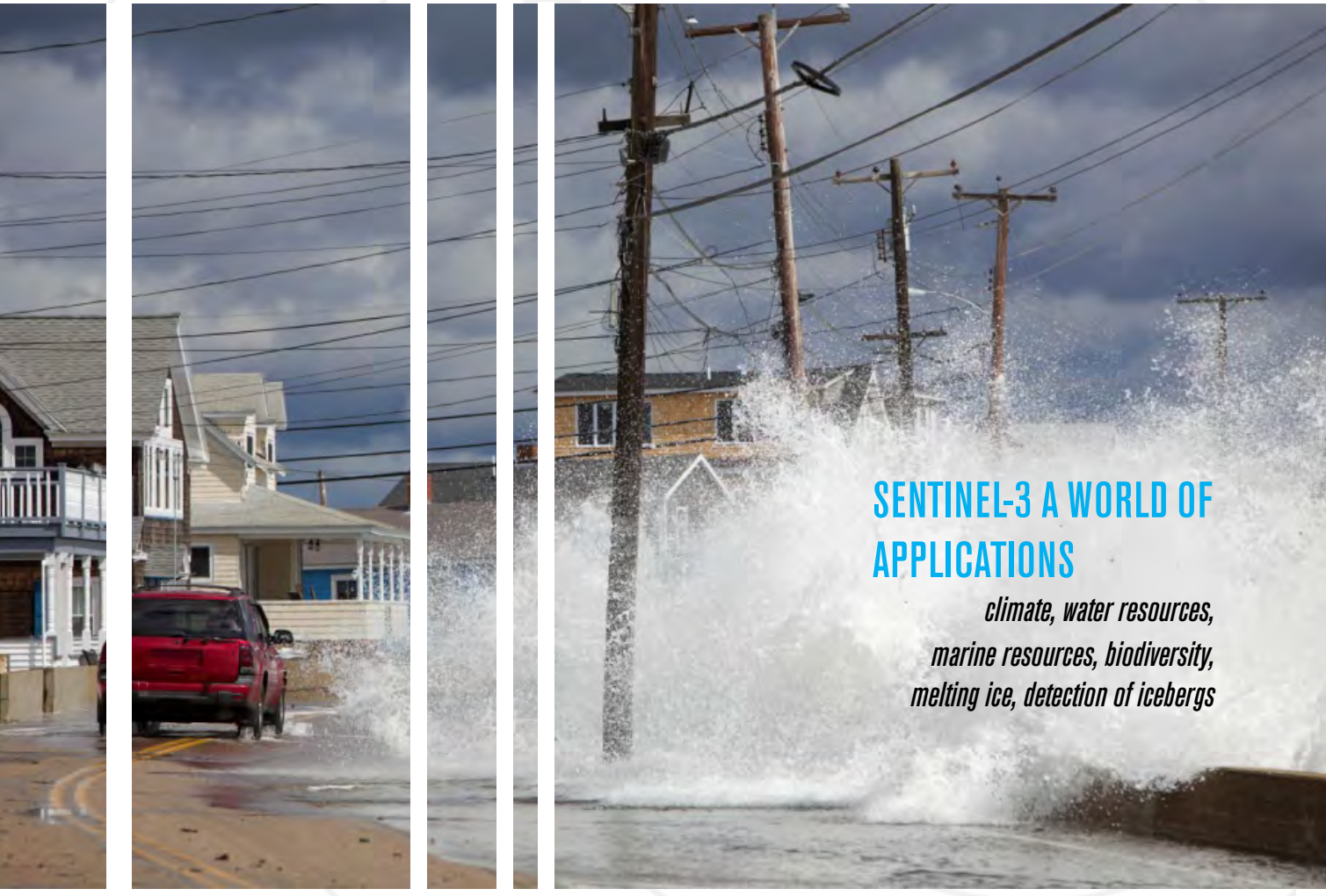
CLS
COLLECTE LOCALISATION SATELLITES

CLS PRESS KIT



SENTINEL-3 A WORLD OF APPLICATIONS

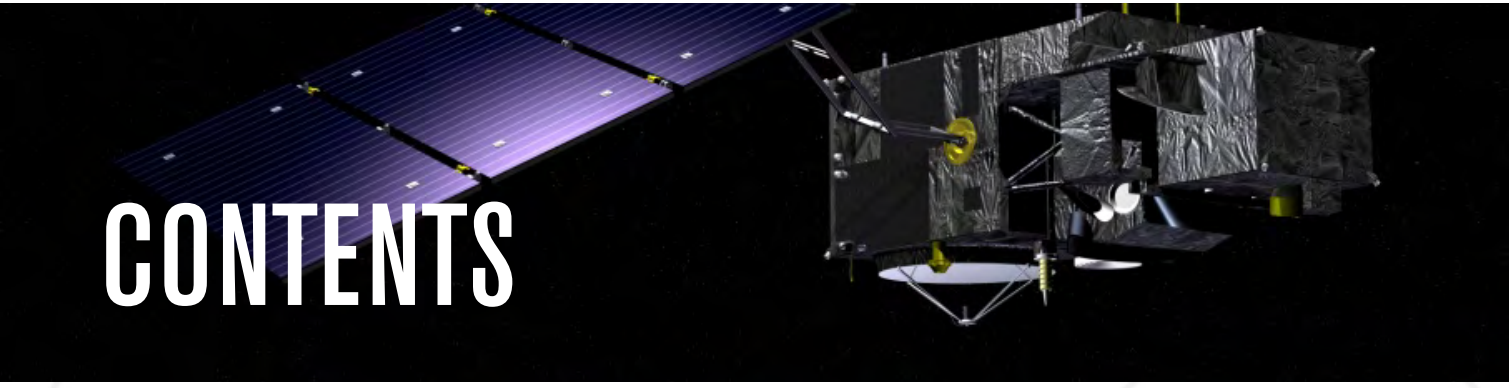
climate, water resources, marine resources, biodiversity, melting ice, detection of icebergs

Copernicus

EUMETSAT

LEGOS

cnes



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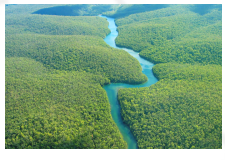

HYDROLOGY, optimizing the stewardship of water resources

CLS in brief

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SENTINEL-3:

higher resolution
more detailed data

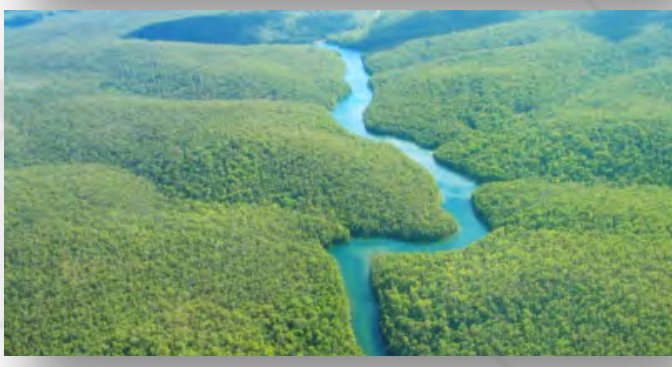
CLS
COLLECTE LOCALISATION SATELLITES

SENTINEL-3

How can we monitor the effects of global warming, optimize management of our freshwater resources, help traditional local fishermen exploit marine resources in a sustainable way, and ensure a safe route for skippers in solo round-the-world races?

The data from the European Sentinel-3 satellite, combined with the know-how of the scientific teams at CLS, a subsidiary of CNES, and of its customers or users, will address these issues from space.

Designed to monitor the Earth and oceans, Sentinel-3, part of the Copernicus program, was developed jointly by ESA and the European Commission. This program is the European response to ever-increasing needs for environmental stewardship. Sentinel-3 is one of a family of several satellites, each using a different technique or having a different goal (Sentinel-1 is carrying a synthetic aperture radar; Sentinel-2 is dedicated to optical imaging and Sentinel-3 will focus on the oceans).



