155DPRZ
Practical lesson

Lesson 1 - Introduction

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esa

→ WHAT IS REMOTE SENSING?

Remote Sensing is the principle of measuring information about an object without being in physical contact with it.

The instruments that are used in remote sensing are called sensors. They measure the electromagnetic radiation of objects and convert it into data that a computer can interpret.

Remote sensing can be done from the ground, from an aircraft or from space. In remote sensing from space, the sensors are mounted on a satellite and are oriented towards the Earth so that the atmosphere, ocean, land and objects such as trees, crops, buildings, rivers can be observed.

Remote sensing sensors are grouped into two categories: passive and active.

Mosaic of optical images measured by a Passive sensor (Envisat MERIS)

PASSIVE SENSORS

Passive sensors measure the radiation coming from a source external to the sensor, such as the sunlight reflected by objects on the Earth or the thermal infrared radiation emitted by the Earth itself. Passive sensors cannot detect sunlight during the night. If they are optical, they also cannot see through clouds.

Mosaic of radar images measured by an Active sensor (Envisat ASAR)

ACTIVE SENSORS

Active sensors use their own source of radiation. In this case, the sensor emits radiation towards objects on the Earth and measures the amount of radiation reflected back. In contrast to passive sensors, active sensors can measure by day and by night. If they are radar, they also can see through clouds.

Find out more at: **www.esa.int/eduspace**

European Space Agency

In which fields is remote sensing commonly used?

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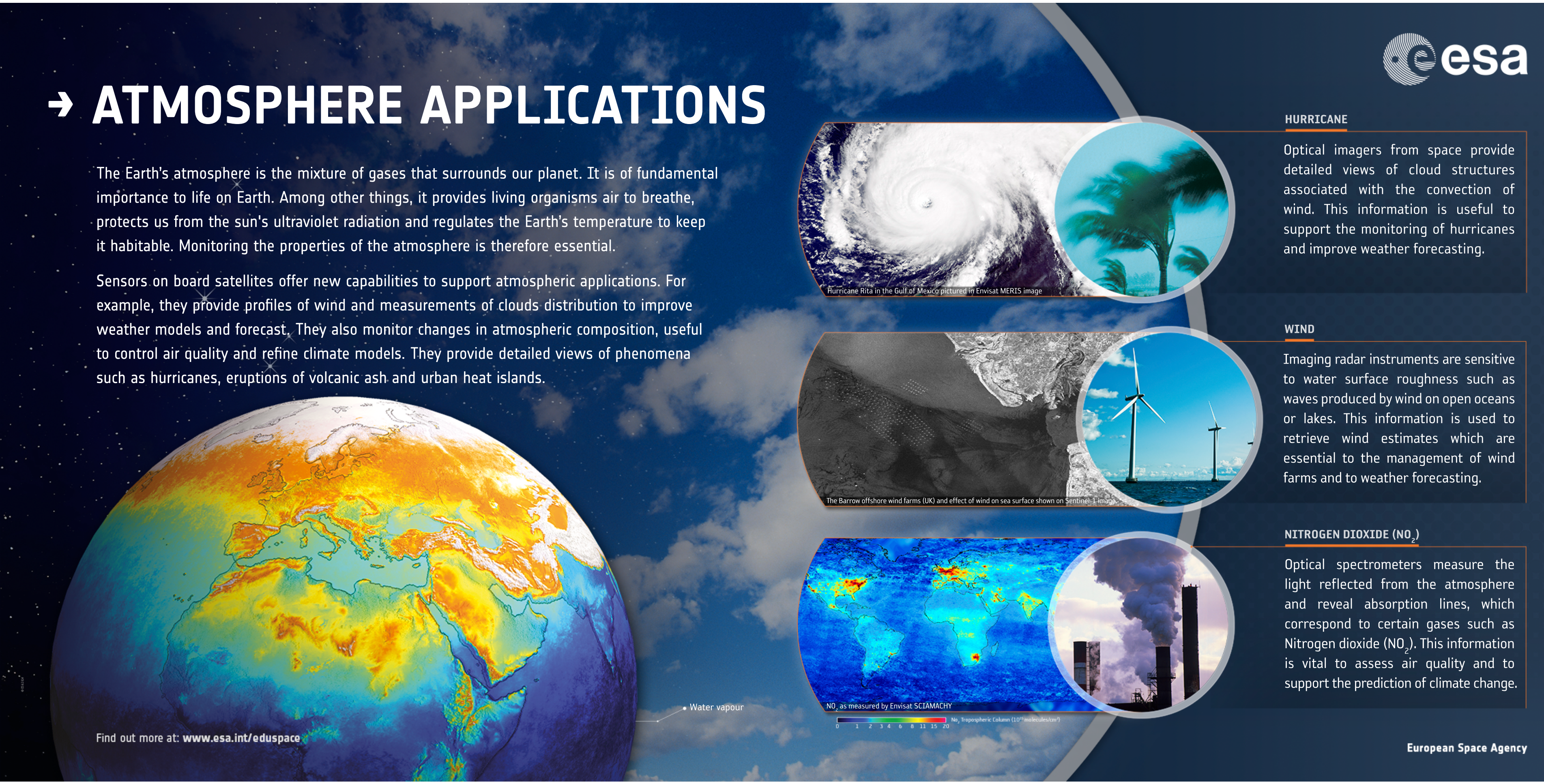

