	Annual balance (kg m ⁻²)	Annual balance uncertainty
1988	1989	-81	
1989	1990	-115	
1990	1991	-155	
1991	1992	-145	
1992	1993	-659	





Observations and data rescue



New in-situ products available:

- Temperature, RH and wind profiles - GRUAN reference network
- In situ total column ozone and ozone soundings from the World Ozone and Ultraviolet Radiation Data Centre.
- Integrated Global Radiosounding Archive
- Global Land & Marine Observations Database: surface atmospheric variables from comprehensive in-situ observations
- E-OBS: 8 gridded, daily variables from 1950 to the present, derived from European station observations
- Regional networks:
 - NGCD: Nordic gridded, daily temperature and precipitation data from 1971 to present derived from in-situ observations.
 - LAPrec: gridded, monthly precipitation from 1871 and 1901, from Alpine stations.

In situ temperature, relative humidity and wind profiles from 2006 to March 2020 from the GRUAN reference network

In situ total column ozone and ozone soundings from 1924 to present from the World Ozone and Ultraviolet Radiation Data Centre

In situ observations of meteorological variables from the Integrated Global Radiosounding Archive and the Radiosounding Harmonization dataset from 1978 onward

Global land surface atmospheric variables from 1755 to 2020 from comprehensive in-situ observations

Global marine surface meteorological variables from 1851 to 2010 from comprehensive in-situ observations

E-OBS daily gridded meteorological data for Europe from 1950 to present derived from in-situ observations

Alpine gridded monthly precipitation data since 1871 derived from in-situ observations

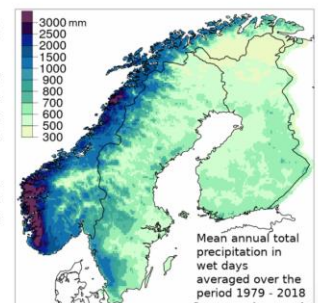
Nordic gridded temperature and precipitation data from 1971 to present derived from in-situ observations

[Overview](#) [Download data](#) [Documentation](#)

The Nordic Gridded Climate Dataset (NGCD) is a high resolution observational gridded dataset of daily minimum, maximum and mean temperature and daily precipitation sums covering Finland, Sweden and Norway. The time period covered begins in January 1971 and the dataset is regularly updated every 6 months, in March and in September.

Spatial interpolation methods are applied to observation datasets to create gridded datasets. There are three types of such methods: deterministic (type 1), stochastic (type 2) and pure mathematical (type 3). NGCD applies both a deterministic kriging (type 1) interpolation approach and a stochastic Bayesian (type 2) interpolation approach to the same in-situ observation dataset collected by weather stations. For more details on the algorithms users are advised to read the product user guide.

The input data is provided by the National Meteorological and Hydrological Services of Finland, Norway and Sweden. The time-series used for Finland and Sweden are the non-blended time-series from the station network of the European Climate Assessment & Dataset (ECA&D) project. For Norway, time-series are extracted from the climate database of the Norwegian Meteorological Institute.



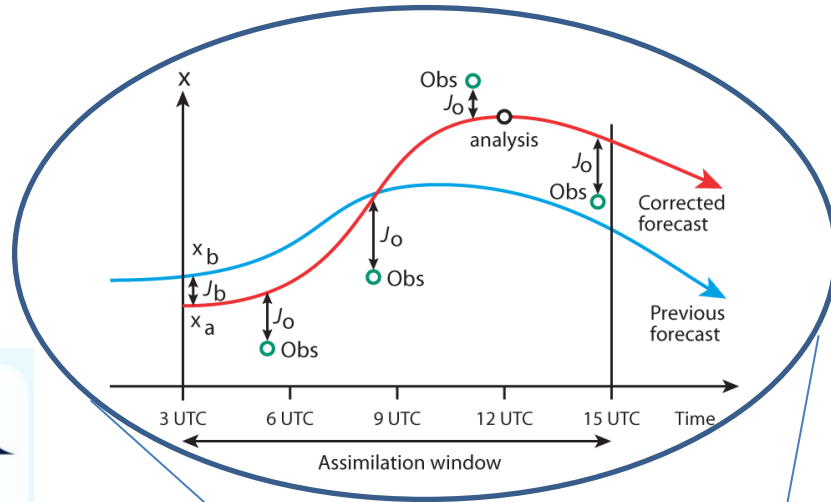


Reanalysis: a key tool and a popular product

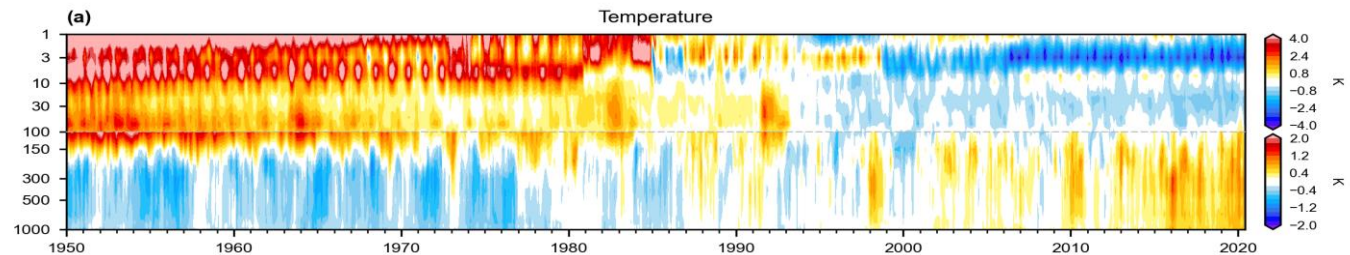
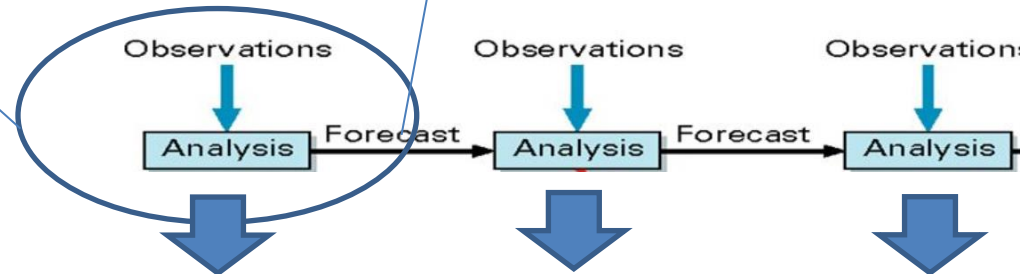
MODELING



OBSERVATIONS



Data assimilation & reanalysis
 Combining information from observations and models to provide an estimate of weather and climate over multi-decadal timescales

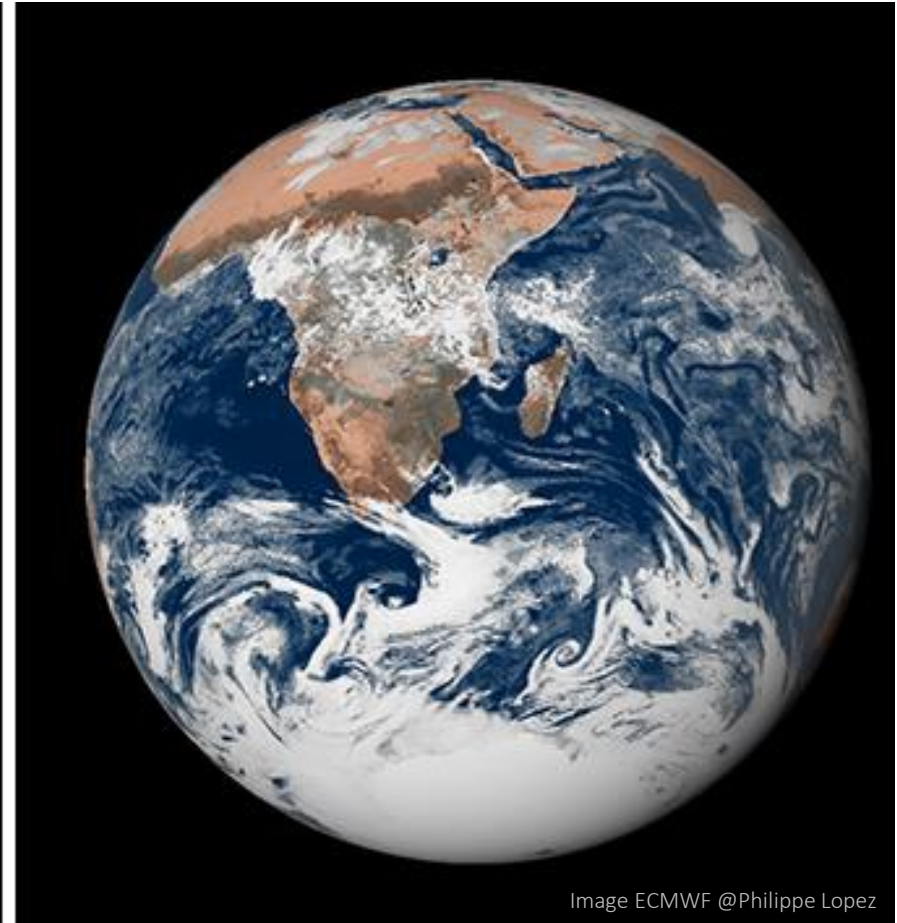




Climate
Change



Reconstructing the weather of the past



<https://www.ecmwf.int/en/about/media-centre/science-blog/2019/ecmwf-over-moon>

NASA Apollo 17 image of the Earth taken on 7 December 1972 at 10h39 UTC (left) and the corresponding pseudo-image generated from an 11-hour 9-km resolution ECMWF forecast initialised from ERA5 reanalysis (right).



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implemented by 



Climate Change

Climate monitoring



SURFACE TEMPERATURE

The global temperature has gone up by

1.2°C

since the pre-industrial era



Climate Change



C3S seasonal predictions

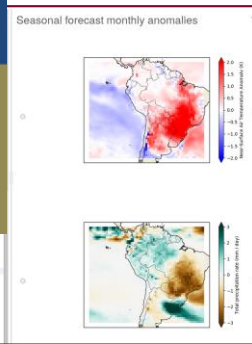


DATA PRODUCTS

<http://cds.climate.copernicus.eu>

Datasets available in the Climate Data Store:

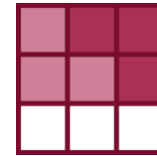
- Daily and subdaily data (6h, 12h, 24h)
- Monthly statistics (mean, max., min. and standard deviation)
- Bias corrected data (monthly anomalies)



CDS Toolbox

```
import cdsapi
c = cdsapi.Client()
c.retrieve(
    'seasonal-monthly-single-levels',
    {
        'format': 'grib',
        'originating_centre': 'meteo_france',
        'variable': 'total_precipitation',
        'product_type': '1',
        'ensemble_mean': 'hindcast_climate_mean'
    },
    'year': '2018',
    'month': '09',
    'leadtime_month': ['1', '2', '3', '4', '5', '6']
, 'cds_seasonal_output.grib')
```

CDS API



GRAPHICAL PRODUCTS

https://climate.copernicus.eu/charts/c3s_seasonal/

Source	Individual contributing systems
Variables	<p>C3S multi-system seasonal forecast Prob(most likely category of precipitation) MAM 2022</p> <p>Nominal forecast start: 01/02/22</p> <p>Unweighted mean</p>
2D Maps	<ul style="list-style-type: none"> - Global - Predefined regions
Time series	<ul style="list-style-type: none"> - SST NINO regions - SST Indian Ocean - Wind at 10hPa



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implemented by ECMWF



Global climate projections

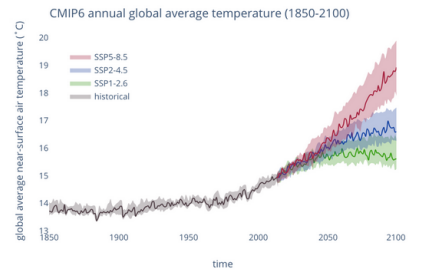
CMIP6 climate projections

[Overview](#) [Download data](#) [Documentation](#)

This catalogue entry provides daily and monthly global climate projections data from a large number of experiments, models and time periods computed in the framework of the sixth phase of the Coupled Model Intercomparison Project (CMIP6).