SENTINEL-3

CLS, A KEY PLAYER FOR THE PLANET ALONGSIDE SENTINEL-3

As part of the Sentinel-3 adventure, CLS has been appointed by ESA:

-to manage the S-3 processing chains and mission performance center for the topography component,

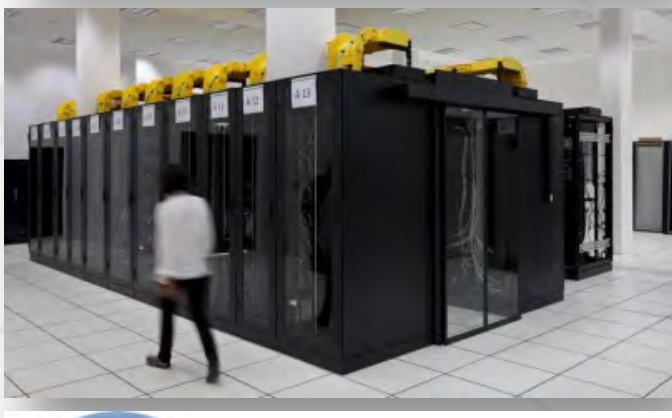
-and also the data processing and archiving center for land surface topography.

MERCATOR OCEAN has also given CLS responsibility for delivering the altimetry data to the data access platform for the Copernicus Marine Environment Monitoring Service.

CLS is also carrying out research and development on behalf of CNES.

CLS is also producing altimetry data of superior level on behalf of EUMETSAT & CNES.

As such, CLS has developed unique processing systems capable of providing data on the level of oceans, lakes and rivers to scientists, climatologists, meteorologists, oceanographers, biologists and hydrologists, all around the world.



Copernicus
The European Earth Observation Programme

Image 1 CLS Control Center (based in Toulouse, France),
Image 2 CLS data center (based in Toulouse, France)

CLS

SENTINEL-3

These processing systems draw on almost 25 years of expertise in the acquisition, processing, calibration, validation and dissemination of altimetry data (sea surface height, winds, waves).

On the basis of this raw ocean topography data, CLS is developing new value-added products and services multi-missions & multi-sensors.

These products provide vital information on:

-the level of the oceans, the wind, the waves for climatologists,

-the direction and strength of currents for ship captains,

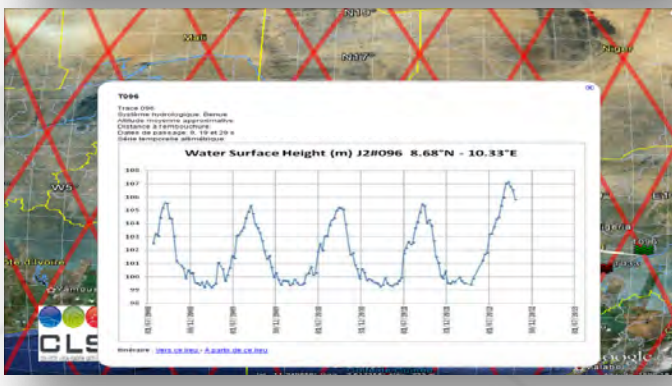
-the level of rivers for water agencies,

-the thickness of ice for scientists,

-the presence of fish for fishery authorities,

-the physico-chemical conditions in which marine populations evolve for biologists,

-and even the presence of icebergs threatening skippers for organizers of round-the-world races.



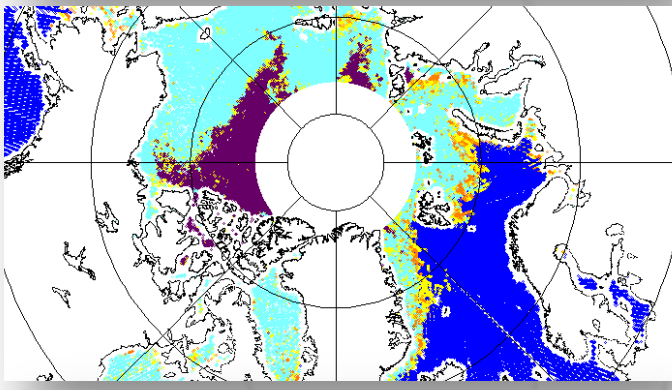


Image 1 Michael ABLAIN,
Manager of the Performance & Climate department
standing in front of the mean sea level curve © CLS,
Image 2 Map of levels of the Bénoué River, Nigeria © CLS
Image 3 Ice dating map © CLS
Image 4 Iceberg detection and drift map © CLS/MDA

CLS

CLIMATE

Measuring the impact of global warming

CLS
COLLECTE LOCALISATION SATELLITES

CLIMATE

MEASURING THE IMPACT OF GLOBAL WARMING

SENTINEL-3/CLS: determining the rise in mean sea level

During the COP 21, Jean Jouzel, climatologist and IPCC Member, stated: "Satellite data have revolutionized the study of the climate, we must maintain these observation systems in order to safeguard our future."

With the launch of Sentinel-3 and the European partnerships in which CLS is playing an active role, this goal will be achieved.

Sentinel-3 is fundamental to the study of the climate because it will help improve our understanding of the ocean, which plays a key role in the climate machine.

The ocean is the planet's main carbon pump and has the largest capacity for storing heat.

Understanding climate mechanisms primarily means understanding the ocean.

But how can we learn more about this immense maritime territory? Over the last 30 years, observation systems for the ocean have made giant leaps.

The development of satellites for space oceanography and collection of environmental data has been the driving force behind this revolution. From the start, CLS was a pioneer in the field, and receives, processes and qualifies these satellite data for the entire international community under a CNES & ESA mandates.

CLS has been involved in the adventure since the launch of the very first oceanography satellite, TOPEX/Poseidon, in 1992.

CLIMATE

MEASURING THE IMPACT OF CLIMATE CHANGE

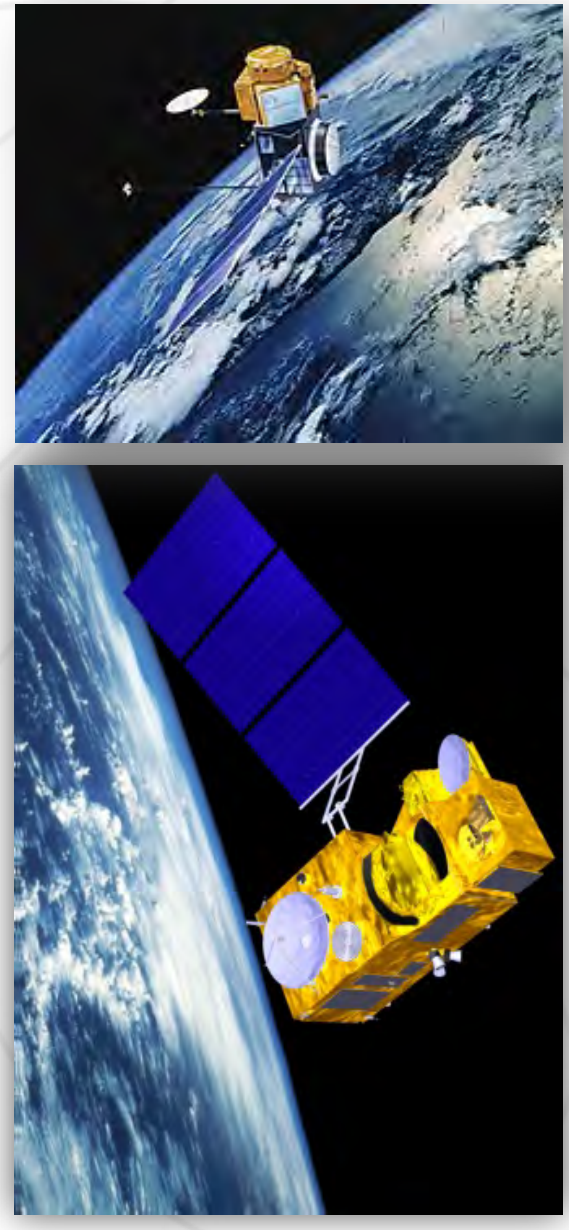
CLS, the altimetry leader for the Sentinel-3 mission

As world leader in altimetry, CLS is the main player in the Sentinel-3 altimetry mission.

