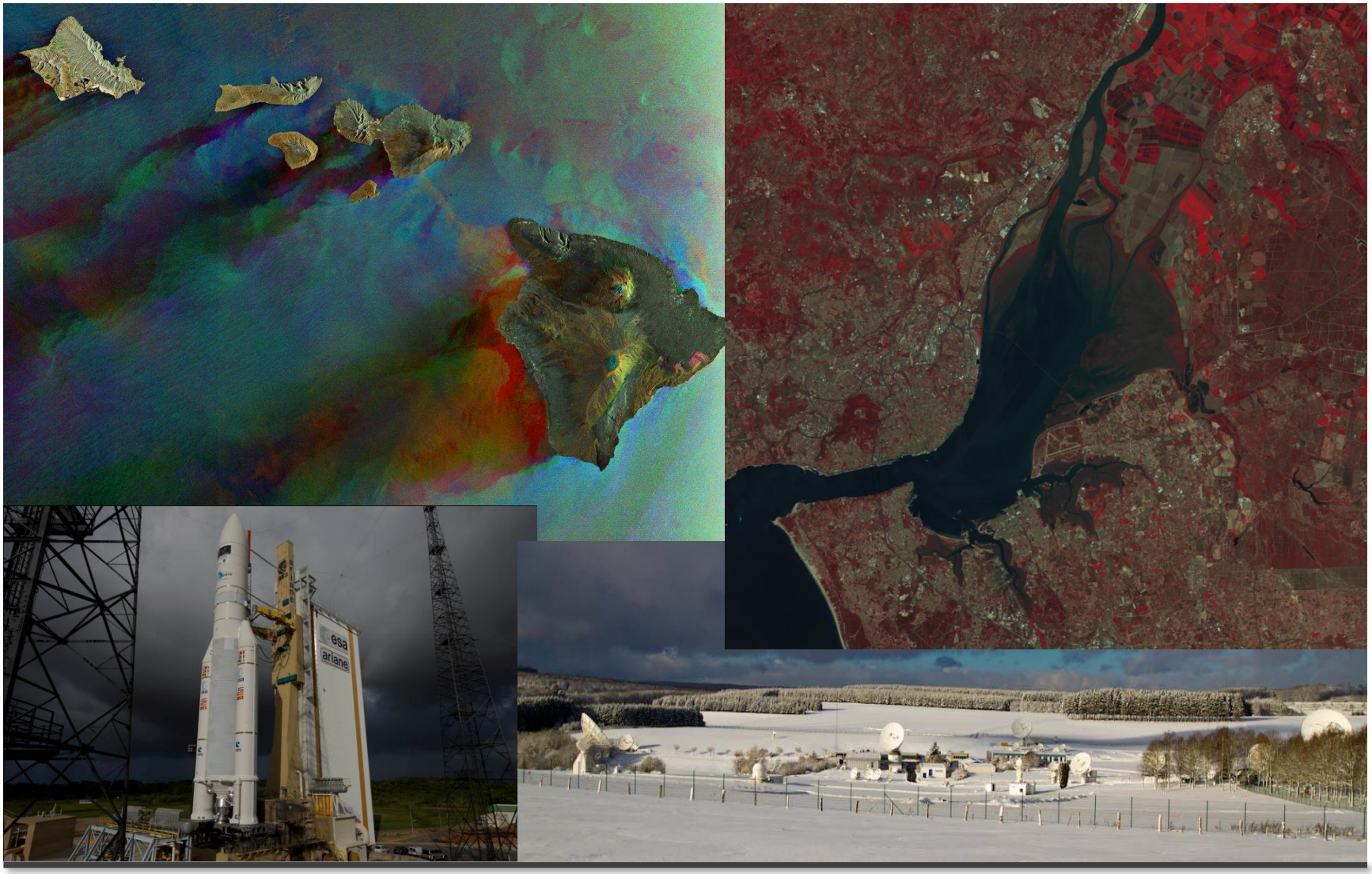
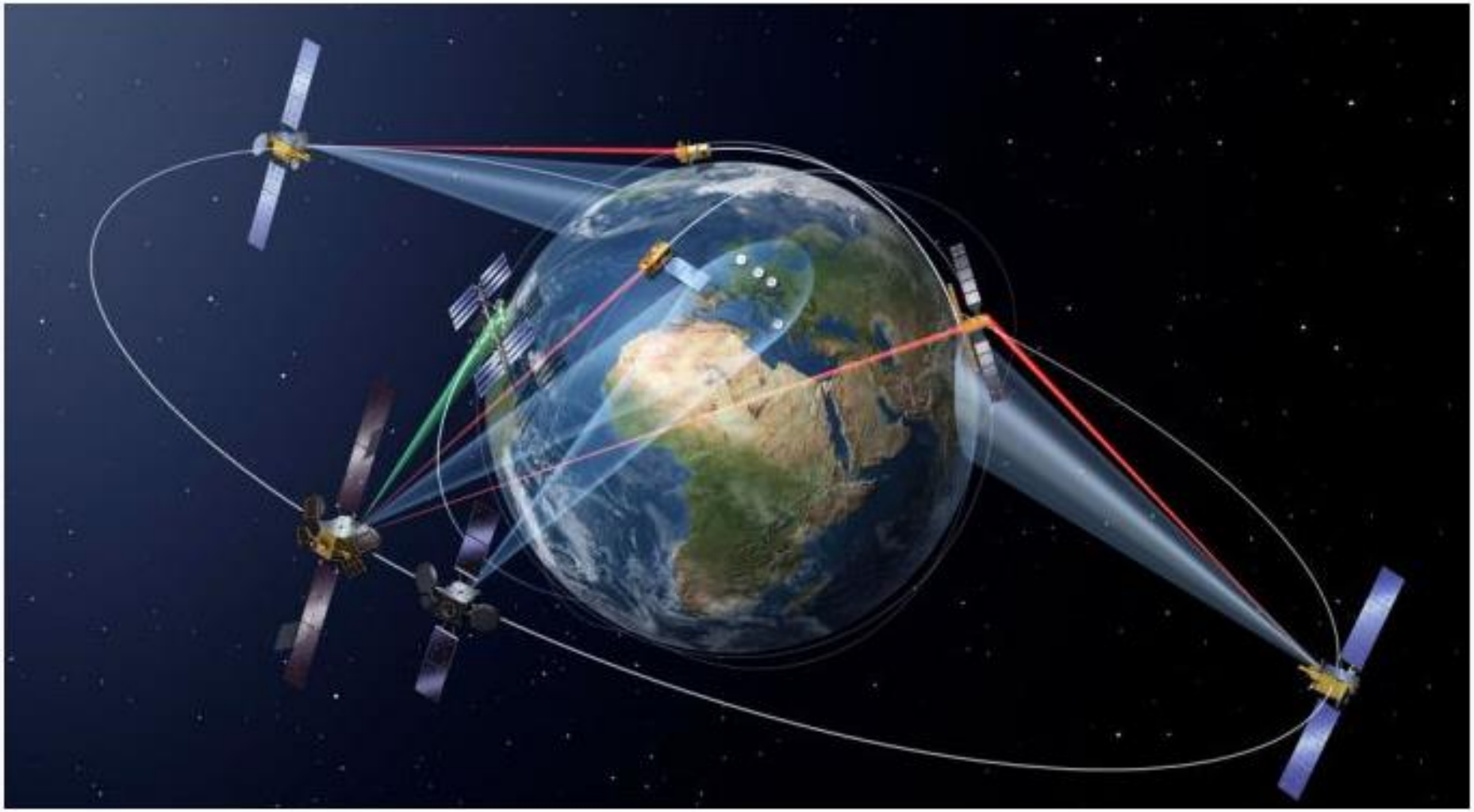
DETECÇÃO REMOTA e PROCESSAMENTO DE IMAGEM