CMIP6 data underpins the Intergovernmental Panel on Climate Change 6th Assessment Report. The use of these data is mostly aimed at:

- addressing outstanding scientific questions that arose as part of the IPCC reporting process;
- improving the understanding of the climate system;
- providing estimates of future climate change and related uncertainties;
- providing input data for the adaptation to the climate change;
- examining climate predictability and exploring the ability of models to predict climate on decadal time scales;
- evaluating how realistic the different models are in simulating the recent past.

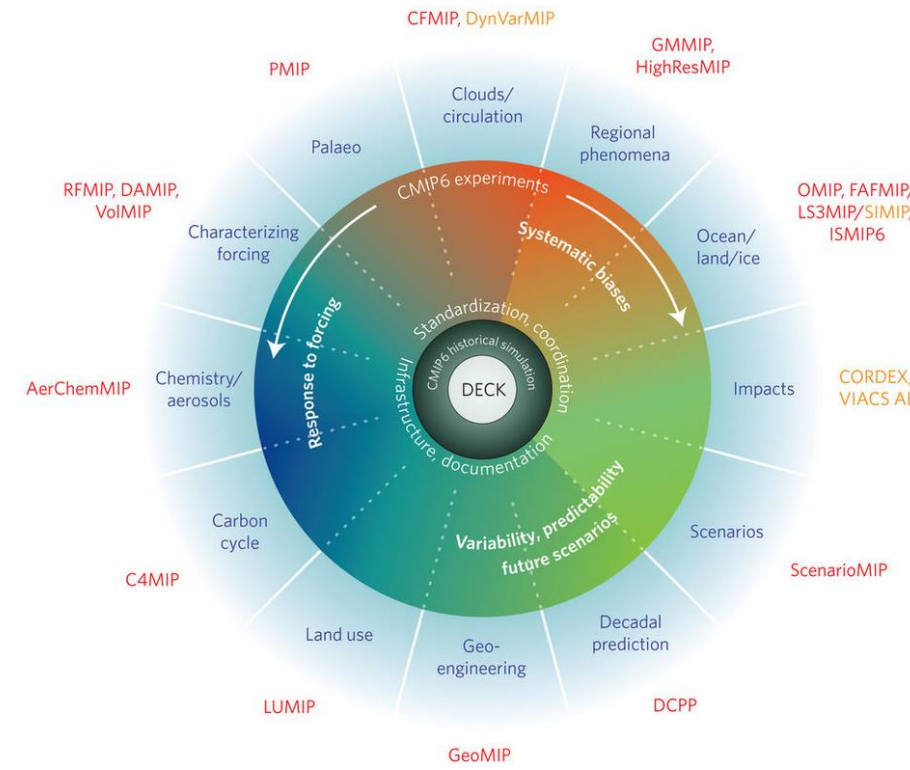


Contact
copernicus-support@ecmwf.int

Licence
 CMIP6 - Data Access - Terms of Use

Publication date
 2021-03-23

References
 DOI: [10.24381/cds.d7eac3d](https://doi.org/10.24381/cds.d7eac3d)



Compute processes (e.g. spatial and temporal sub setting) are possible at download so that users can retrieve only the information they need

Web article: <https://climate.copernicus.eu/latest-projections-future-climate-now-available>
 ECMWF Newsletter article: <https://www.ecmwf.int/en/newsletter/167/news/new-climate-projection-datasets-copernicus>

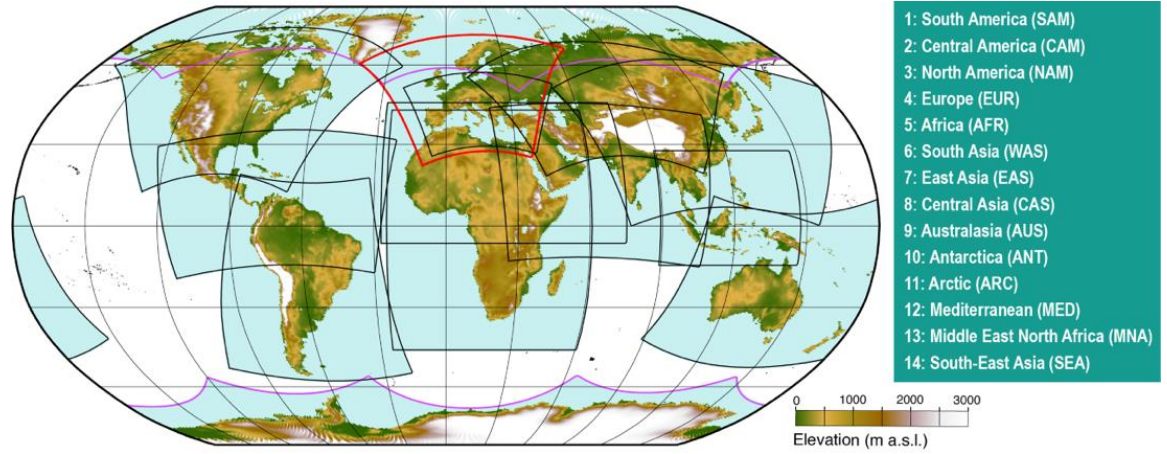




Climate Change



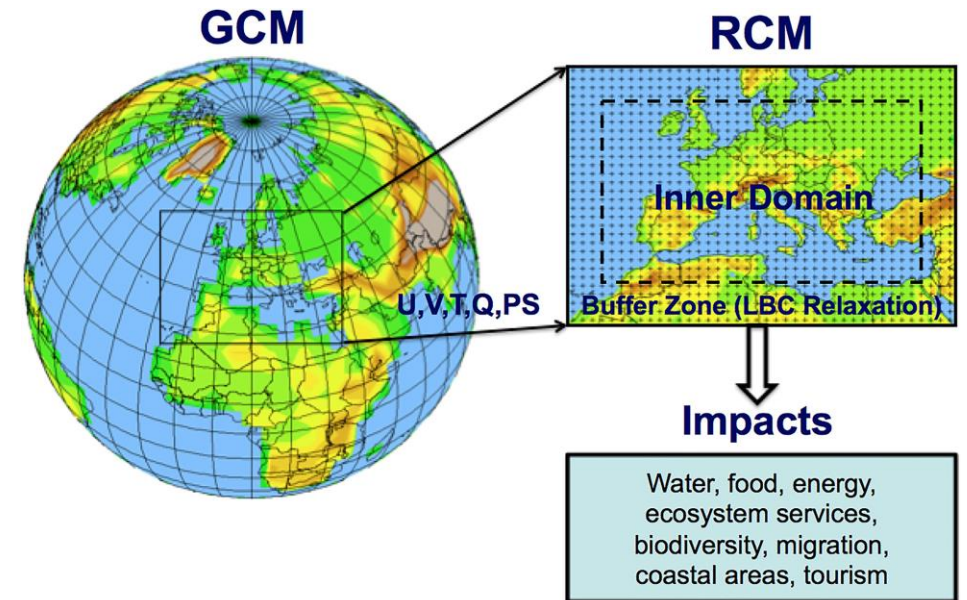
Regional climate projections: Europe and beyond



New CORDEX simulations including high resolution EURO-CORDEX simulations and world-wide simulations for all 14 CORDEX domains published in the CDS

World-wide simulations: connected and aligned to the IPCC Climate Atlas.

Very large ensemble for Europe (130 simulations about half of which was funded by C3S)



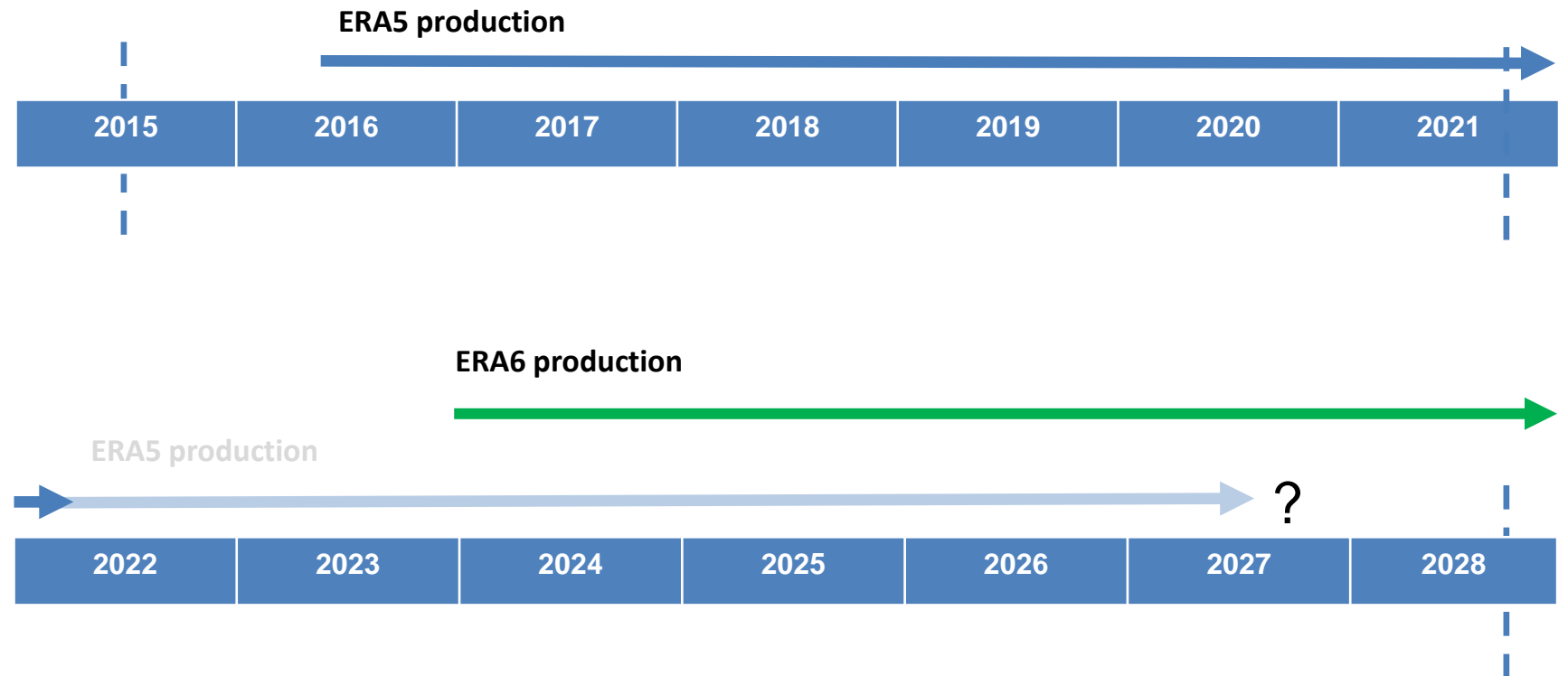
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implemented by **ECMWF**