More than fifty engineers, oceanographers and project leaders will be working daily on this key mission.

Since the launch of the first altimetry satellite, TOPEX-Poseidon, in 1992, CLS has developed products and solutions, operated all the existing altimetry systems, and assisted climatology experts on a day-to-day basis.

Under a CNES mandate, CLS operates, processes, qualifies and distributes the data from all the altimetry satellites currently in flight: JASON-3, JASON-2, CRYOSAT-2, HY2A, SARAL, and will soon be involved in the Sentinel-3 missions.



TOPEX/Poseidon (above), Sentinel-3 (below). 24 years have elapsed between their two launches. 24 years in which CLS has been processing data from all the altimetry satellites designed and in operation. Unmatched experience.

CLIMATE

MEASURING THE IMPACT OF CLIMATE CHANGE

TESTIMONIAL: Anny Cazenave: *"Altimetry data are vital to the study of the climate"*

Member of the French Academy of Sciences and Member of the IPCC, Anny Cazenave is a renowned researcher on climate change and routinely uses CLS's mean sea level indicator. She tells us just how important it is and emphasizes the leading international position* of CLS in establishing this key indicator of global warming.

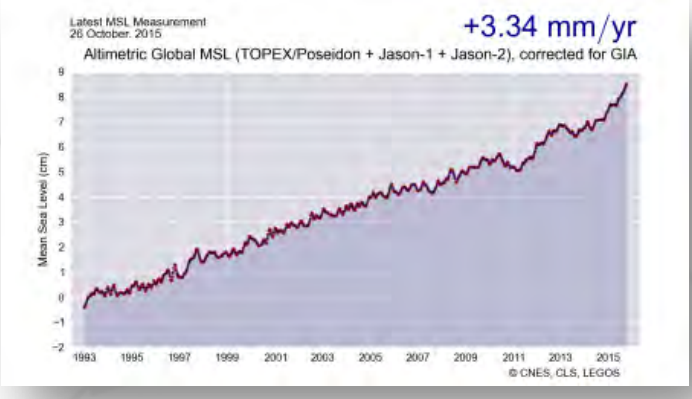
Why is it important to determine mean sea level?

Mean sea level is one of the best indicators of global warming. Certainly much better than mean global temperatures. Today, because of greenhouse gas emissions

generated by human activities, our planet has an energy disequilibrium. It is accumulating heat and 93% of this excess heat is stored in the oceans. The remaining heat is causing the ice caps to melt and is warming the atmosphere. Sea level is related to ocean warming and ice cap melting, and is therefore a key indicator of global warming. This is because heat that accumulates in the ocean dilates the water, resulting in higher sea level. Melting mountain glaciers and the loss of ice mass in Greenland and Antarctica are another cause of the current rise in sea level. But the higher levels are far from uniform. Specific zones have seen levels rise four times faster than the overall average. This is the case for instance in the western tropical Pacific Ocean. Certain coastal regions are therefore worse hit than others by this phenomenon.

CLIMATE

MEASURING THE IMPACT OF CLIMATE CHANGE



TESTIMONIAL: Anny Cazenave *"Altimetry data are vital to the study of the climate"*

How do you use this indicator?

At LEGOS**, we are trying to understand the regional and global causes of changes in sea level. Our research has shown that the mean overall rise in sea level over the past 20 years is caused for about 35% by ocean warming, 45% by melting of continental ice and 10% by pumping water from underground sources, since this water ultimately ends up in the ocean.

The remaining 10% is not accounted for at this time, but is most probably related to uncertainties in measurements. To establish a very clear picture, we need data that are as accurate as possible.

CLS has been working extensively these past few years on precise calculations of sea levels based on space altimetry data from several satellites. The "sea level" indicator calculated by CLS is increasingly reliable and more and more accurate. It is no doubt one of the best products available today. This will be even more true with the data from Sentinel-3.

Why is this indicator crucial for managing the climate?

Mean sea level is rising, as we said. It is a key indicator of current global warming. The time series of sea level measurements taken by CLS are also used to validate the climate models developed to simulate future changes.

**Laboratory for Space Studies in Geophysics and Oceanography, CNRS

CLIMATE

MEASURING THE IMPACT OF CLIMATE CHANGE

Testimonial: Benoît Meyssignac *"The data from Sentinel-3, processed by CLS, will be essential to ensure good spatial and temporal coverage of sea level."*

Benoît Meyssignac, Doctor of Science at LEGOS**, uses the sea surface height data calculated and qualified by CLS. He compares variations in sea level to estimate the energy disequilibrium of the planet caused by climate change.

In his report, Benoît Meyssignac, a specialist in climate studies, shows that this energy disequilibrium has resulted in excess heat being accumulated by the Earth over the last few decades, and that it is due mostly to human activity and not to natural climate variability.

What will you learn from the Sentinel-3 data?

The data from Sentinel-3, processed by CLS, will be an essential complement to the constellation of altimeters, to ensure good spatial and temporal coverage of sea level. These data will essentially confirm and supplement the data we already have. Sentinel-3 will ensure the continuity of the systems and enable us to pursue our ongoing studies on the climate.

**Laboratory for Space Studies in Geophysics and Oceanography, CNRS

GLACIOLOGY

Measuring the melting of the ice caps

CLS

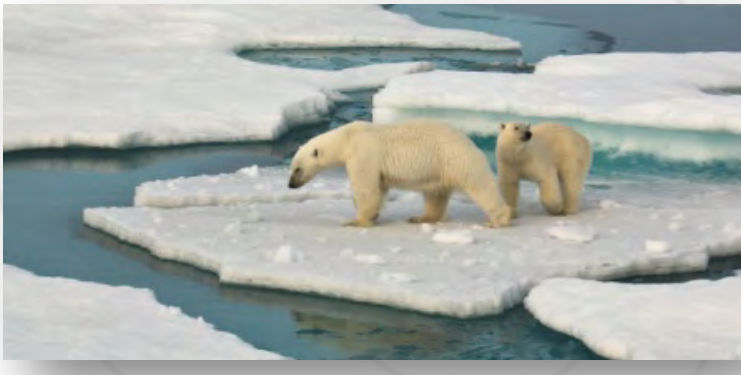
GLACIOLOGY

The Poles and continental glaciers play a vital role in the study of the climate, since they are both the Earth's glacial archives and an indicator of current climate change. Today, space technologies are the only ones able to provide an overall view of these territories and monitor their evolution. The data from Sentinel-3, offering higher resolution than the other existing altimetry missions, will further our understanding of these hostile places.

The altimetry data from Sentinel-3, combined with the expertise of CLS, will make it possible to map the topography of the Poles, assess the volumes of ice, study the snow pack and find out more about the subglacial water networks.

SENTINEL-3: CLS will finally be able to "read" between the ice

Thanks to the superior resolution provided by Sentinel-3, the CLS scientists will now be able to estimate the height of the "freeboard". Pierre Thibaut, Instrument & Measurement Physics manager at CLS: *"Thanks to the new altimetry technology carried by Sentinel-3, similar to that on the Cryosat satellite, we will be able to acquire measurements with higher resolution and greater precision. The altimeter will then be able to measure the height of emergent ice in free spaces or "holes" in the pack ice. This is important data that will enable us to quantify the volume of ice, both sea ice and continental glaciers. This additional information will provide a new indicator of the impact of global warming on our planet."*



Thanks to the new measurement resolution offered by Sentinel-3 and CLS's expertise in satellite altimetry, CLS scientists will be able to estimate the volume of ice at the Poles and in continental glaciers.