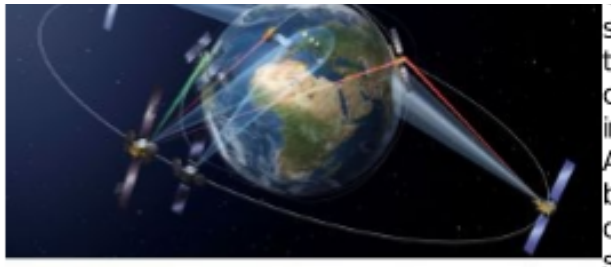


Satellite-based Earth

Big data environment

Companies (both operators and new service providers, such as Orbital Insights, AllSource Analysis, etc.) are building algorithms to detect changes in multisourced data to detect patterns and build predictive analytics, said Pacome Revillon, CEO of Euroconsult. Bringing higher-frequency collected data into these models, the so-called 'Big Data' environment will further aid developments, with the potential to open new services areas based around location-based systems such as financial intelligence and site monitoring, among others.

Euroconsult has identified approximately 20 companies that have announced intentions to develop lower-cost constellations to collect data at a high rate of revisit based on smallsat and cubesat technologies. As of 2017, these new operators have attracted more than USD600 million in venture capital to fund their initiatives. None of the newly announced initiatives have yet reached full capacity; for these constellations to come to fruition, additional investments will be required.



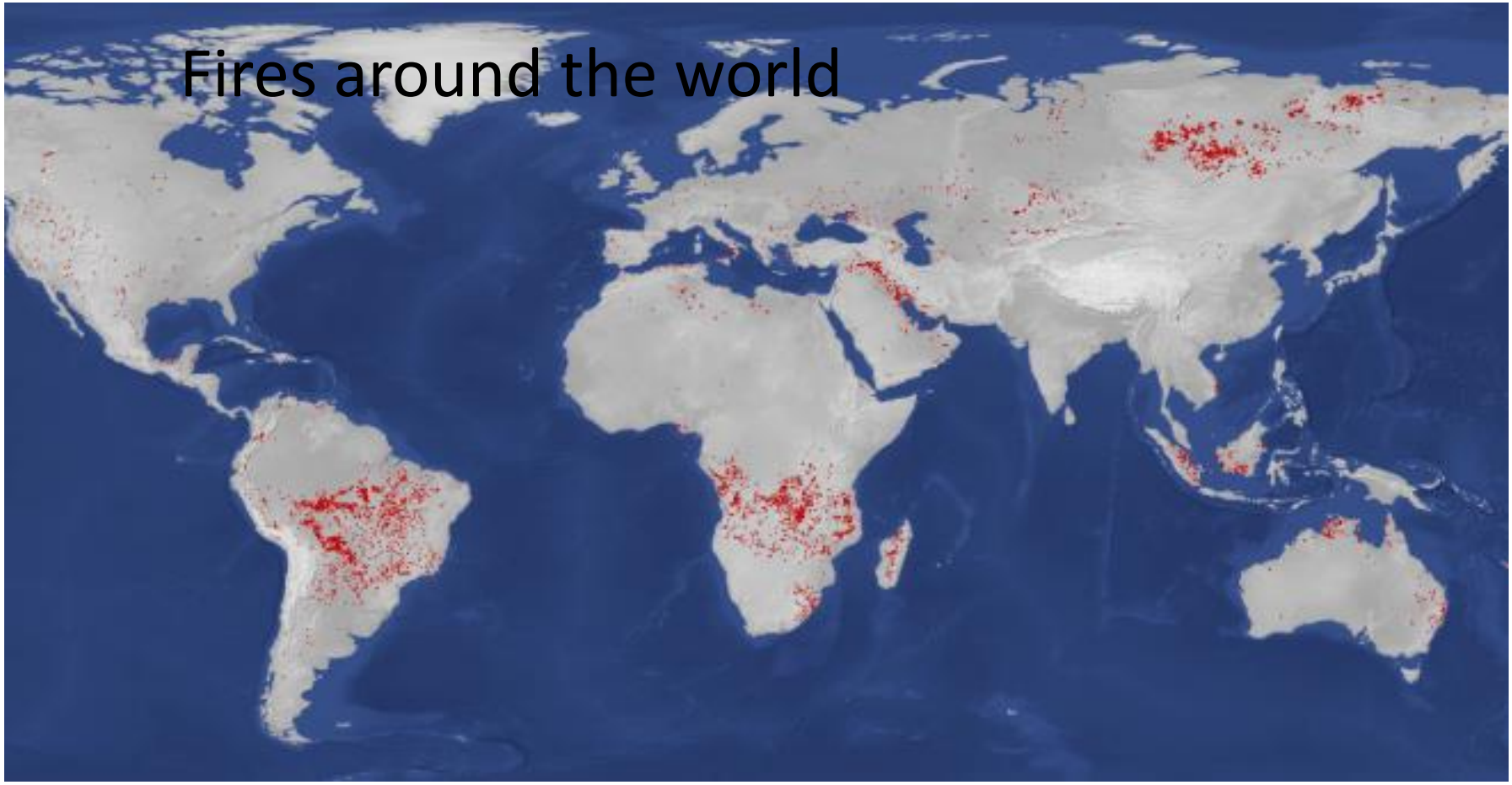
services market should reach USD8.5 billion by 2026 based on current growth trajectories. An alternative value-added services (VAS) model also presented has a combined market potential of USD15 billion. This upside model considers the implications of new supply solutions being able to open further markets. Additionally, advances in artificial intelligence and deep learning are expected to benefit the sector, acting as enablers for new solutions based on change-detection analytics. Simultaneously, competition is expected to be fierce on the supply side.