What is the name of a satellite that we see every day in weather forcast on CT? Is it an active or passive sensor?

What remote sensing data outcome we use on a daily basis?

Is it an active or pasive sensor? Why?

What would be the rise of a ocean level (in meters) if all ice would melt?

The biggest ammount of ice was detected in Peistocen, do you know how may %?

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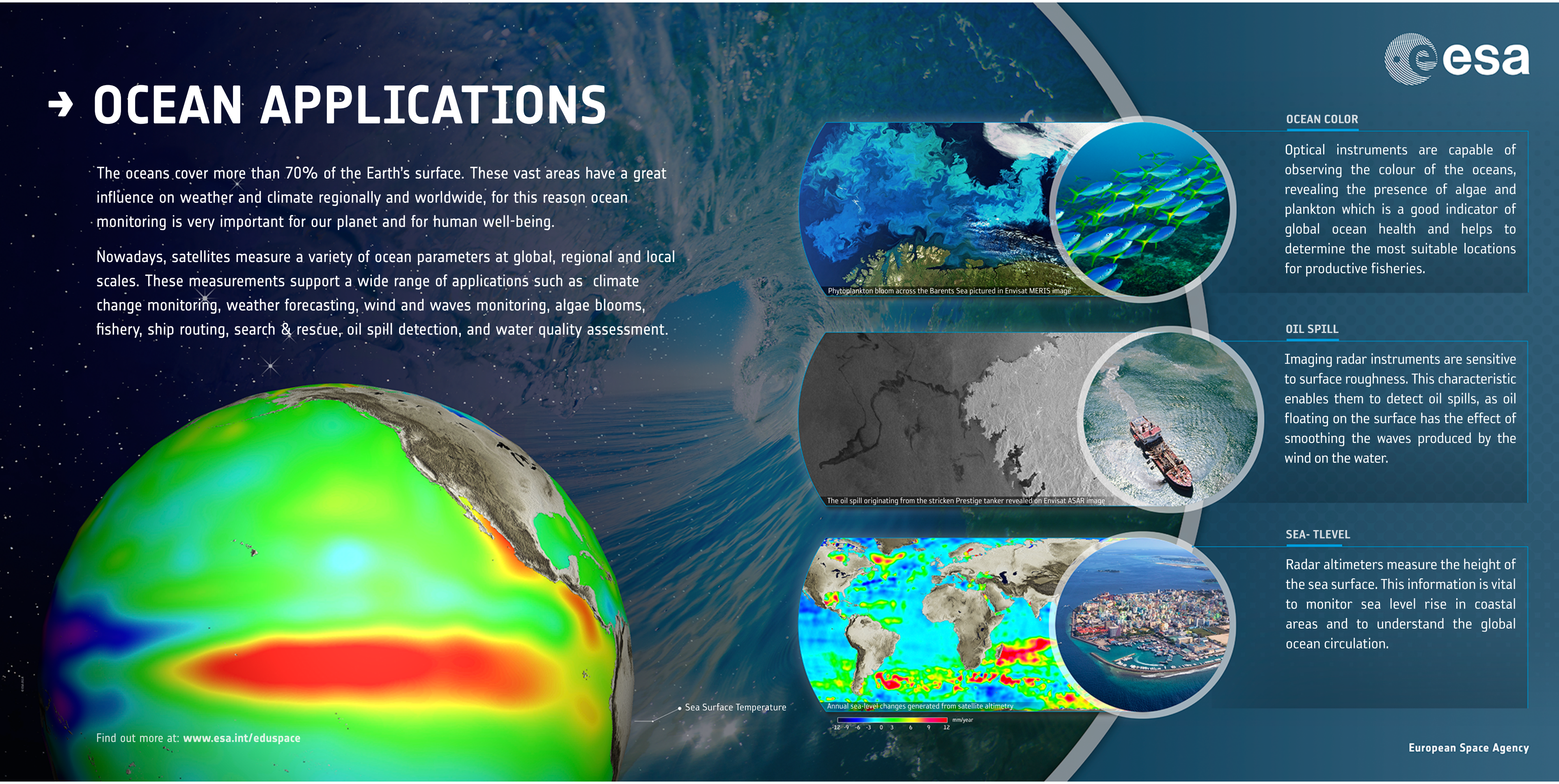