© istock

GLACIOLOGY

"ICE AGE"

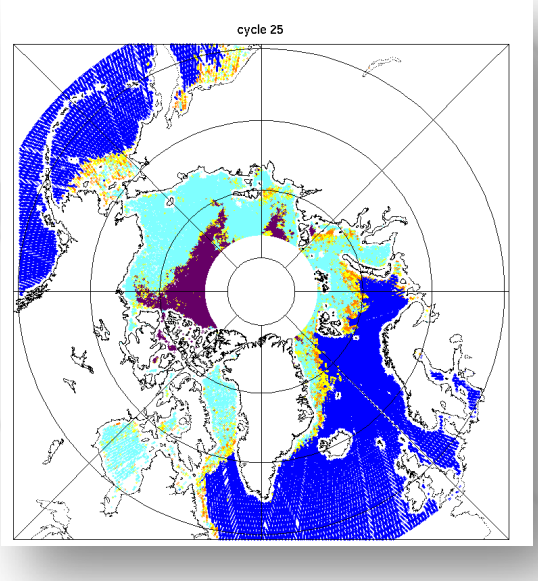
Using the measurements taken by the altimeters and radiometers, such as those on Sentinel-3, CLS classifies sea ice according to its age.

From one-year-old sea ice that develops during the winter season to the multi-year ice that is at least two years old, the ice can be identified and classified (CLS study sponsored by ESA).

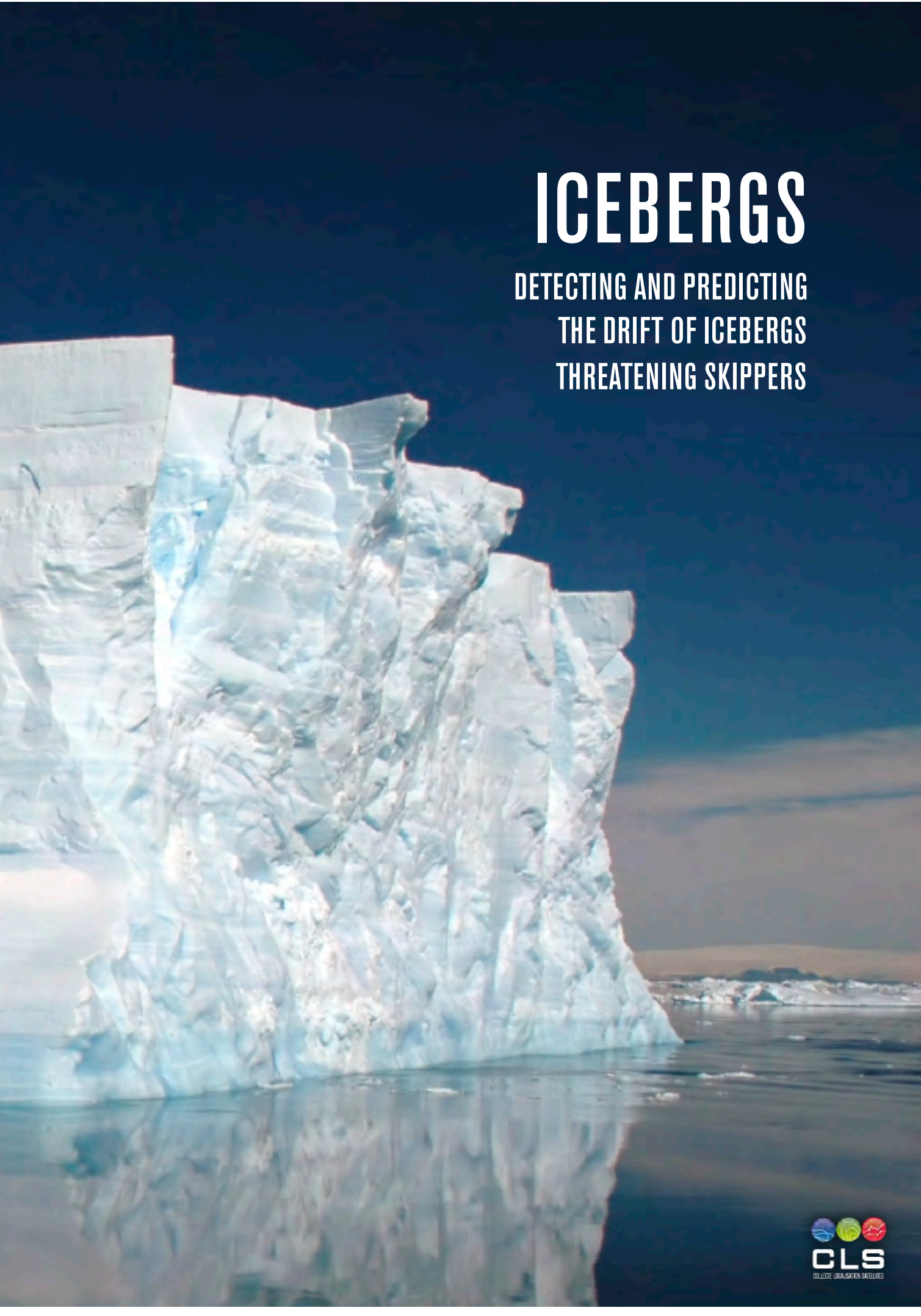
The altimeter gives CLS scientists indications about the roughness of the ice, which in turn gives a clue to its age.

The radiometer sends CLS the surface brightness temperature, which is related to the ice surface's emissivity and therefore its age.

Combining these two data enables the ice to be classified by type. Understanding the age of the sea ice provides scientists at ESA (the European Space Agency) with a global parameter on changes in sea ice, and gives glaciologists basic data for estimating the mass of the ice. The continuity of observation systems and the improved quality of their measurements is crucial for studying and understanding our planet. As such, the entire community of polar scientists is eagerly awaiting the Sentinel-3 data.



Give me your roughness,
and I'll tell you how old you are!
Classification of sea ice
© CLS



ICEBERGS

DETECTING AND PREDICTING THE DRIFT OF ICEBERGS THREATENING SKIPPERS

CLS
COLLECTE LOCALISATION SATELLITES

ICEBERGS

At the end of the year, the Vendée Globe, the solo round-the-world yacht race, will set off from the port of Les Sables d'Olonne on the French Atlantic coast. 27 skippers will embark on this mythical race.

Put yourself in their place: you've just been through the Roaring Forties and are at the gateway to the Furious Fifties.

Far from anywhere. In the event of a problem, help would take days to arrive.

The water temperature is beginning to fall. And you know there is a strong likelihood of crossing paths with a drifting iceberg.

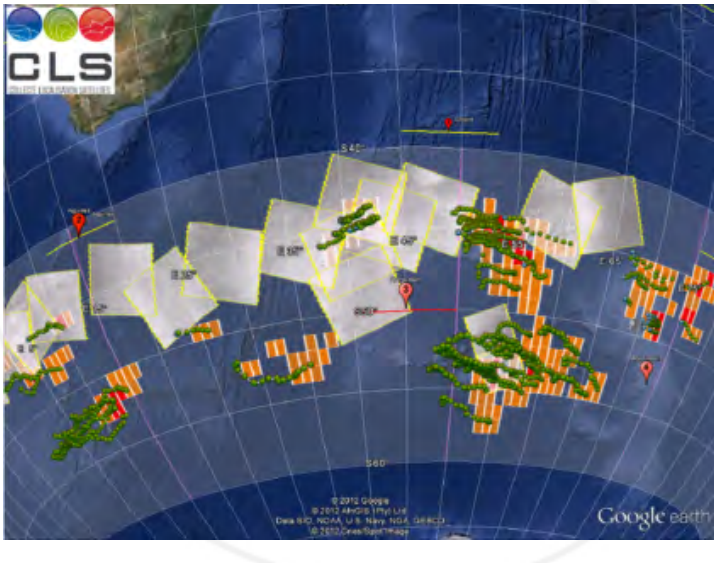
This is where the satellites of the COPERNICUS program, Sentinel-1 and Sentinel-3, and CLS's know-how come into play.