The growth drivers for data and services are distinctly different. Defence still dominates the market for commercial data, with the sector alone responsible for over USD1 billion in data sales with a focus on very high-resolution and high-accuracy datasets. Data prices to support defence applications are expected to remain high, a drawback for services development in the civil government and private sector. VAS' largest markets remain infrastructure and natural resources monitoring. However, in order to build these solutions often lower-cost or free data solutions are utilised. This creates a disparity in the value chain in which high-cost, precision datasets make up most of the defence-driven commercial data market, whereas more services are being built from less expensive, more competitively priced solutions.

The Copernicus Programme of the European Union is poised for growth. Spearheading the earth observation industry of Europe, Copernicus contributes heavily to the economic excellence of the Space industry.

Recognised as a leader of development, the earth observation industry is creating both social and economic impact at the global stage. The commercial earth observation industry is generating high-resolution and multi-spectral data that is unprecedented in both magnitude and scope. Since the launch of the first civil imagery satellite system, LANDSAT, countries globally have understood the need for satellite systems to support policy objectives for sustainable development, national security and climate change. In this regard, the Copernicus Programme, fondly known as 'Europe's eye on Earth', is an Earth Observation Programme formed in collaboration with the European Union (EU), the European Space Agency (ESA), and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), and the member states. Also, known as Europe's leading and world's largest civil earth observation program; the satellites and in-situ sensors, are focused on monitoring the Earth and its diverse ecosystem to generate economic, social, environmental and strategic benefits globally thus creating significant economic impact of Copernicus.

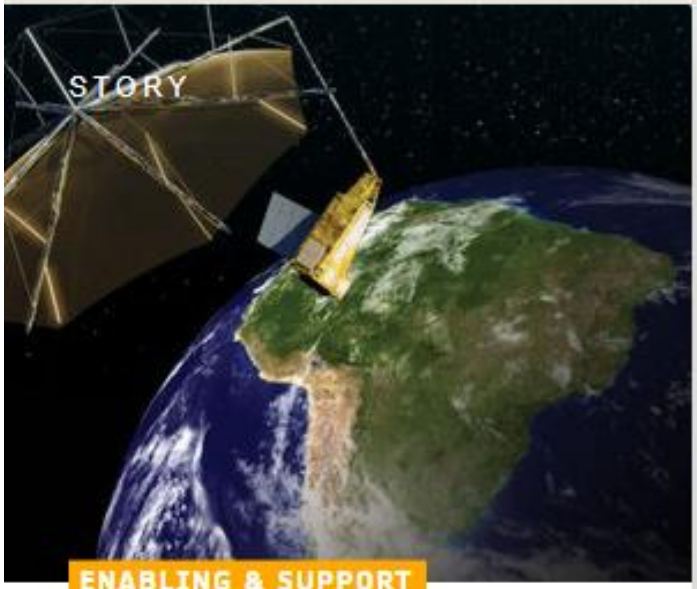
Fires around the world



Data from the Sentinel-3 World Fire Atlas shows that there were almost five times as many wildfires in August 2019 compared to August 2018, but a detailed analysis reveals precisely where these fires have been occurring – most of which were in Asia.

Working like thermometers in the sky, the sensors on satellites measure thermal infrared radiation to take the temperature of Earth's land surfaces. This information is used to detect and monitor the heat emitted by the fires.

BIOMASS



ENABLING & SUPPORT

Key components of tree-counting Biomass radar cleared for s...