Do you know what is an approxamate rize of the ocean level every year?

Term explanation

PIXEL

Basic image element

Shortcut of „picture element“

Place where one measured information is detected

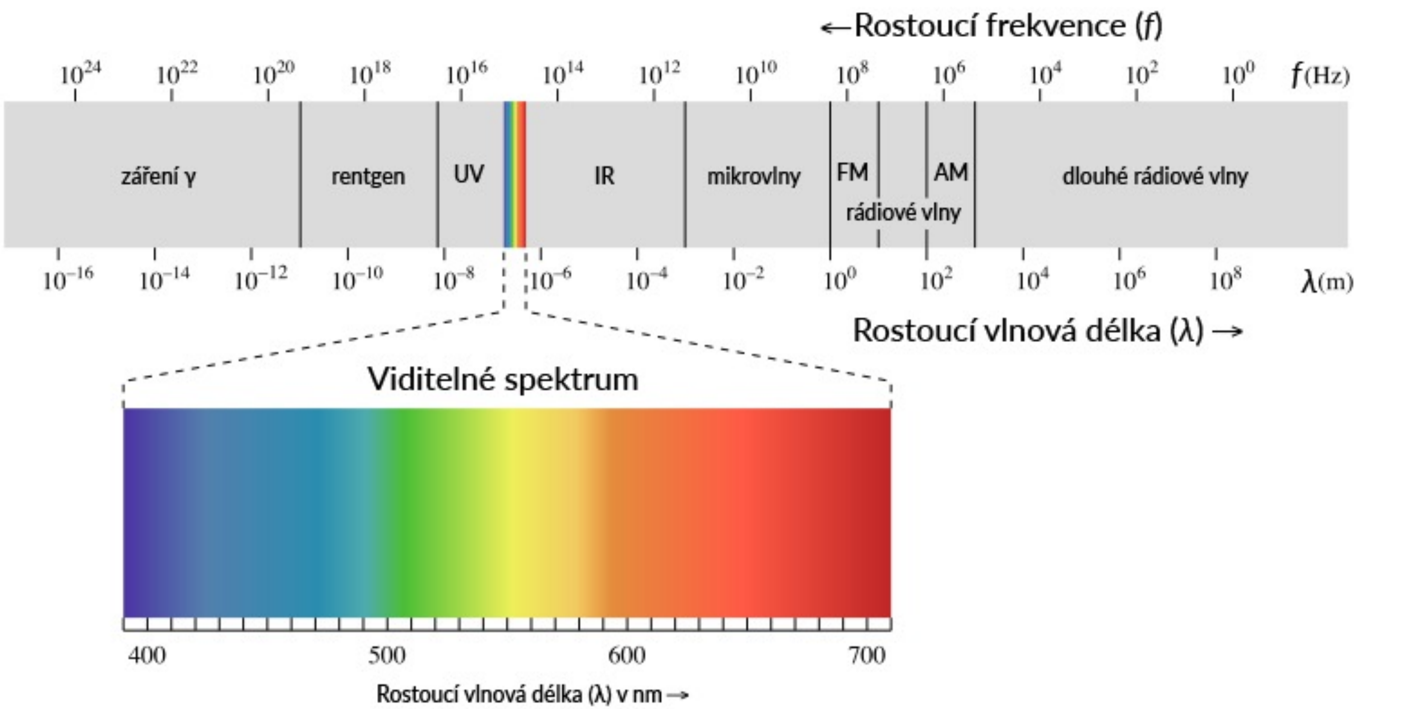
Defined spacial coordinates in raster

Term explanation

BAND

Is part of an electromagnetic spectrum defined by boundary wave lengths