Thanks to algorithms developed since 2008,

1. CLS maps the likelihood of the presence of icebergs on the skippers' route using altimetry data such as that provided by Sentinel-3,
2. CLS controls the radar imaging of satellites such as Sentinel-1 and can detect the presence of icebergs with greater reliability,
3. CLS predicts the drift of these icebergs mainly from the currents it infers from ocean topography (e.g. using data from Sentinel-3).

CLS and Sentinel-3 thus help race organizers improve the safety of round-the-world events.

CLS is a partner in the Vendée Globe, the Barcelona World Race, and in record attempts such as the Jules Verne Trophy, etc.



The type of map provided to the organizers of the Vendée Globe race, showing the likelihood of the presence of icebergs and their drift trajectories. © CLS/MDA

FISHING

Managing our marine resources in a sustainable way

CLS
COLLECTE LOCALISATION SATELLITES

FISHING

THE FUTURE OF MARINE RESOURCES IS BEING DECIDED TODAY

Marine resources are too often overexploited (overfishing or illegal, unregulated, unreported fishing) and are also victims of other types of human activity (pollution, global warming). Stocks will be able to cope with such pressures, but only if we return to sustainable levels of exploitation. We are thus faced with a daunting challenge: fishing activities need to be controlled and limited while at the same time supporting the development of local economic sectors in a way that protects the resource.

Tuna at an Indonesian market © CLS

CLS has been working on this for nearly 30 years. The French company provides satellite solutions for the sustainable management of marine resources to fishermen and fishery authorities around the world. Soon all the users of its products, services and infrastructure will benefit from the data provided by Sentinel-3.

Indonesian fisherman © CLS

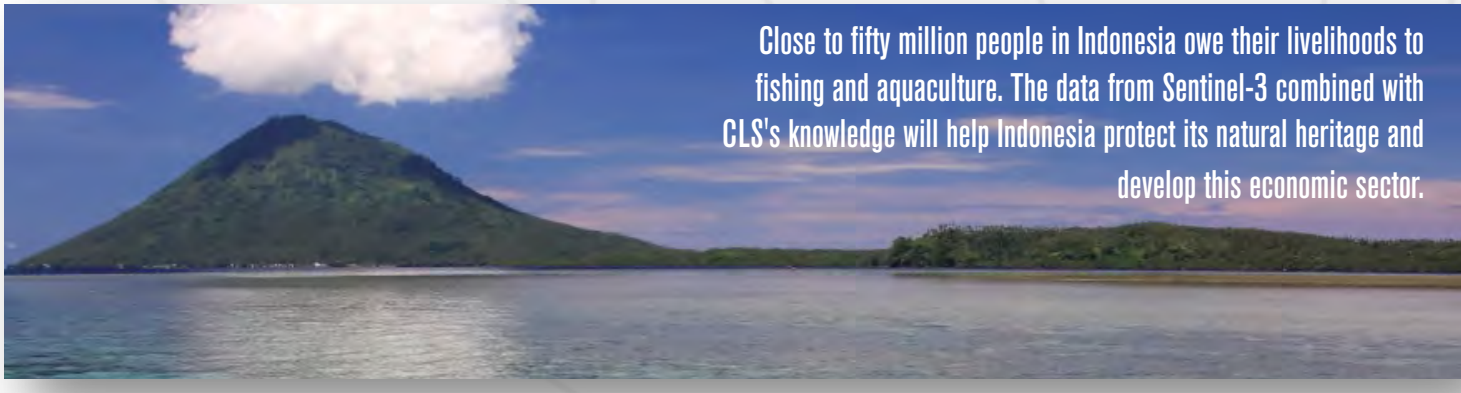
As an example, the CNES subsidiary supplied Indonesia with a national centre whose priorities are to predict changes in marine resources, while protecting (especially against illegal fishing) and developing them.

FISHING

3000 INDONESIAN FISHERMEN AND THEIR NATIONAL FISHERIES MONITORING CENTER ARE WAITING FOR SENTINEL-3 DATA

The Indonesian archipelago, at the heart of the Coral Triangle, is one of the most important reservoirs of marine biodiversity on the planet. Close to fifty million people owe their livelihoods to fishing and aquaculture. These resources are under threat as never before. Every year, illegal fishing plunders these marine resources and deprives the Indonesian government and fishermen of nearly 2 billion dollars. To combat these risks and launch its Blue Revolution, with the aim of making Indonesia the world's leading producer of fishery products, the government has chosen CLS.

The INDESO Center for sustainable management of marine resources, delivered by CLS to Indonesia, will receive data from Sentinel-3

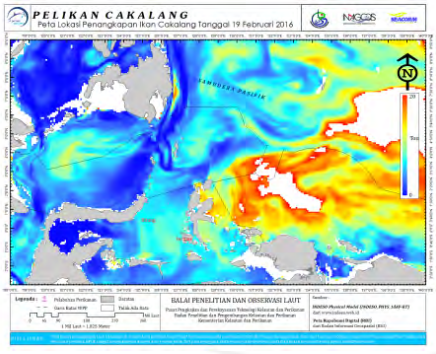


Close to fifty million people in Indonesia owe their livelihoods to fishing and aquaculture. The data from Sentinel-3 combined with CLS's knowledge will help Indonesia protect its natural heritage and develop this economic sector.

FISHING

As such, CLS fitted Indonesia's 3000 largest fishing boats with locator beacons. These beacons and the associated fisheries monitoring center enable authorized fleets to be tracked. This phase was the first step in establishing responsible fishing. CLS then supplied Indonesia with INDESO, a center for detection of illegal fishing and support for local fisheries, offering synergies between resource conservation and economic development.

The inspectors and licensed fishermen have access to maps predicting the presence of fish, drawn up by the CLS population dynamics models. These models can simulate changes in the dynamics of marine populations such as tuna, in time and space, depending on the ocean's physical and biogeochemical conditions, as well as fishing effort, pollution and global warming. These models predict the density distributions at different stages of life (larvae, juveniles, immature and adult fish). The Sentinel-3 data (ocean temperature, water color and altimetric fronts) will be incorporated into the models. This should help the authorized fishing fleets comply more effectively with quotas and respect the environment (saving fuel, reducing the vessels' carbon footprint). The maps will also enable inspectors to target the fishing zones to be monitored. This will ensure continuity of service and improve the recommendations, thanks to greater precision.



Forecast map of tuna distribution (from the SEAPODYM model developed by CLS and delivered to the Indonesian Government as part of INDESO) © CLS/INDESO

BIODIVERSITY

STUDYING, UNDERSTANDING AND PROTECTING WILDLIFE

CLS
COLLECTE LOCALISATION SATELLITES

BIODIVERSITY

SATELLITE OBSERVATION: A KEY TOOL FOR THE CONSERVATION OF OUR NATURAL HERITAGE

Yvon Le Maho is an advisor to the French Government and helps shape its policy choices for the management of our natural heritage, both terrestrial and aquatic (freshwater and marine). He has studied Antarctic and sub-Antarctic penguins for many years and has helped further our understanding of them.

Yvon Le Maho and his teams have monitored hundreds of penguins thanks to CLS and the ARGOS satellite system. The knowledge thus acquired has been of fundamental importance in understanding the feeding strategy of these animals, as well as in seeing how they can be used as an indicator of the state of marine resources. Yvon Le Maho and the scientific community studying the living world are eagerly awaiting the data from Sentinel-3.