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APPLICATIONS

Ready to build the Biomass forest mission

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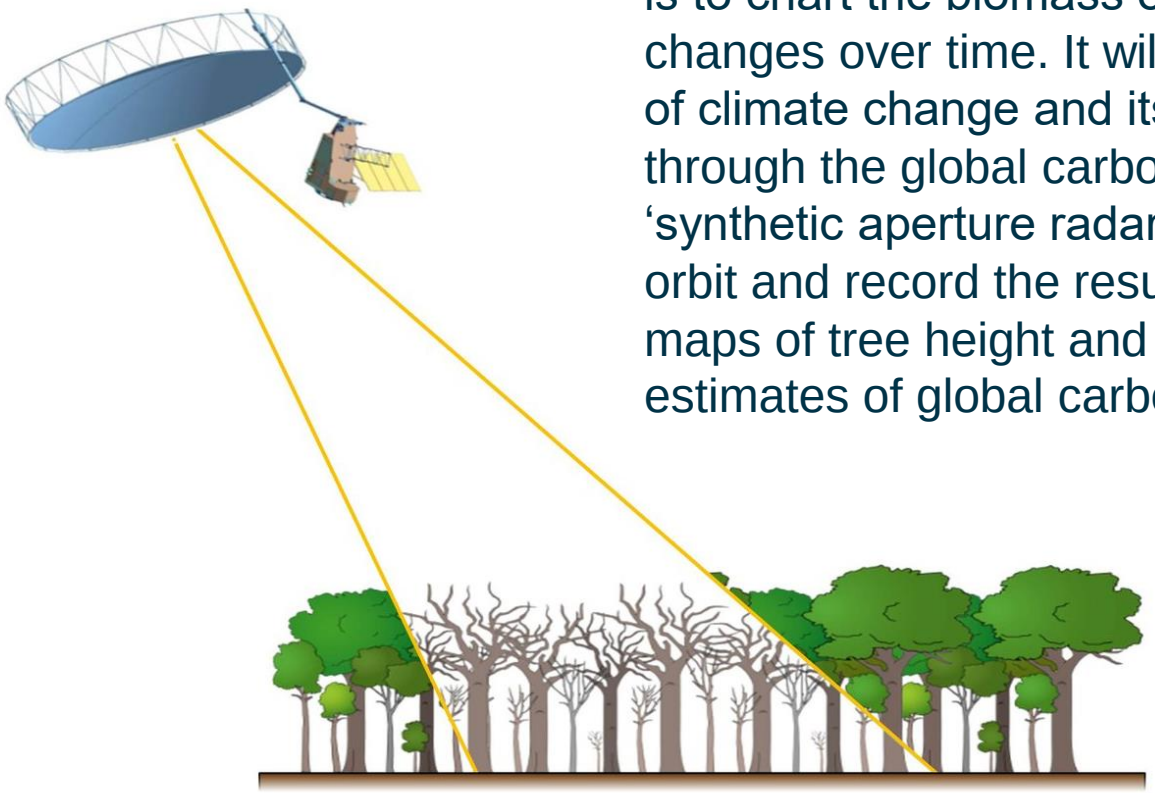
BIOMASS



Due for launch in 2022, Biomass's five-year mission is to chart the biomass of Earth's forests, and its changes over time. It will contribute to understanding of climate change and its effects on Earth's system through the global carbon cycle. It does this using a 'synthetic aperture radar' to send down signals from orbit and record the resulting backscatter, to build up maps of tree height and volume, and sharpen estimates of global carbon stocks.

To be launch in 2022

To see through leafy treetop to the trees themselves, Biomass will employ long-wavelength 'P-band' radar, which has never previously flown in space. It will have its signals amplified to travel down from a 600-km-altitude orbit down to Earth and back.

DETECÇÃO REMOTA e PROCESSAMENTO IMAGEM

Programa -Teórica

Cap. 5 **A Detecção Remota**

Cap. 6 **Princípios Físicos da Deteção Remota**

Cap. 7 **Órbitas**

Cap. 8 **Satélites e Sensores**

DETECÇÃO REMOTA e PROCESSAMENTO IMAGEM

Capitulo 5 – A Detecção Remota

- O que é da Deteção Remota
- Radiação Eletromagnética
- Interação com atmosfera, Interação Radiação-Alvo
- Assinatura Espectral
- Deteção Passiva vs Ativa
- Sensores Óticos
- Características das imagens
- Resolução Espacial, Espectral, Radiométrica e Temporal
- Formato dos dados
- Distorção geométrica das imagens

DETECÇÃO REMOTA e PROCESSAMENTO IMAGEM

Capitulo 6 – Princípios Físicos da Detecção Remota

- Ondas eletromagnéticas e Equação de Maxwell
- Polarização e Interferência das ondas eletromagnéticas
- O espectro eletromagnético
- Fontes de radiação eletromagnética
- Quantidades radiométricas
- Interação da radiação eletromagnética com a matéria
- Interação da radiação eletromagnética com a atmosfera
- Conversão números digitais para radiância