Reanalysis: the transition from ERA5 to ERA6



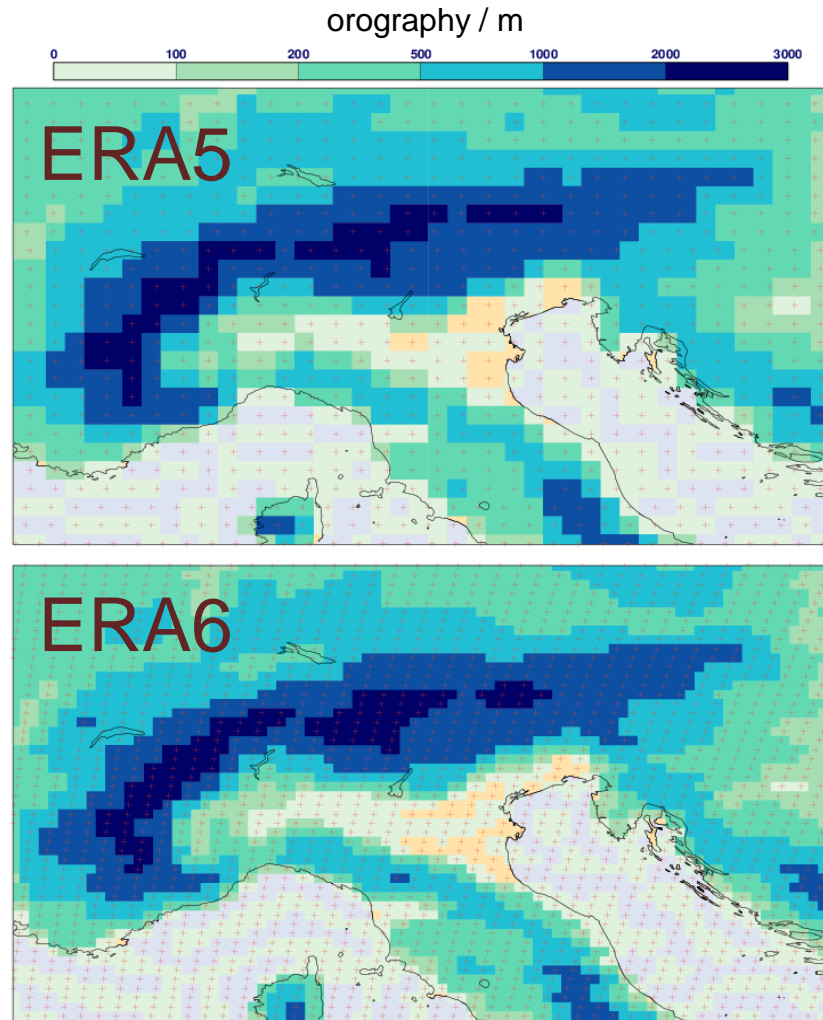
- **ERA5** is based on the ECMWF model (CY41R2) from 2016
 - **ERA6** will be based on the ECMWF model from mid-late 2023
- 8 years of R&D driven improvements in forecast model, assimilation system & reprocessed observations
- significant increase in compute power available → higher resolution reanalysis (31km → 18km)





ERA6 in a nutshell

Better resolution (18 km vs 31 km)



- **Higher resolution ensemble of assimilations** - improved representation of synoptic uncertainty
- **Enhanced coupling** between atmosphere, land and ocean
- **Improved treatment of biases** (from R&D on DA system I)
- **Extensive use of reprocessed conventional and satellite observations from COP1 investments**
- **Improved forcing datasets** (SST, sea ice, GHGs, aerosols) from latest R&D
- **More optimal data assimilation** (observation errors, background errors)
- **Estimation of mean-state uncertainties** (“benchmarking”)
- **Wider range of products**, based on user feedback

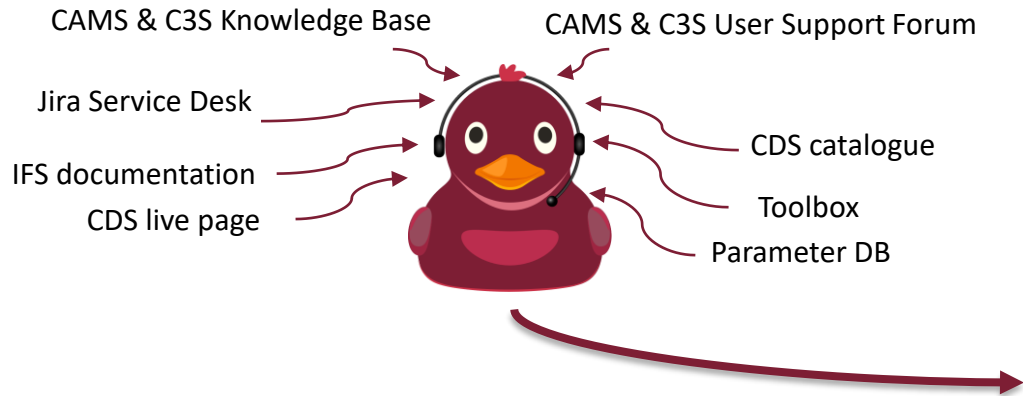




Climate Change

Evolving user support - CDS Conversational Virtual Assistant (CVA)

- Launched July 2021 after 6 m development
- 1,084,309 views; 21,282 interactions
- Interactions monitored, leading to continuous improvement of responses (with ~5K training phrases)
- Top questions: Requests status, variable definitions, CDS system status, latest announcements
- New enhancement project started in December 2021 – linking with other support channels



Knowledge Duck
Virtual Assistant of the CDS

Hello, I am the Knowledge Duck. Do you have a question I can help you with?

How to get started

- Show FAQs
- Latest CDS announcements
- New and recently updated datasets
- Variables search
- Content search
- Shortcut commands

Type your message...

Home Search Datasets Applications Toolbox Support Live

Welcome to the Climate Data Store

Dive into this wealth of information about the Earth's past, present and future climate. It is freely available and functions as a one-stop shop to explore climate data. Register for free to obtain access to the CDS and its Toolbox. We are constantly improving the services and adding new datasets. For latest announcements, watch the posts on the CDS forum.

Enter search term(s) [All] Search

Climate Data Store Toolbox | Climate Data Store API | Access the ECMWF Support Portal

Knowledge Duck chat bubble: Hello, I am the Knowledge Duck. Do you have a question I can help you with?



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implemented by ECMWF



Climate
Change

Thank you for your attention



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Copernicus data for monitoring national environment

Miroslav Havránek

Funded by the European Union



Promoting the European Union Space Programme





EGNSS tools to mitigate the effects of climate change

María Mota Rodrigo





Galileo and EGNOS and Climate Change

Webinar, 7th June 2022

Maria Mota (EUSPA)



Agenda



Introduction to EUSPA

EGNSS: Galileo and EGNOS

Applications

A new EU Agency for the Space Programme



European Union Agency for the Space Programme (EUSPA)

The user-oriented operational Agency of the EU Space Programme, contributing to **sustainable growth, security and safety** of the EU



Exploitation Manager



Management, operation, maintenance, improvement, evolution, and protection of infrastructure

Continuous provision of services

Gatekeeper of security



Security accreditation of all programme components

Operational security of Galileo and EGNOS

Operation of the Galileo Security Monitoring Centre

Market and innovation



User and market uptake

Applications

Innovation

Promotion

Global Navigation Satellite Systems

Global

Coverage

Navigation

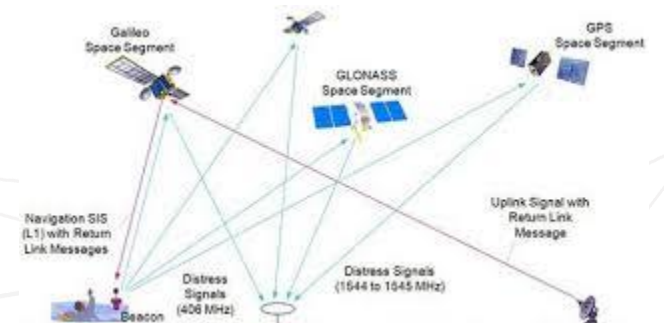
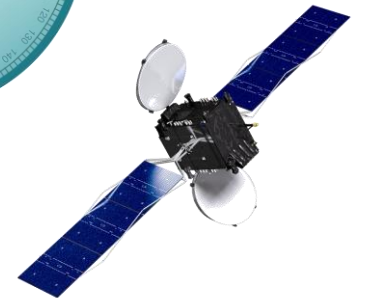
Allows positioning

Satellite

Satellite constellation

System

Formed by several elements



Galileo (European GNSS)

- Under civil control
- Global coverage
- Free of charge
- Higher **availability, continuity and reliability** of signals
- **Mitigation of multipath errors** in harsh environments
- **Authentication** against spoofing events
- **Decimeter level accuracy** (error $\approx 20\text{cm}$)
- Search and Rescue with **Return Link**

Open Service
Multi-frequency
(E1/E5/E6)

Galileo Open Service
Navigation Message
Authentication (OS-NMA)

Galileo High Accuracy
Service (HAS)

Galileo Search and
Rescue Service (SAR)



EGNOS (European SBAS)

EGNOS improves GNSS performance:

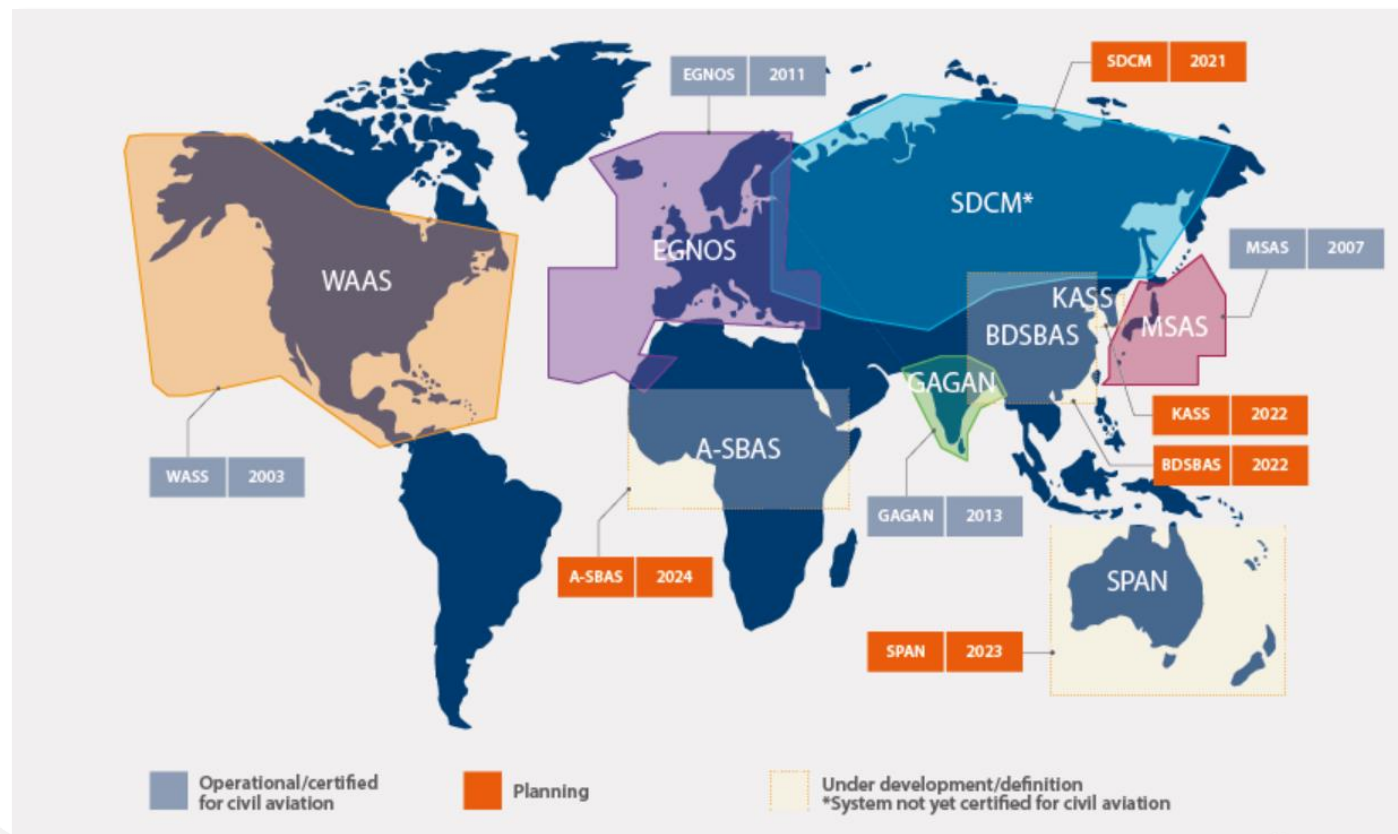
- Improves accuracy
- Provides integrity

Interoperable: SBAS equipment will work:

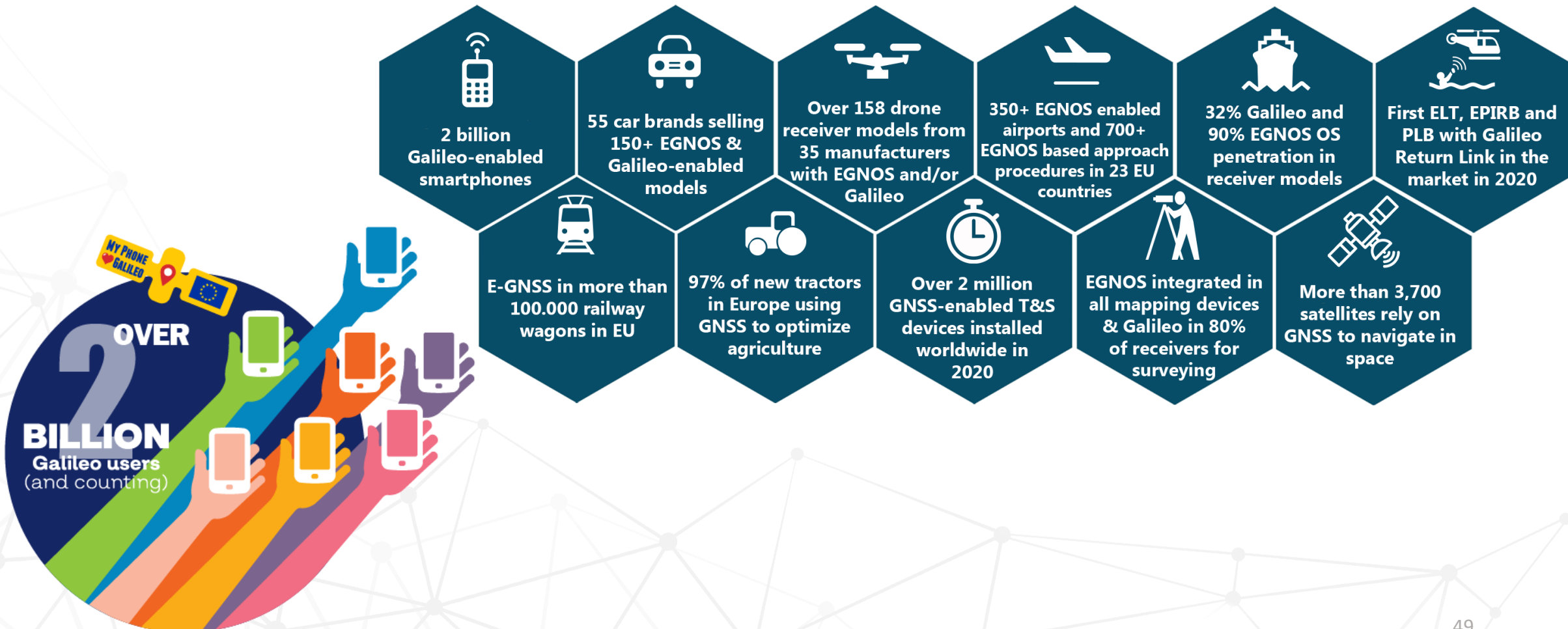
- in any of the regions where there is a SBAS service
- with other GNSS source

In the future (>2026):

- EGNOS will augment also Galileo
- EGNOS will broadcast dual-frequency corrections



Galileo and EGNOS: European success story enabling new business across different market segments



Transport

✓ GNSS positioning, navigation and timing used for reduction of road, maritime and aviation emissions through route optimisation.



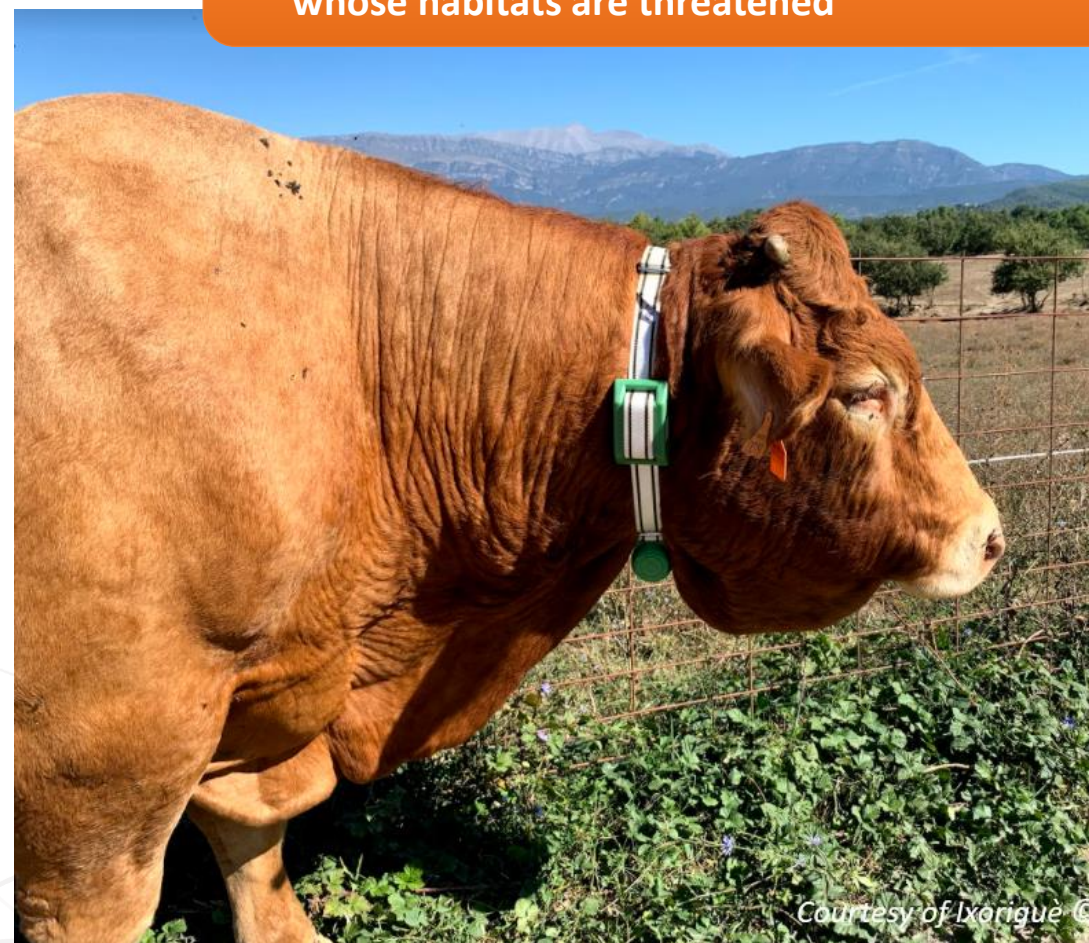
- **Optimisation of flight routes**, saving fuel, reducing emissions and noise impact
- Drones enabling new and **greener air mobility** and parcel delivery schemes
- Maritime **robust position** with Galileo and route predictions with Copernicus
- 6 car makers commercialising highly **autonomous cars with Galileo**



GNSS technologies for wildlife tracking

- GNSS beacons on a targeted sample size of an endangered species and used for **tracking**.
- Downloading of data once the animal/device has been retrieved
- Data is transmitted remotely, sometimes in real time.
- **Map behaviour, population demographics and inter-species interactions**, including with the predatory environment.

✓ GNSS supports biodiversity and ecosystems by providing data for the tracking of animals whose habitats are threatened



Fisheries and Aquaculture

Fight illegal, unreported and unregulated (IUU) fishing and preserve fish stocks.