Number of bands and their width defines the data characteristics



Term explanation

RESOLUTION

Spatial – size of one point (pixel) – Low and middle, High, Very high

Spectral – Panchromatic (1 band), Multispectral, Hyperspectral (tens to hundreds od bands)

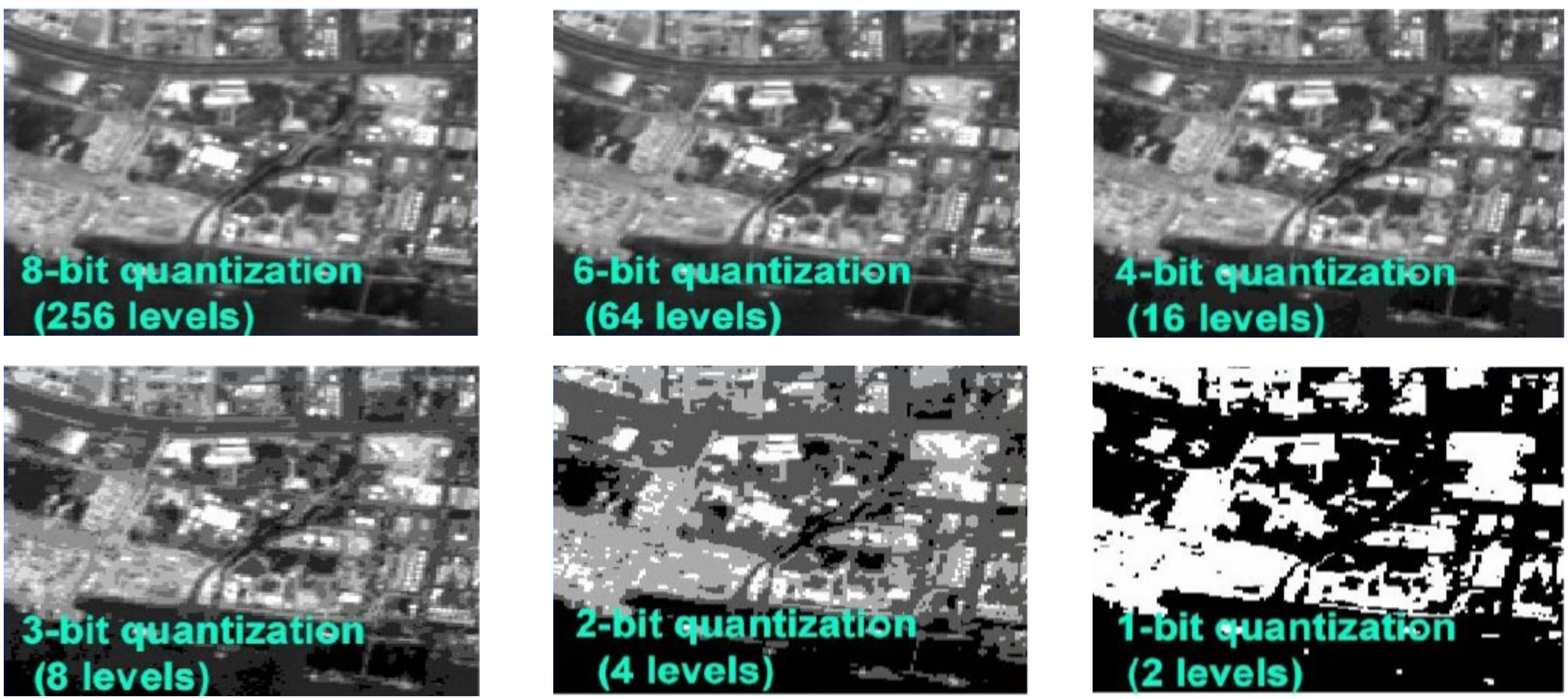
Temporal – revisit frequency of a defined area