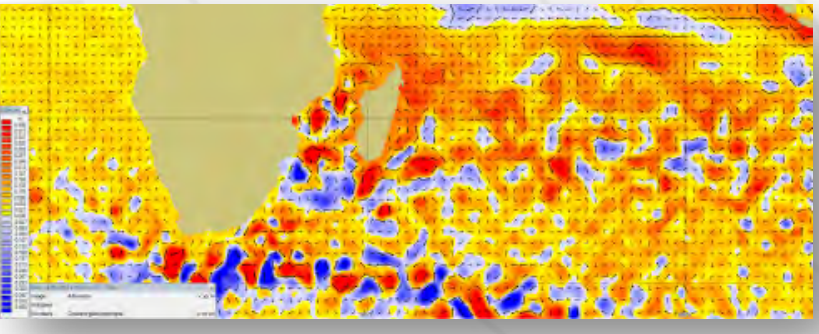
"With Sentinel-3 data and CLS's development of value-added products, we will gain a more precise knowledge of eddies and currents. This information is critical to understanding the location and abundance of marine resources, both in order to preserve them and for the sustainable management of fisheries. This is because the abundance and location of marine resources determine food chain dynamics in marine ecosystems.

BIODIVERSITY

Satellite observation has given us access to global images covering the entire planet, and through the ARGOS data collection system and ocean observation satellites we now have information on marine predators. Many of these predators form part of our fishery resources. Without satellites, we would be unable to monitor their locations, distribution or movements according to oceanographic conditions. The data we receive from CLS in particular, in terms of location and knowledge of the physical conditions of the ocean, have really revolutionized understanding, study and informed decision-making in the management of our natural heritage."

Yvon Le Maho is a member of the Academy of Sciences (France), the Academy of Pharmacy (France), the Academy of Science and Letters (Norway), Emeritus Research Director at CNRS, President of the Scientific Committee on Natural Heritage and Biodiversity (France)

IPHC
Institut Pluridisciplinaire Hubert CURIEN
STRASBOURG



Map of currents produced by CLS. Thanks to the data from Sentinel-3, CLS will be able to calculate marine currents more precisely and help biologists the world over gain a better understanding of species.

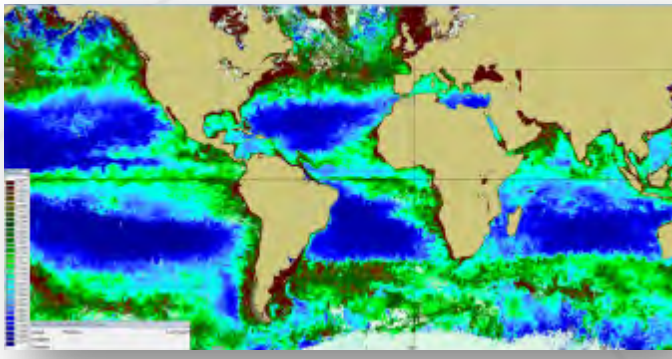
CLS

BIODIVERSITY

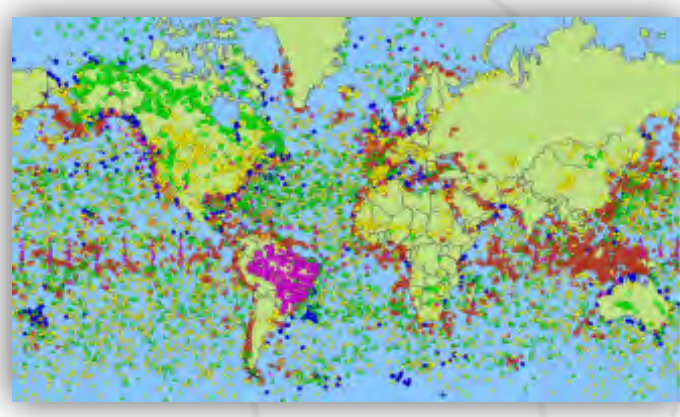
The Sentinel-3 data: currents, eddies, water color, temperture, winds and waves will soon be available for the entire international scientific community.

Every month, CLS tracks more than 8000 animals. A total of more than 100,000 have been monitored by satellite with the ARGOS* system since the 1980s. CLS also provides ocean maps that inform scientists about the state of the physical environment in which the studied species live.

In 1978, CNES, NASA and NOAA created the ARGOS satellite-based environmental data collection and location system. The data in this system are acquired, processed and distributed to the international scientific community from CLS headquarters.



Water color data from Sentinel-3 are key information for understanding the dynamics of biodiversity. CLS will also supply this valuable indicator to various authorities, to enable sustainable management of fisheries and marine resources.



22,000 ARGOS transmitters send data on a daily basis for processing by CLS

BIODIVERSITY

SENTINEL-3/CLS: MORE ACCURATE OCEANOGRAPHY DATA TO IMPROVE OUR UNDERSTANDING OF TURTLE BEHAVIOR

Where do sea turtles feed? Where do they breed? Which migration corridors do they use? How is their behavior modified by environmental variables throughout their lives?

Damien Chevallier, a CNRS researcher at the Hubert Curien Multidisciplinary Institute in Strasbourg, is continuing and developing a program initiated by Yvon Le Maho, in which they have been trying to answer these questions together over the last decade. Their goal is to shed more light on these species in order to improve conservation efforts.

To do this Damien Chevallier uses ARGOS satellite transmitters, operated by CLS, to study the trajectories of his turtles. He has fitted these transmitters to almost a hundred individuals in order to track them. His work concerns five species: leatherback, green, olive ridley, hawksbill and loggerhead, which come to breed on the South American, Caribbean and Mediterranean coasts.

He superimposes their trajectories onto oceanographic data provided by Earth observation satellites. This helps him determine the turtles' ecological preferences (temperature, chlorophyll, salinity, etc.), and any environmental constraints imposed on individuals by the currents, for example.

Green turtle fitted with an ARGOS transmitter by Damien Chevallier (above), trajectory of 6 young green turtles tracked by satellite (below).

BIODIVERSITY

Damien Chevallier's work is currently demonstrating the vulnerability of turtles in the face of climate change and the ability of these species to adapt.

Indeed, sea turtles are directly exposed to the effects of changes in ocean temperatures.

Damien Chevallier and his teams are looking forward to the forthcoming data from Sentinel-3.

Once processed and analyzed by CLS, the data will be more accurate and will provide researchers with information on even smaller ocean structures.

They will give researchers a more precise view of the ecosystem of the sea turtles. Yet another valuable aid for understanding and protecting our biodiversity.

Damien Chevallier, a CNRS researcher at the Hubert Curien Multidisciplinary Institute in Strasbourg, first worked on black and white storks and birds of prey, as well as lynx, before deciding to focus mainly on turtles. A committed biologist, he devotes all his work to understanding and preserving our natural heritage.