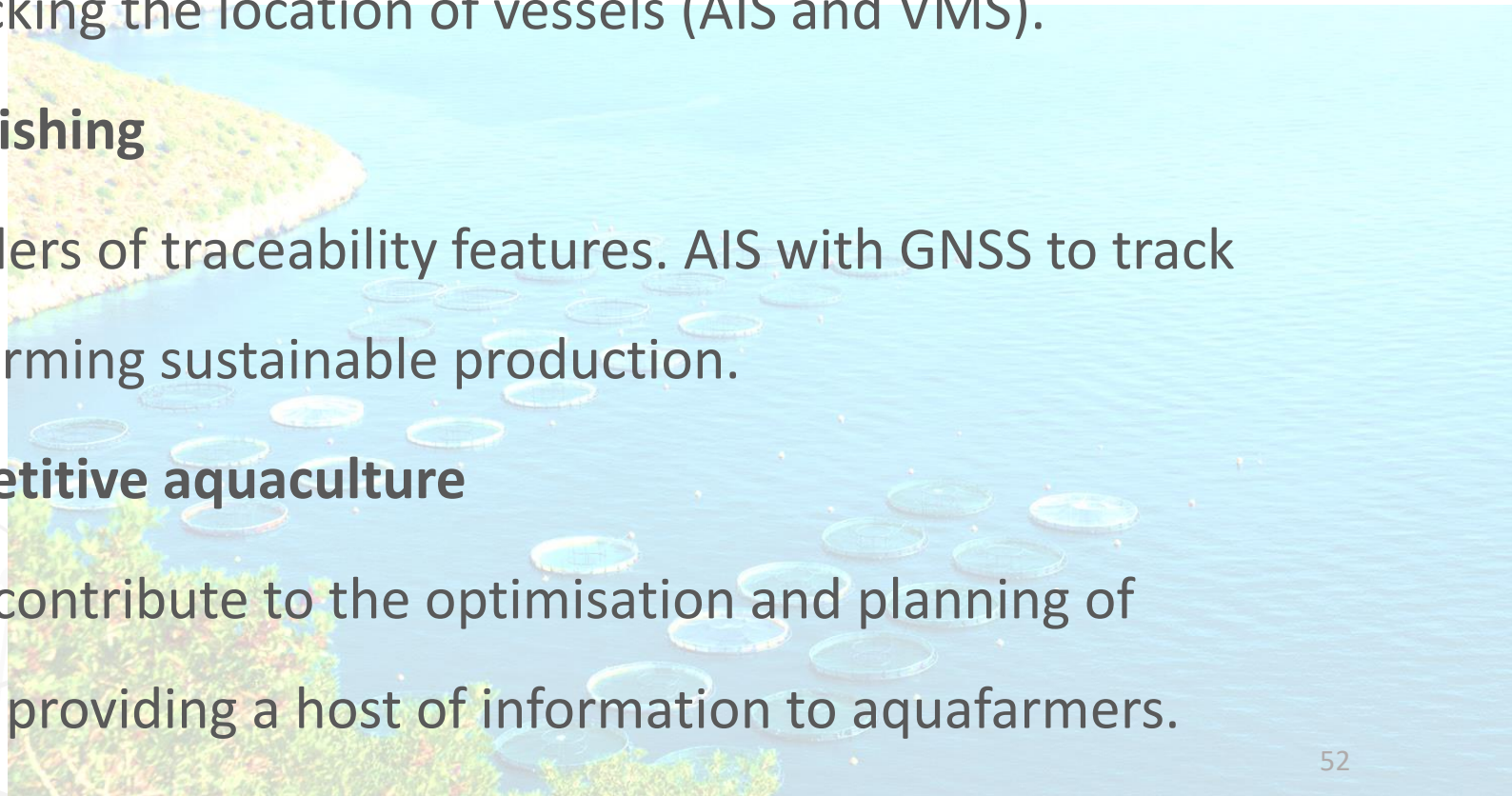
- GNSS contributes with tracking the location of vessels (AIS and VMS).

Traceability for sustainable fishing

- EO and GNSS are key enablers of traceability features. AIS with GNSS to track certified fishing fleets, informing sustainable production.

More sustainable and competitive aquaculture

- GNSS and EO applications contribute to the optimisation and planning of aquaculture operations by providing a host of information to aquafarmers.



Agriculture and Forestry

- GNSS and EO for **precision farming, sustainable management of soils** and preservation of biodiversity
 - To **precisely guide machinery and track livestock**, ensuring farm operations remain as efficient as possible
 - To **track food from source to consumer**, ensuring safety and quality (deforestation-free commodities, sustainable fisheries, fair trade,...)
- GNSS and EO for **efficient and sustainable forest management**
 - Precision forestry operations: guidance of machinery and variable rate application of fertilisers and irrigations, timber movements tracing.





Linking space to user needs

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Earth Observation based environmental needs

Ariel Blanco

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ASEAN Earth Observation- based initiatives to fight climate change

Dr. Khruewan Champangern

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ASEAN Earth Observation- based initiatives to fight climate change

Dr. Lam Dao Nguyen

Funded by the European Union

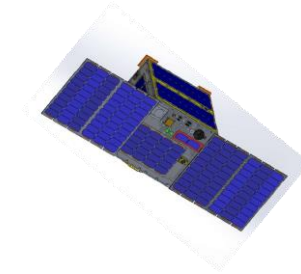
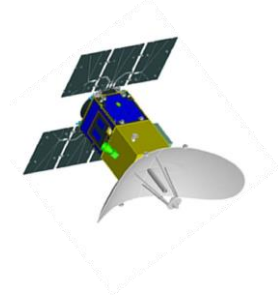


Promoting the European Union Space Programme





Climate change and EU space data: exploring opportunities for ASEAN countries
June 7th, 2022

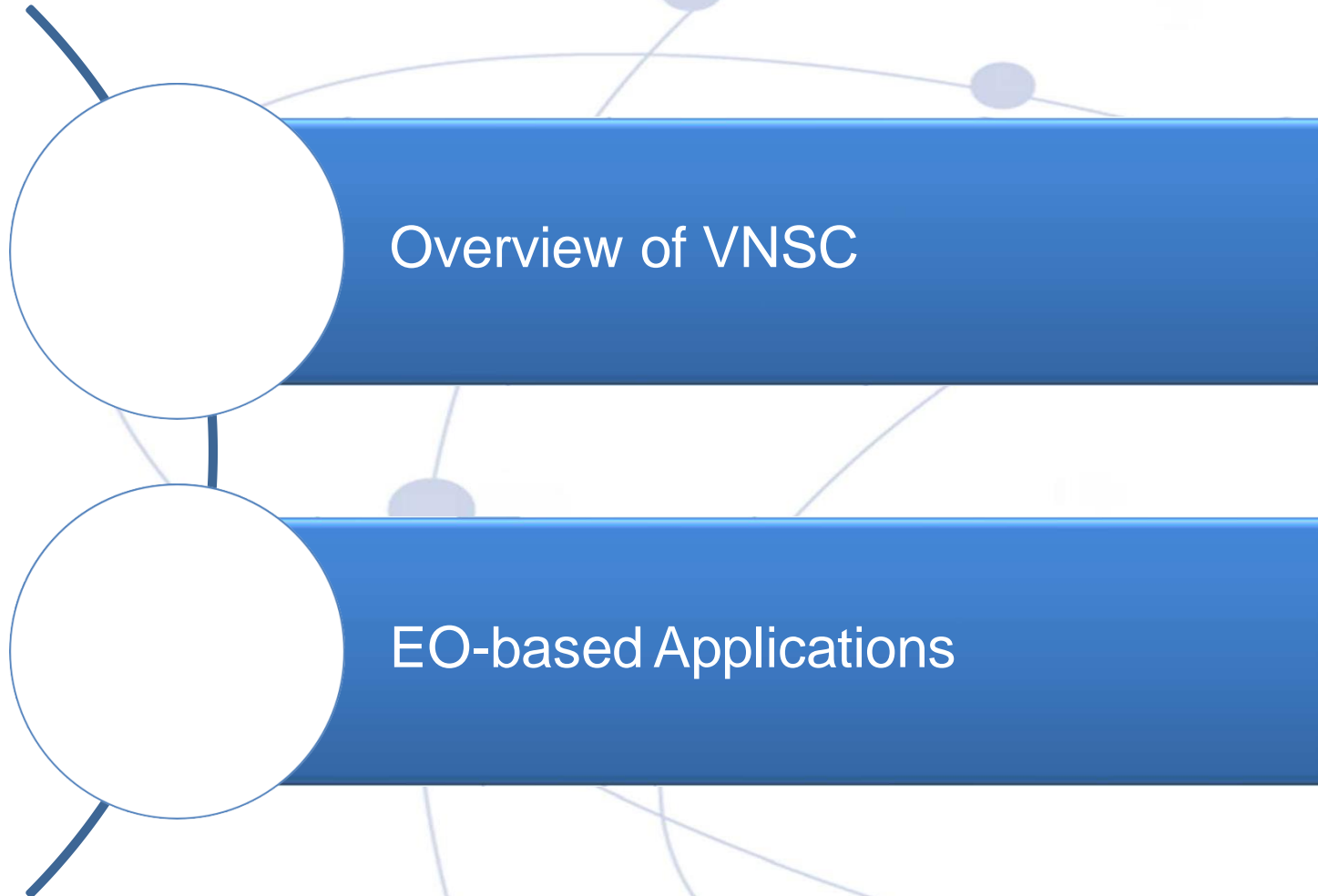


ASEAN Earth Observation-based initiatives to fight climate change – VNESC report



Lam Dao Nguyen
HCMC Space Technology Application Center (STAC)
Vietnam National Space Center (VNESC)