Radiometric – pixel depth – smallest change in radiance intensity that can be detected (in bites)

Polarimetric – for radar data – better distinguishing between land cover types, improves object detection

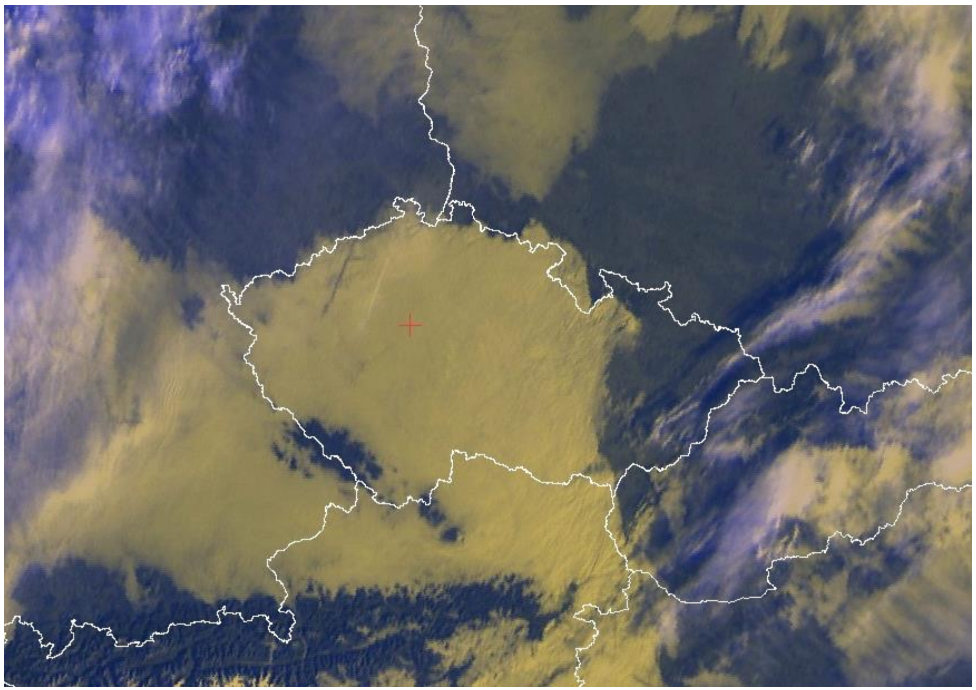
Examples

RESOLUTION

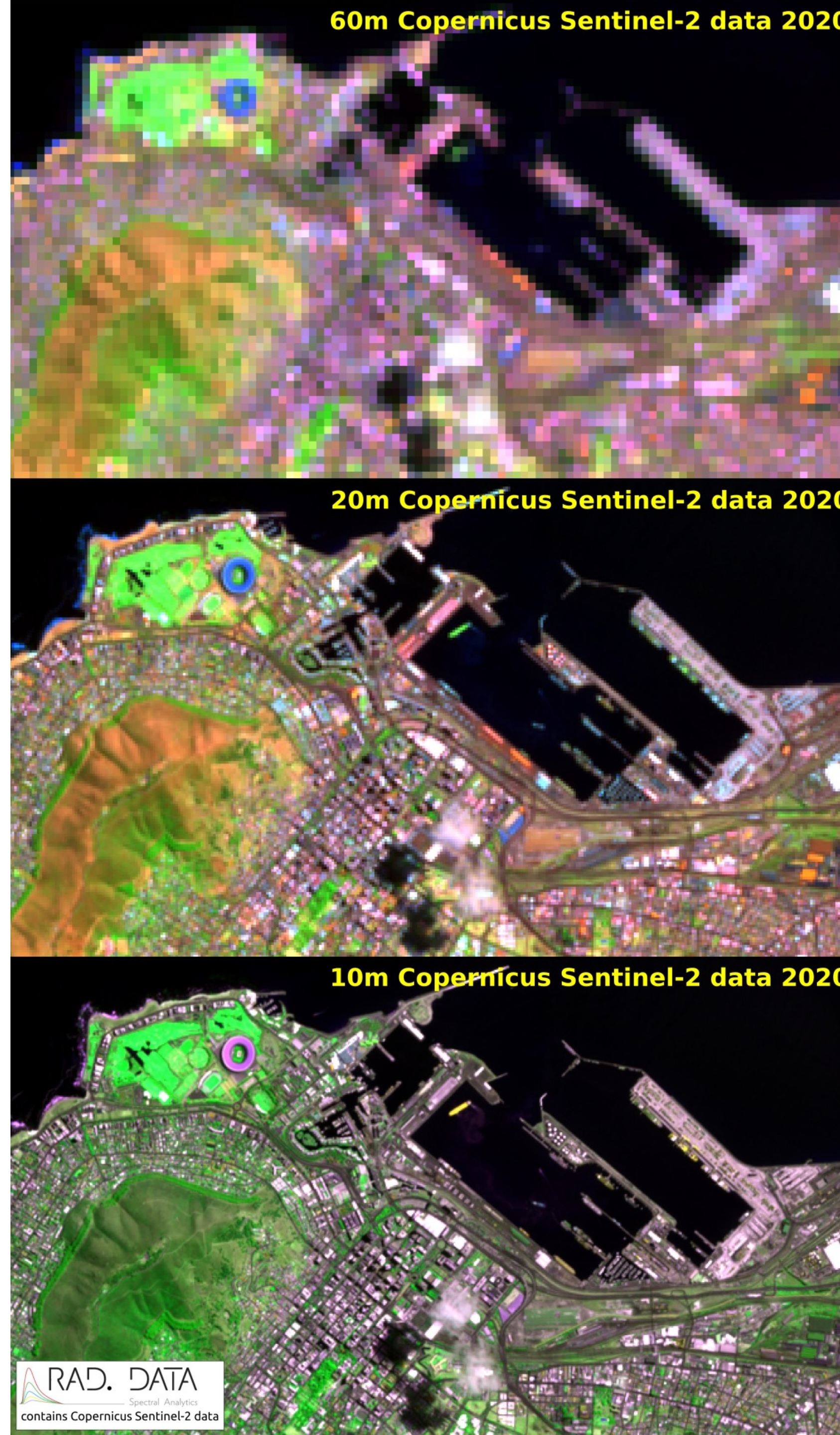


Examples

RESOLITION



Low to middle- Meteosat MSG (km)
High - Sentinel 2 sensor MSI (tens of m)