IPHC
Institut Pluridisciplinaire Hubert CURIEN
STRASBOURG

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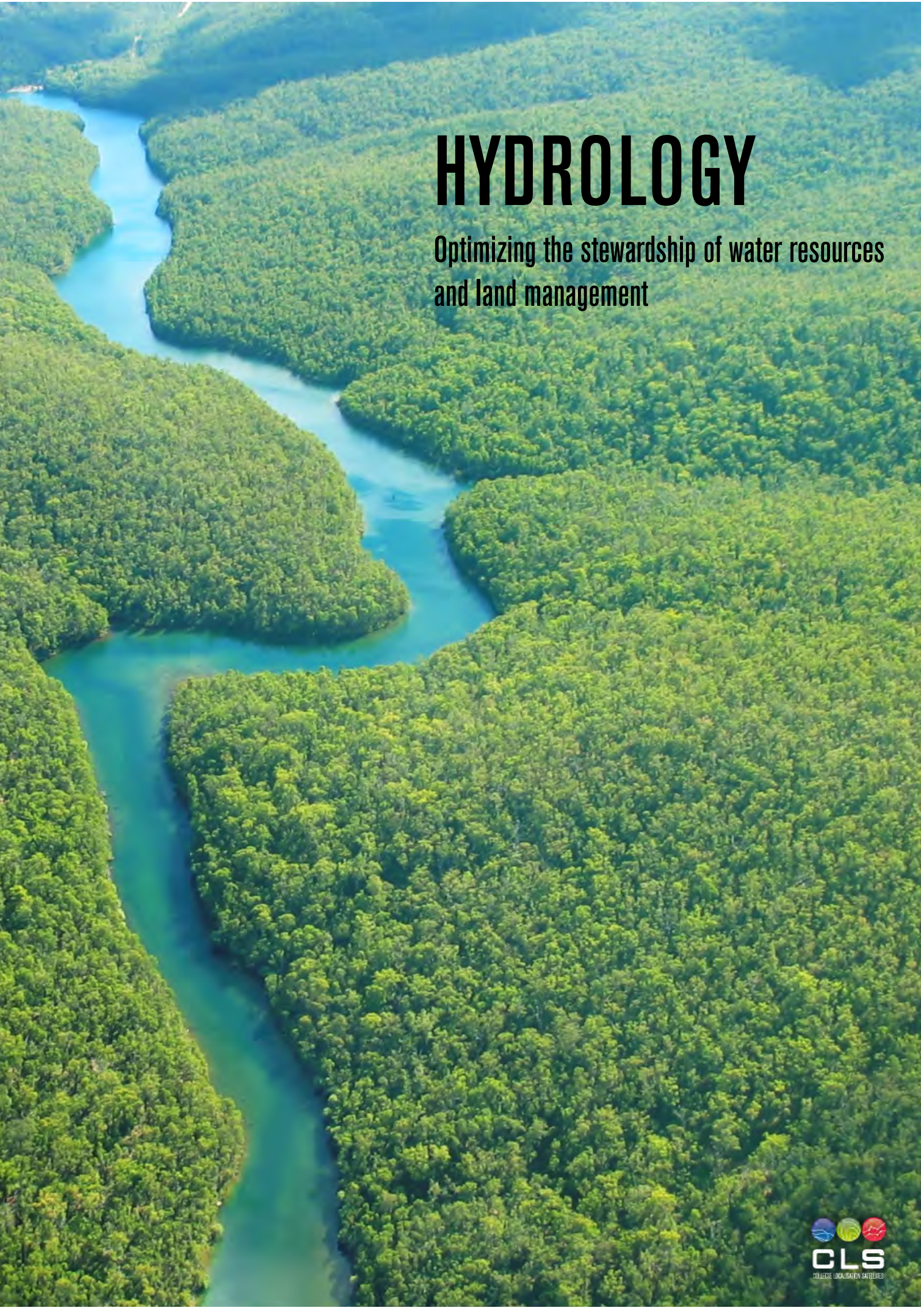


HYDROLOGY

Optimizing the stewardship of water resources and land management

CLS
COLLECTE LOCALISATION SATELLITES

HYDROLOGY

Water has become one of the major challenges of the 21st century. Water resources occupy a central place on the global agenda, affecting emerging, developed and developing countries alike. According to the French Ministry of Ecology, Sustainable Development and Energy (MEDDE), they represent a multi-theme cross-cutting global issue, whether in terms of health, environmental protection, food security, education, energy, economic development or land-use planning. The two major challenges covering all of these themes are the preservation of environmental resources and ecosystems, and universal access to water (mainly for drinking) and sanitation. In this context, CNES has been commissioned to support the development of satellite applications and services in the field of water, in particular. These products and services will rely on all satellite missions that generate relevant data on water. This currently includes Sentinel-1,2,3 Pleiades and Meghtropiques. For the future, the SWOT (Surface Water and Ocean Topography) mission is awaited with great interest. SWOT will enable global coverage of inland waters and provide spatio-temporal variations in the water height of rivers and lakes. In the meantime, the Sentinel-3 altimeter will provide measurements on inland waters that are more accurate than those of most previous altimetry missions.

SWOT Satellite © CNES

Sentinel-3, with its SRAL instrument, will enable more precise characterization, and will complement the JASON missions while awaiting the global coverage to be provided by the forthcoming SWOT mission.

The Sentinel-3 altimeter is now highly anticipated for the study and management of inland waters. Its data will be integrated in the Copernicus Global Land Services platform, which will offer free, open, online access to hydrological data acquired from space. CLS, alongside CNES, LEGOS, CESBIO and many other partners, is working to optimize the acquisition, processing, distribution and exploitation of these hydrological data.

HYDROLOGY

COMBINING SATELLITE SOURCES: THE KEY TO HYDROLOGICAL SOLUTIONS

CLS, a provider of applications and value-added services using satellite data, can offer powerful observation solutions for managing water resources or mitigating extreme weather events. CLS combines different types of data: spatial, *in situ* and those from models.

These solutions should prove invaluable for fair, global management of water resources.

CLS will use the Sentinel-3 data in its hydrological services.

Being more accurate than the existing data, the water height data calculated by CLS from Sentinel-3 will enable the company to deliver more effective services.

These solutions will help improve surveillance of the river networks, and monitoring and forecasting of the state of resources at the regional level.

HYDROLOGY

MONITORING FLOODWATERS

Estelle Obligis, Deputy Director of Space Oceanography at CLS, tells us more: "Thanks to Sentinel-3, the other satellite missions we use and our expertise in altimetry (measuring the height of water), when flooding occurs, we are able, for instance, to monitor the water level in order to anticipate flooding of infrastructure located further downstream.

This is what we did for one of our customers.

A major flood of the Benoué River had serious consequences for local populations and infrastructure. Our customer, who had infrastructures in the Niger Delta, wanted to know whether the flood was over and whether it could return to its plants without putting its employees in danger.

The satellite altimetry data we analyzed showed that most of the water located upstream had already flowed downstream, and that the floodwaters were in the process of receding. This information was vital to our customer for managing the site.

With Sentinel-3, we will be able to perform this kind of monitoring on smaller tributaries and area not yet covered."

Map of levels of the Bénoué River, Nigeria © CLS

HYDROLOGY

SENTINEL-3: HYDROLOGICAL DATA ACCESSIBLE FROM THE EUROPEAN GLOBAL LAND PLATFORM

To address the water challenges facing humanity in the next few years, the European Commission will be introducing a service dedicated to water and snow issues, to be coordinated by CLS within GLOBAL LAND.

This new European service will allow online access to hydrological data derived from space measurements. The data acquired from satellites such as Sentinel-3 and processed by CLS and its European partners will be made freely available via this platform, providing many hydrological and cryospheric parameters.

One of the key hydrological variables that will be produced is the water height of rivers and lakes (used to estimate their flow). CNES is assisting and supporting LEGOS with R&D, in order to integrate new products based on SRAL data. These products will complement those on water height derived from JASON and ALTIKA data in the HYDROWEB platform. The products validated by LEGOS and CLS may then supply the GLOBAL LAND service. One of the components of the European COPERNICUS program, the GLOBAL LAND platform will provide useful first-level parameters for the development of solutions and services related to the management of water

Selma CHERCHALI, Manager of Continental Environment and Hydrology Programs at CNES

Selma Cherchali, Manager of Continental Environment Programs at CNES says: "These new services are the result of close cooperation between the European Commission, space agencies (ESA, CNES…), research laboratories and industrial/service companies. They respond to growing calls from society in the field of water and environmental management."

HYDROLOGY

INCREASING KNOWLEDGE OF THE LOCAL WATER CYCLE FOR BETTER MANAGEMENT OF THE RESOURCES AND RISKS

The key to land management in terms of hydrology is to enhance our knowledge of the water cycle. Today, CESBIO[1] and its partners LEGOS[2] and GET[3] are using satellite data to map the extent of open water areas in the major tropical watersheds such as the Amazon, Congo, Ganges, etc. (with the help of the SMOS satellite), in order to determine variations in volume by coupling them with the JASON-2 altimetry data made available by CLS on the CNES AVISO+ platform. This work will help them better understand the water cycle in these regions and better estimate the flow of the world's largest rivers.

This promising work is being conducted as part of CNES's TOSCA-SOLE project (Ahmad Al Bitar, Yann Kerr et al., post-doc Marie Parrens from CESBIO).

[1] Centre for the Study of the Biosphere from Space

[2] Laboratory for Space Studies in Geophysics and Space Oceanography

[3] Geoscience Environment Toulouse

Knowledge of local water cycles is an indispensable condition for the optimal management of water resources and the risks associated with water flows. Satellites such as Sentinel-3 combined with the know-how of players such as CESBIO and CLS will be decisive.