Contents

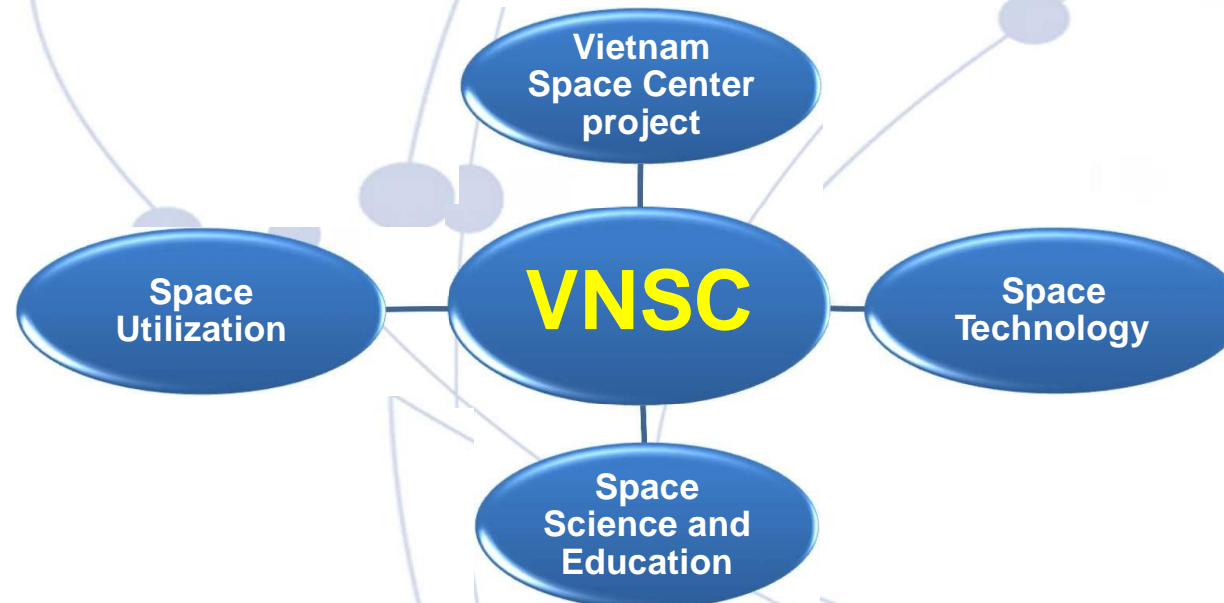




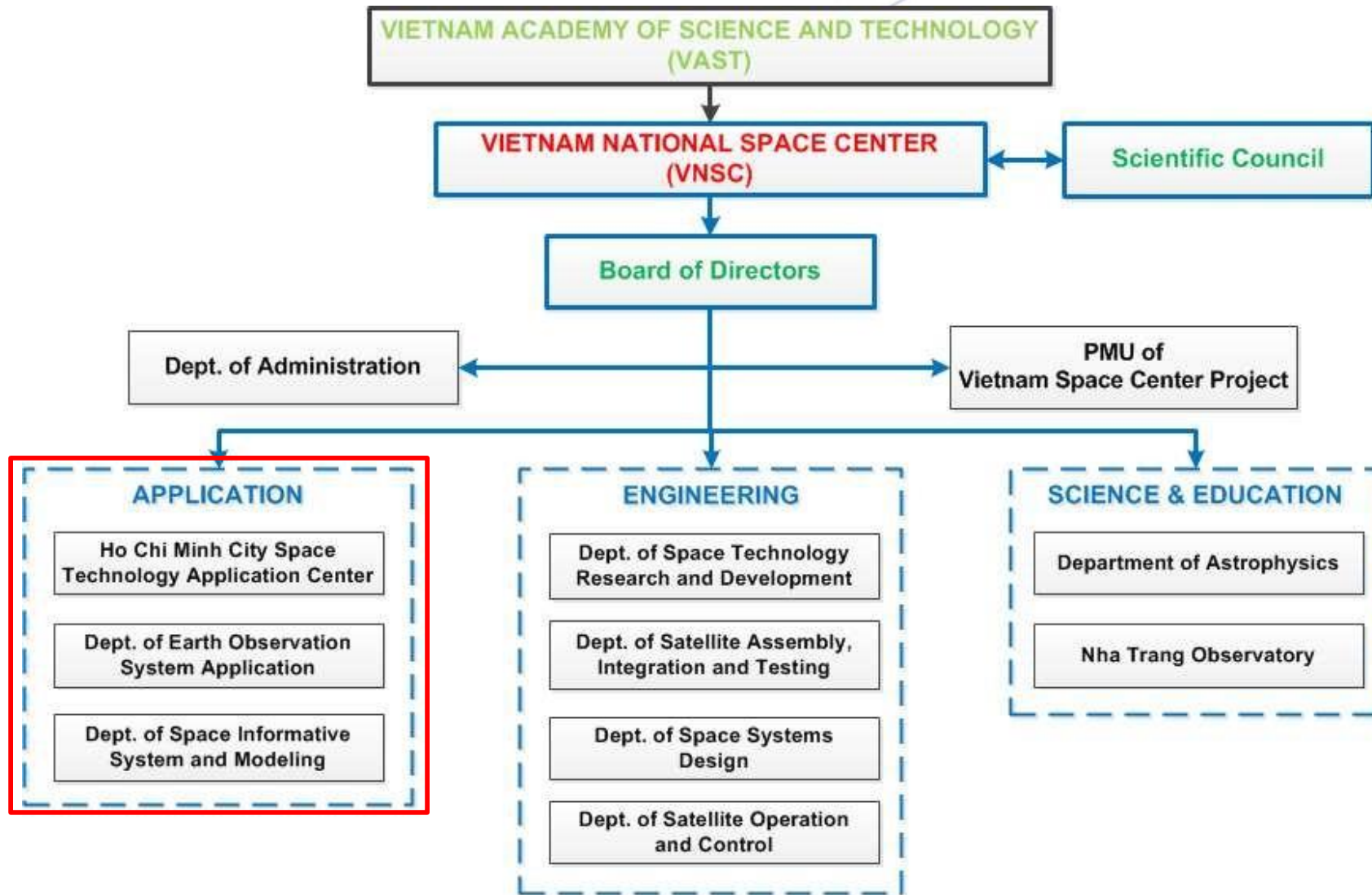
Overview of VNSC

On Sep. 16, 2011, **Vietnam National Satellite Center (VNSC)** was established under **Vietnam Academy of Science and Technology (VAST)** by the Vietnamese PM's decision.

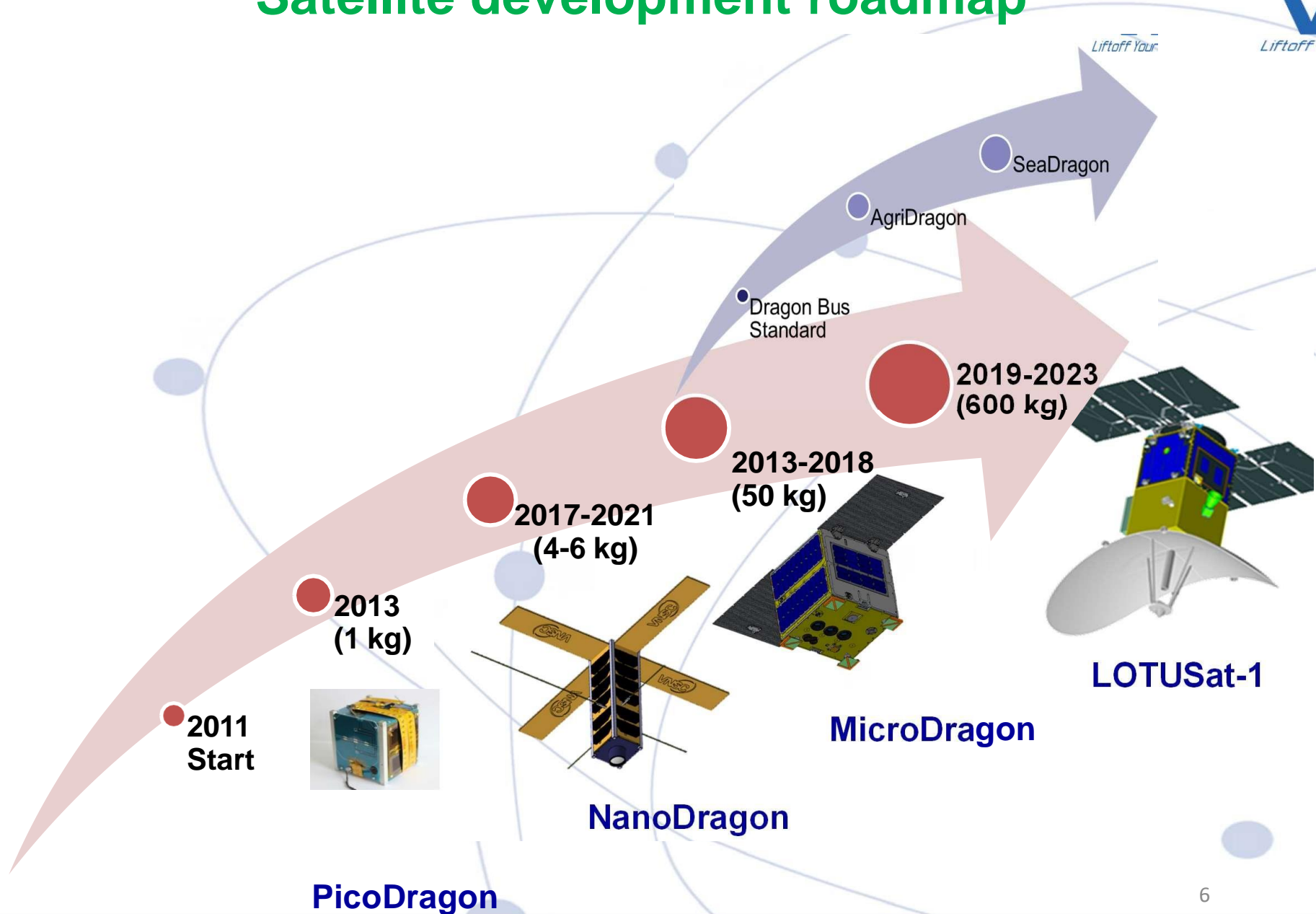
From July 17, 2017, the **Vietnam National Satellite Center** was officially changed to: **Vietnam National Space Center.**



Organization Chart



Satellite development roadmap



- ❑ Strategy for development and application of **space science and technology** to 2030
- ❑ The Strategy of National **remote sensing development** to 2030, vision to 2040



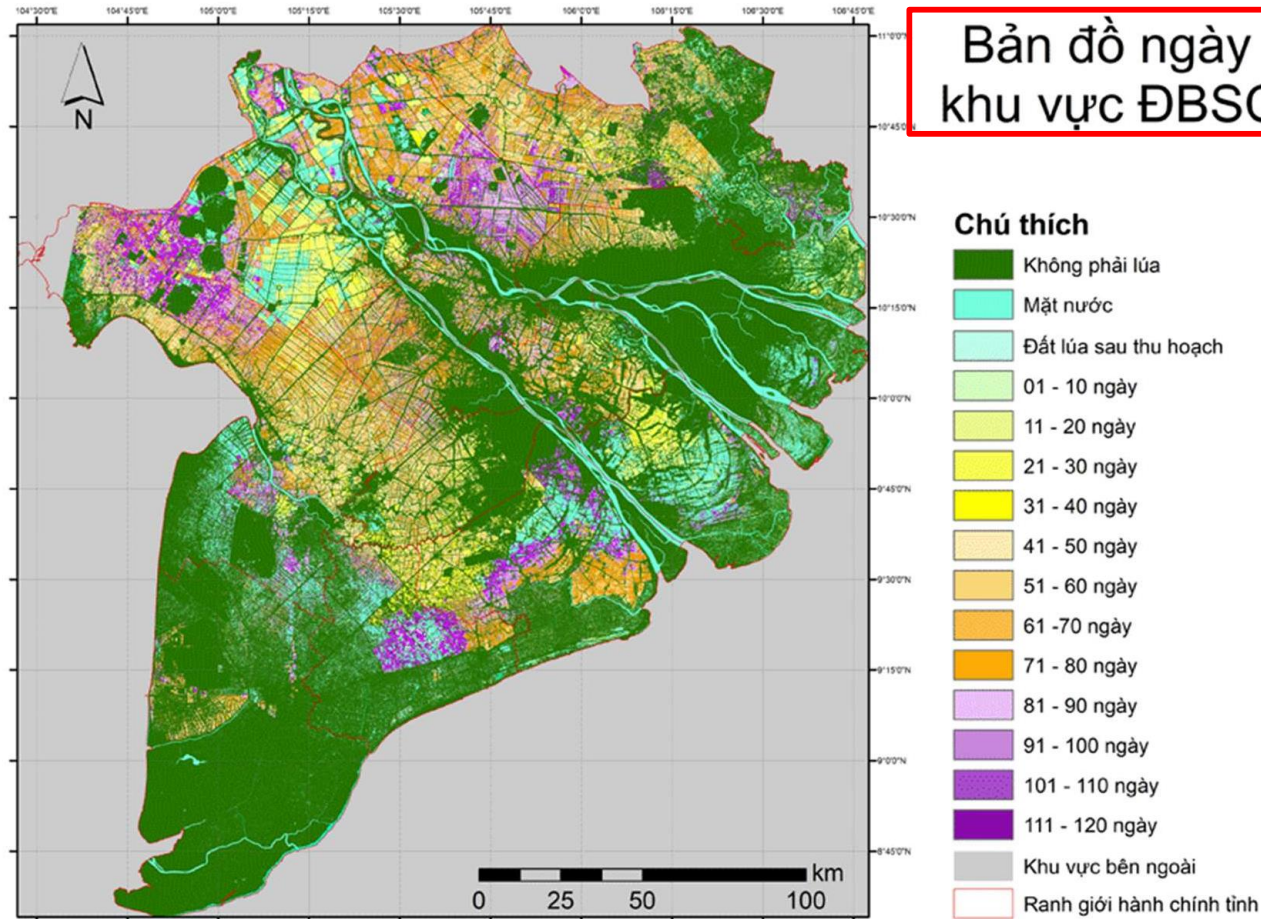
Earth observation-based applications to fight climate change