DETECÇÃO REMOTA e PROCESSAMENTO IMAGEM

Capitulo 7 – Órbitas

- Órbitas e Swaths
- Generalidades sobre movimento
- As leis de Kepler
- Estudo do movimento do corpo
- Equação do movimento no plano
- Estudo do movimento na órbita
- Os parâmetros da órbita
- Perturbação da órbita
- Órbitas usadas para observação da Terra (Geoestacionárias e heliosincronas)
- Determinação dos parâmetros orbitais

DETECÇÃO REMOTA e PROCESSAMENTO IMAGEM

Capitulo 8 – Satélites e Sensores

- Satélites Meteorológicos
  - GOES, NOAA AVHRR, Outros satélites
- Satélites de Observação do Mar
- Altimetria Espacial
- Missões Geopotenciais Espaciais
- Missões LIDAR
- Missões SAR
- Missões na banda do visível
  - LANSAT, SPOT, IRS, IKONOS, QuickBird, GeoEye-1

DETECÇÃO REMOTA e PROCESSAMENTO IMAGEM

Programa -Prática

6 Nov	Características das imagens de satélite Sentinel-2, Landsat-8 (resolução espectral, espacial, radiométrica e temporal, largura de banda). Visualização das imagens na aplicação ENVI. Composições coloridas (cor verdadeira e falsa cor). Visualização dos respetivos ficheiros de metadados.
13 Nov	Descarregamento de uma imagem Landsat-8 do site Landsat Data Acess (http://earthexplorer.usgs.gov). Junção das bandas multispectrais (B2 a B5) da imagem Landat-8 (Layer Stacking). Extração de uma área geográfica da imagem Landsat-8 (Subset Data from ROIs). Fusão de bandas: fusão das bandas multispectrais com a banda pancromática (B8) da imagem Landsat-8 (SPEAR Pan Sharpening).
20 Nov	Fontes de distorção radiométrica. Correcção ao topo da atmosfera (TOA correction) de uma imagem do satélite Landsat-8 (Band Math). Correção atmosférica de imagens (Sen2Cor)
27 Nov	Deteção de alterações. Determinação de área ardida numa imagem satélite
4 Dez	Deteção de alterações. Determinação de área ardida numa imagem satélite
11 Dez	Conceitos básicos sobre imagens SAR (calibração, multilooking, filtros de speckle, correcção de terreno).
18 Dez	Apresentação do trabalho prático

DETECÇÃO REMOTA e PROCESSAMENTO IMAGEM

Avaliação

Exame Escrito	60%
Relatório do trabalho prático:	40%

A data limite para entrega do trabalho prático é **18 de Dezembro de 2019.** Deve entregar o relatório através do Moodle em formato PDF até ao final desse dia.

Bibliografia

- Fundamentals of Remote Sensing, Canada Centre for Remote Sensing. http://www.ccrs.nrcan.gc.ca/resource/tutor/fundam/index_e.php

- Ana Duarte Fonseca, João Cordeiro Fernandes, "Detecção Remota". LIDEL.

- R.A. Schowengerdt, "Remote Sensing. Models and Methods for Image Processing", Academic Press ed.

- Remote Sensing Digital Image Analysis, An Introduction. Hohn A. Richards. Springer-Verlag.

- Principles and Applications of Imaging Radar. Manual of Remote Sensing, Third Edition, Vol. 2. Edited by Floyd M. Henderson and Anthony J. Lewis.

- Remote Sensing of the Earth Sciences. Manual of Remote Sensing, Third Edition, Vol. 3. Edited by Andrew N. Rencz.

DETECÇÃO REMOTA e PROCESSAMENTO IMAGEM

Agencias Espaciais

www.esa.int	European Space Agency
www.nasa.gov	National Aeronautics and Space Administration
www.dlr.de	Deutches Zentrum für Luft- und Raumfahrt
www.nasda.go.jp	National Space Development Agency of Japan
www.cnes.fr	Centre National d'études Spatiales
www.space.gc.ca	Canadian Space Agency
www.bnsc.gov.uk	British National Space Centre
www.isro.org	Indian Space Research Organization

Noticia 23 Novembro 2017

Sentinel-2A

La Rochelle and surroundings are featured in this Sentinel-2A image, captured on 26 December 2015.