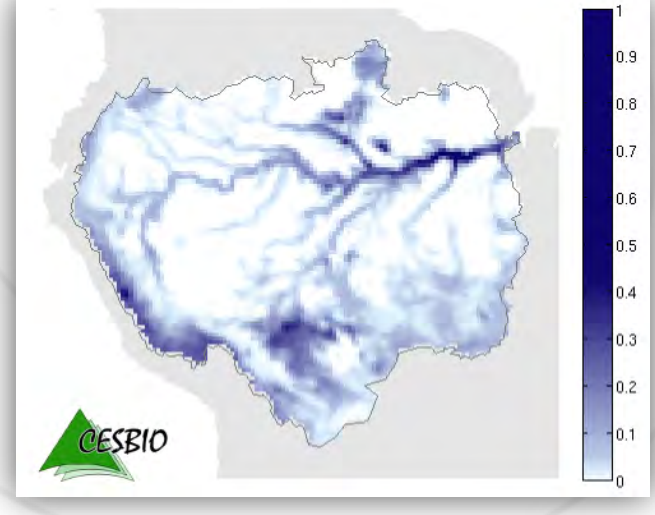
HYDROLOGY

Thanks to Sentinel-3, these researchers will be able to continue working with recent altimetry data to study the latest droughts and/or floods in these major watersheds. They will also benefit from better temporal resolution, enabling them to refine their spatial coverage and validate their approaches in more detail, in order to gain a better understanding of the water cycle in tropical regions.

They will then be able to link these water masses that have been estimated from space to different hydrological flows, and associate them with the time elapsing between when the water falls on the ground and when it reaches the ocean at the river outlet, with the aim of better predicting the flow of the world's major rivers, which are subject to growing human pressure on the land.

In some regions, they will thus be able to determine the state of water resources available for populations (supply of homes, urban networks), agricultural crops (resources available for irrigation), livestock (animals' water needs), etc.

This information will also quantify the water reserves supplying the water cycle at the local level, where a surplus or deficit may cause drought or flooding. This information could prove vital in regions that are particularly vulnerable to climate change, and in the management of risks to populations.



Estimate of open water areas seen by SMOS between 2010 and 2015. These will be coupled with altimetry data (JASON-2, JASON-3, Sentinel -3) to obtain the volumes of water in the Amazon Basin.

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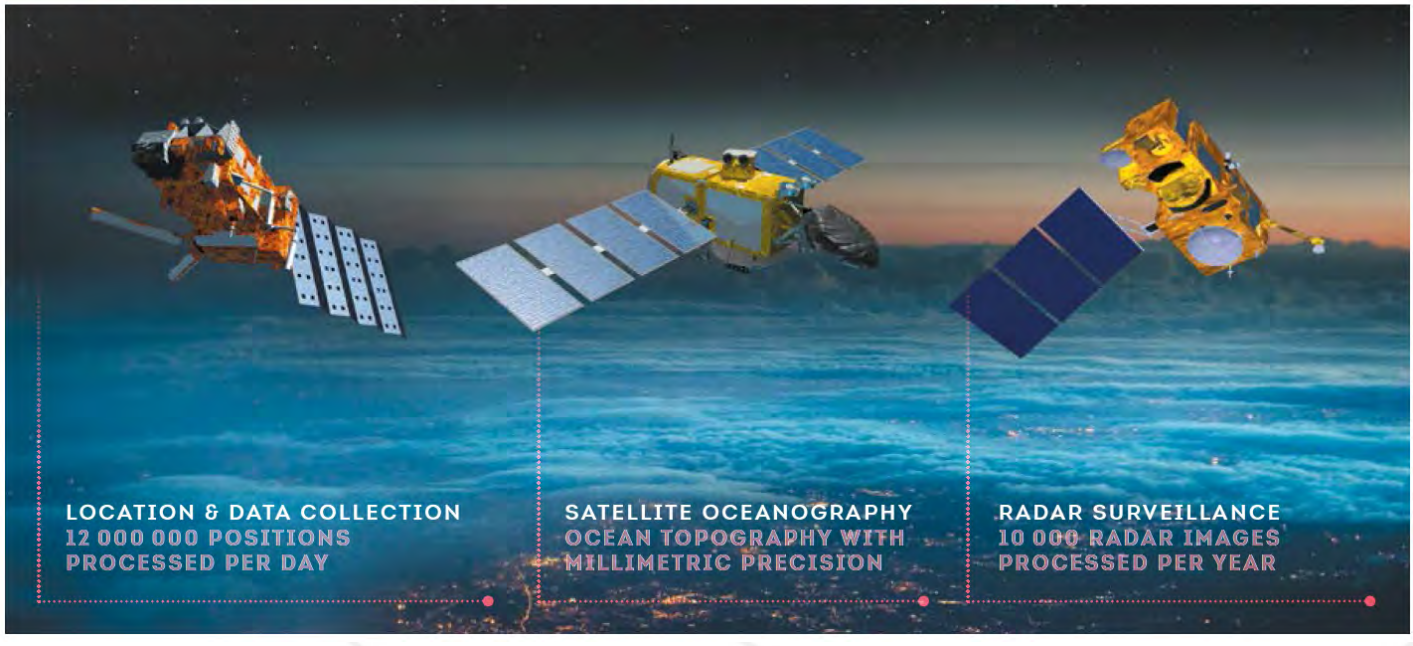
our expertise

Operational exploitation of satellite systems for: location and data collection, ocean observation and ocean surveillance.

Development and marketing of products and added-value services based on 5 strategic fields: sustainable management of marine resources, environmental monitoring, maritime security, optimized management of land vehicles, and monitoring services for the energy sector.

3 types of satellite systems used



CLS

products and services

5 strategic fields

SUSTAINABLE MANAGEMENT **OF MARINE RESOURCES**

- Management solutions for regulated fisheries.
- Infrastructure solutions to fight against illegal fishing.
- Regional modelling of marine ecosystems for sustainable management policies.

ENVIRONMENTAL **MONITORING**

- Systems for measuring, observing, modelling and forecasting ocean behavior on the surface and at depth.
- A full location and data collection service for wildlife protection.
- Applications and services for the management of fresh water resources and river networks.

MARITIME **SECURITY**

- Fleet management solutions and tools in support of safety operations at sea.
- Proven ocean monitoring solutions: maritime traffic monitoring, oil spill detection.
- Data fusion & integration products: tools to help decision-makers initiate and coordinate actions at sea.

OPTIMIZED MANAGEMENT **OF LAND VEHICLES**

- Customizable telematics solutions for the transport and logistics industry.
- Tailored fleet & waste management solutions to help fleet operators.
- Fleet geopositioning services (rescue vehicles) to help humanitarian organizations optimize the efficiency of their emergency operations.

MONITORING SERVICES **FOR THE ENERGY SECTOR**

- Tailored solutions for detecting, measuring and mapping ground movements for the energy sector.
- Solutions to support the security and efficiency of offshore operations, to measure and forecast the impact of climate change, and lead the oil & gas industry to an eco responsible and environmentally friendly approach.

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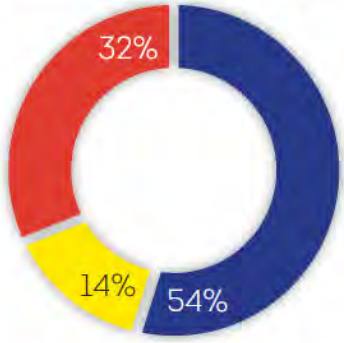
shareholders



ARDIAN

Ifremer

cnes

550 employees

* OUTSIDE OF FRANCE

FRANCE
300 PEOPLE

AMERICAS
100 PEOPLE

EUROPE*
110 PEOPLE

ASIA / PACIFIC
40 PEOPLE

worldwide network


CLS
COLLECTE LOCALISATION SATELLITES