EO-based applications to fight climate change:

- Food security**
- Flood**
- Drought & Salinity**
- Erosion**
- Land subsidence**
- Etc.**



Days after rice planting

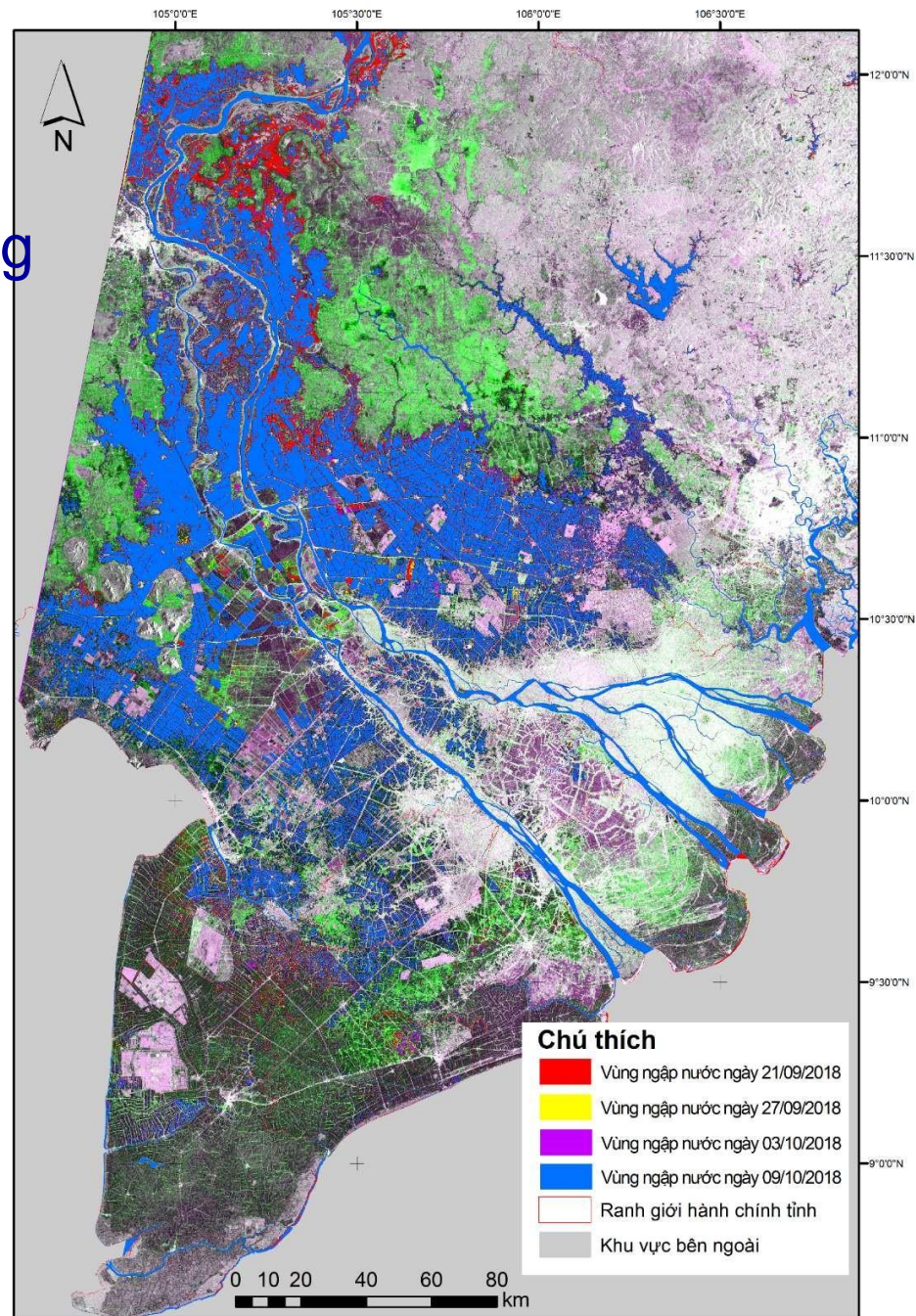


Cơ quan thực hiện:
Trung tâm Ứng dụng Công nghệ Vũ trụ TP. Hồ Chí Minh (STAC)
Trung tâm Vũ trụ Việt Nam (VNSC)
Viện Hàn lâm Khoa học và Công nghệ Việt Nam (VAST)

Hoang-Phi Phung, Lam-Dao Nguyen, Nguyen-Huy Thong, Le-Toan Thuy, Armando A. Apan. Monitoring rice growth status in the Mekong Delta, Vietnam using multitemporal Sentinel-1 data. *J. Appl. Remote Sens.* **14**(1), 014518 (2020), doi: [10.1117/1.JRS.14.014518](https://doi.org/10.1117/1.JRS.14.014518).

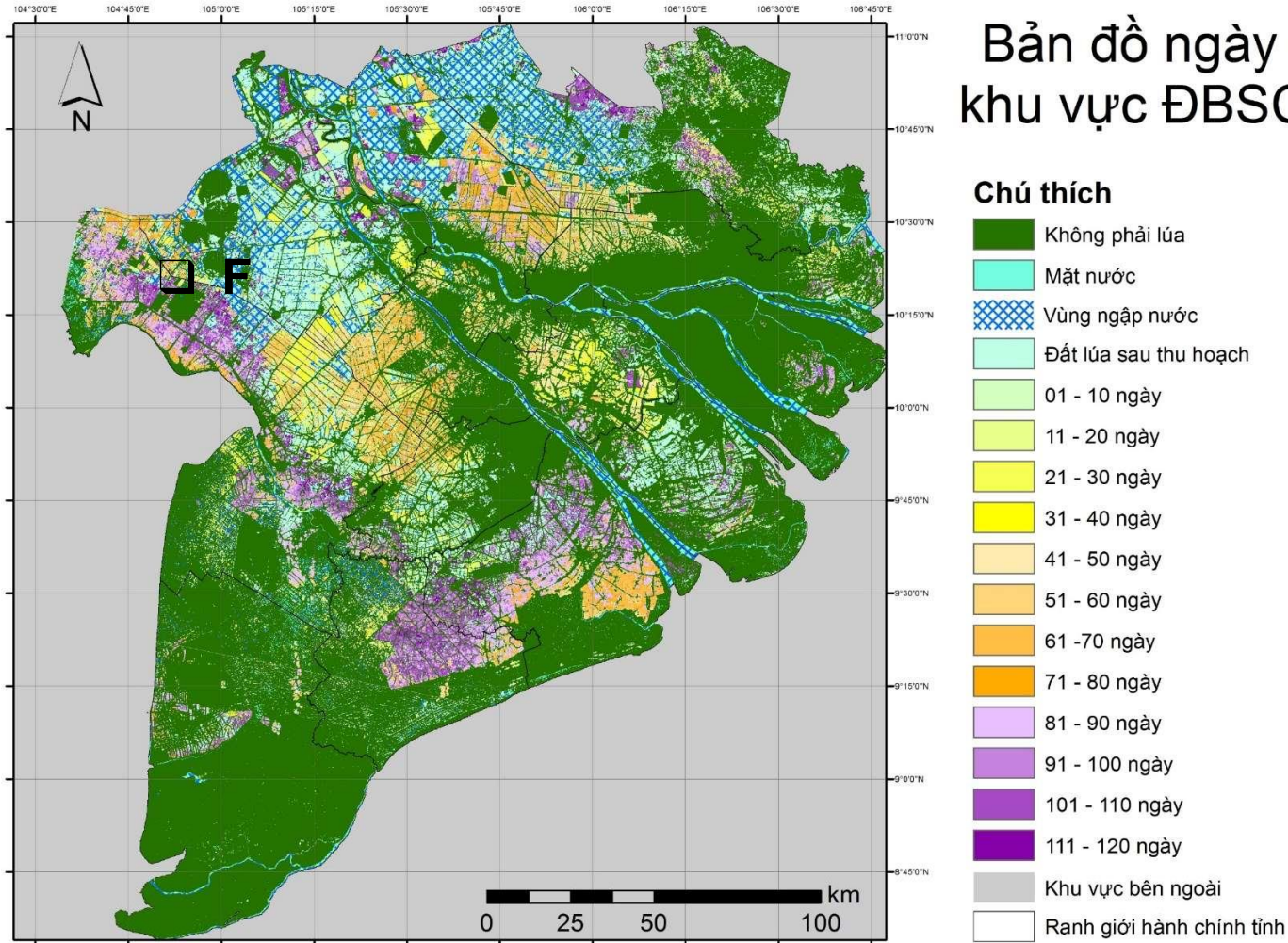
Flood monitoring

21/9-09/10/2018



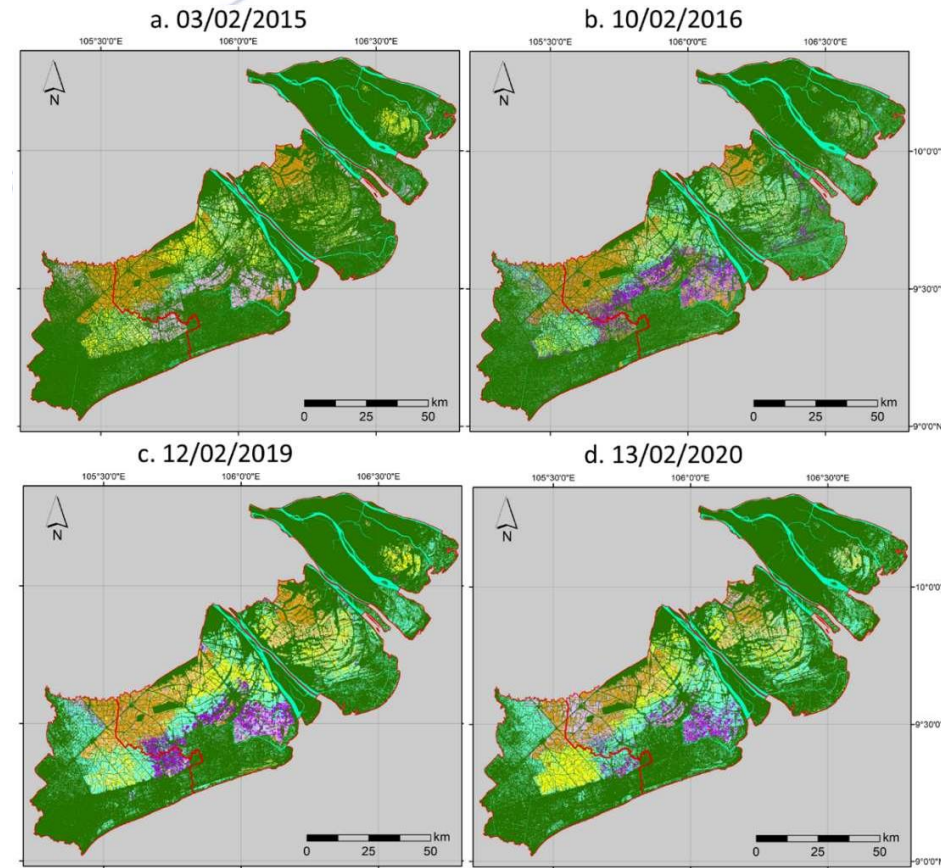
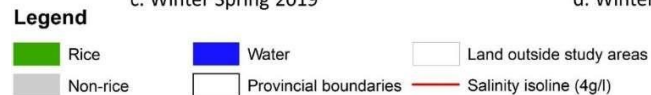
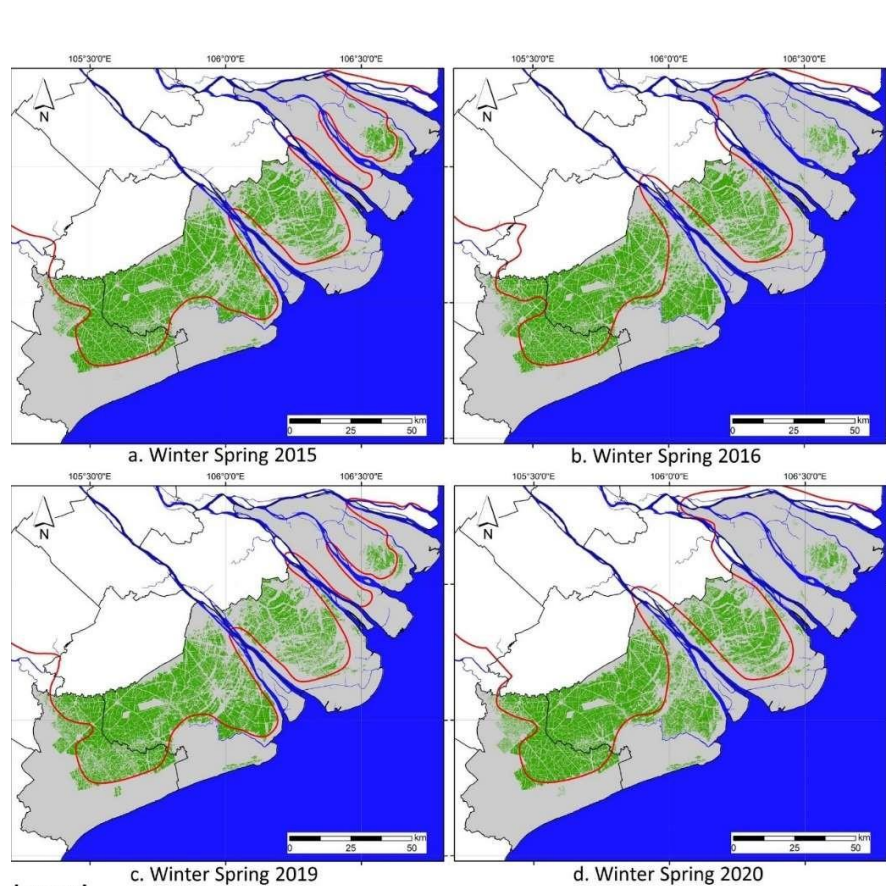
Rice and flood

Bản đồ ngày sau khi sạ/cấy
khu vực ĐBSCL (09/09/2018)

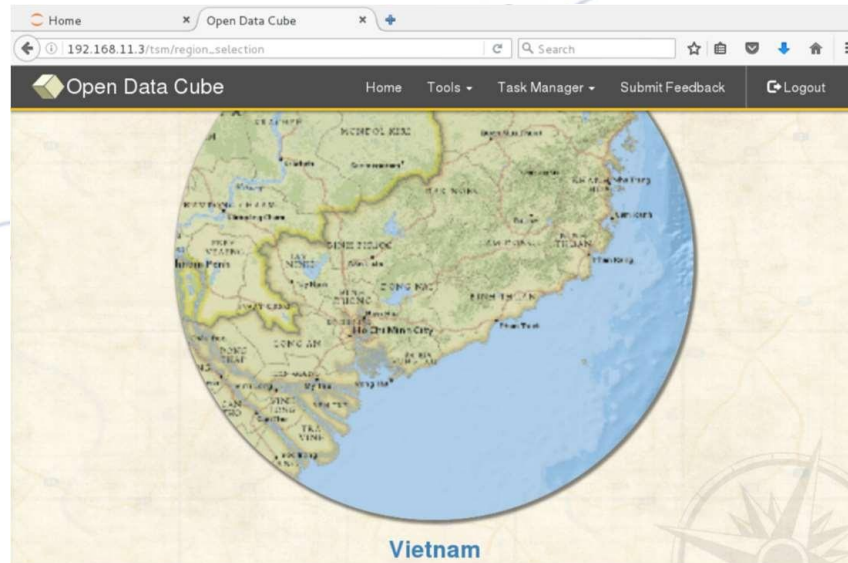
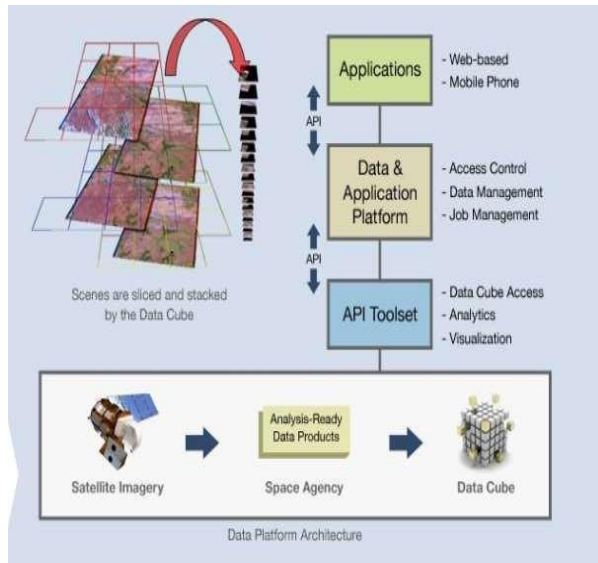


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 Trung tâm Vũ trụ Việt Nam (VNSC)
 Viện Hàn lâm Khoa học và Công nghệ Việt Nam (VAST)

Winter-Spring rice crop 2015, 2016, 2019, 2020



Hoang-Phi, Phung; Lam-Dao, Nguyen; Pham-Van, Cu; Chau-Nguyen-Xuan, Quang; Nguyen-Van-Anh, Vu; Gummadi, Sridhar; Le-Van, Trung. 2020. "Sentinel-1 SAR Time Series-Based Assessment of the Impact of Severe Salinity Intrusion Events on Spatiotemporal Changes in Distribution of Rice Planting Areas in Coastal Provinces of the Mekong Delta, Vietnam." *Remote Sens.* 12, no. 19: 3196. doi.org/10.3390/rs12193196.



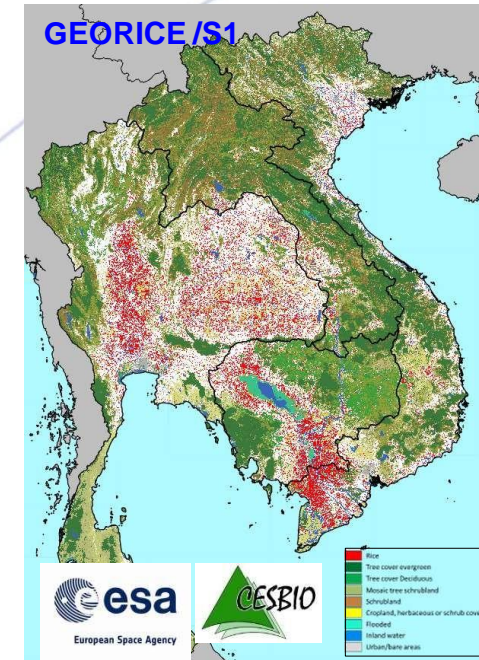
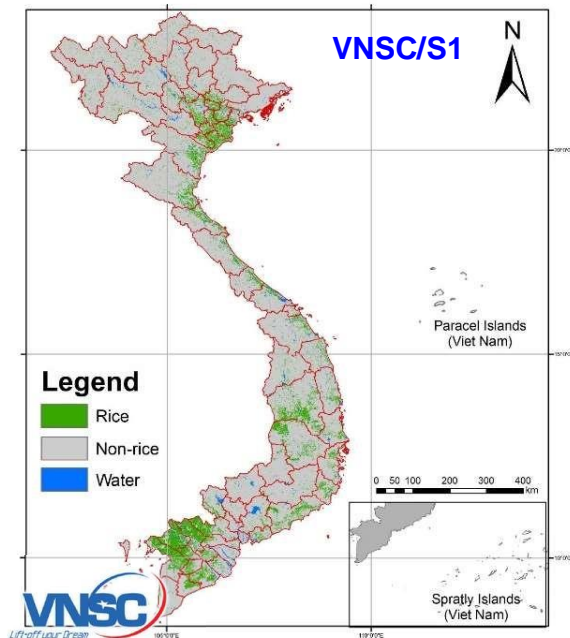
- Under CEOS activities (<http://ceos-cube.org/>)
- Under developing with the technical support from CSIRO (Australia) and IMSG (USA)
- Priority Applications:
 - Forest monitoring
 - Rice crop monitoring
 - Water quality

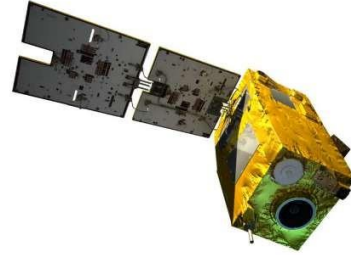
Initiatives and projects:

- ❑ **2019 CEOS Chair Initiatives:** Forest and rice monitoring in the Mekong basin countries
- ❑ **VietSCO (CNES):** Impacts of climate change on rice cultivation in Vietnam
- ❑ **Drought-ADAPT (DLR):** Adaptation to drought and El Niño effects in the Central Highlands of Vietnam
- ❑ **GEORice (CESBIO, ESA project):** Towards Global Earth Observation of Rice
- ❑ **GEO-AWS:** Monitoring rice paddy and flood in the Lower Mekong Basin

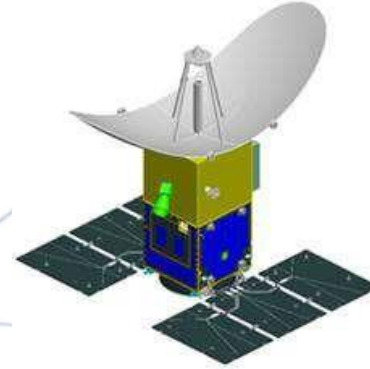


Cross comparison among rice maps (Rainy season 2018) of Mekong region by VNESC (using S1), JAXA (ALOS-2) and CESBIO (S1) in cooperation with respective countries (space agencies and ministries of agriculture) under APRSAF SAFE and other regional framework.





VNREDSat-1 (2013 -)



LOTUSat-1 (2023 -)

Thank you for your attention!

Lam Dao Nguyen
Email: ldnguyen@vnsc.org.vn





Roundtable

All speakers





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