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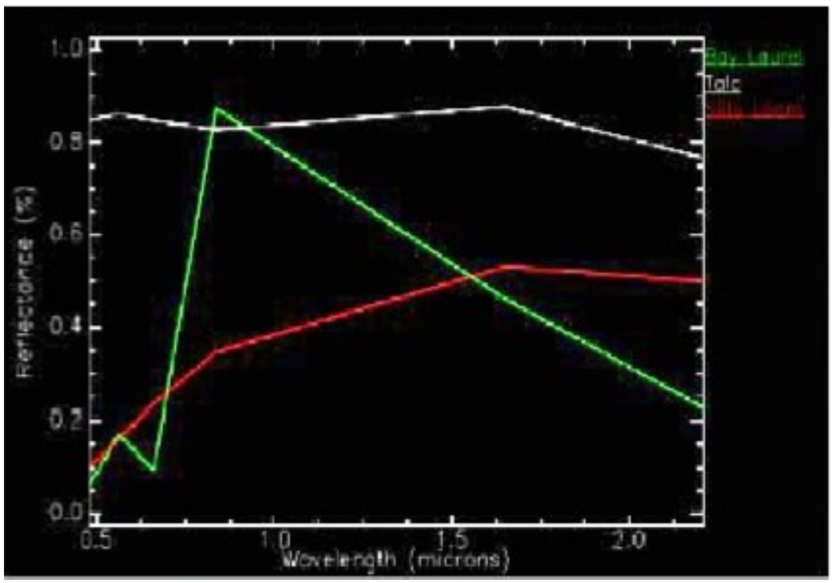
Very high resolution

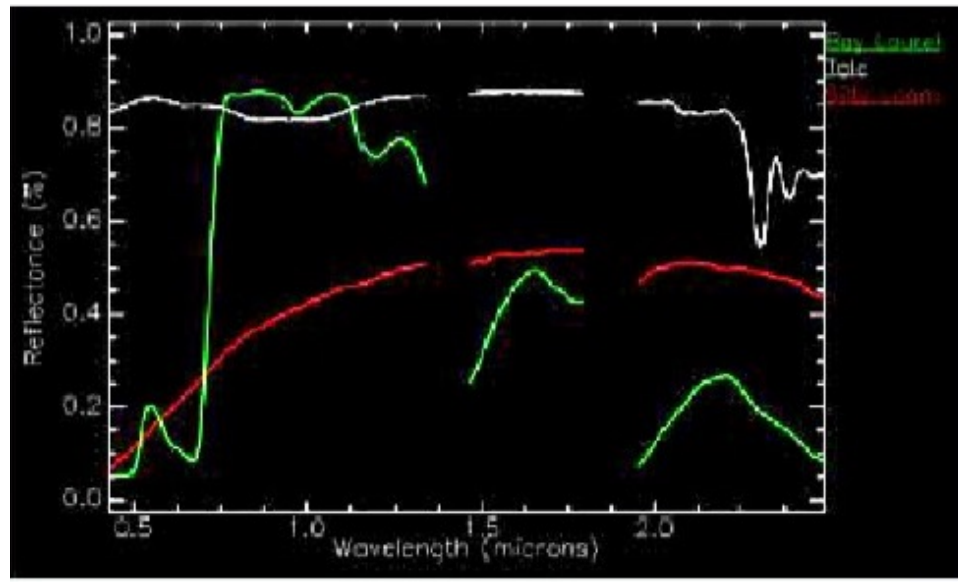
Pleiádes-NEO
MS 1,2m
PAN 0,3m

Can you recognize the city?

Examples

RESOLUTION





Landsat 7 - ETM 7 bands

Letecké - AVIRIS, 224 bands, absorption bands

Panchromatic band – Pan (all) Chroma (color) = 1band in a spectral range of visible and VNIR, black and white picture in grey scale

Data processing types

Unprocessed („raw“) data

Processed (“system corrected“) data

By „processing“ we mean implementation of basic radiometric (sensor calibration), geometric (position) and atmospheric corrections.

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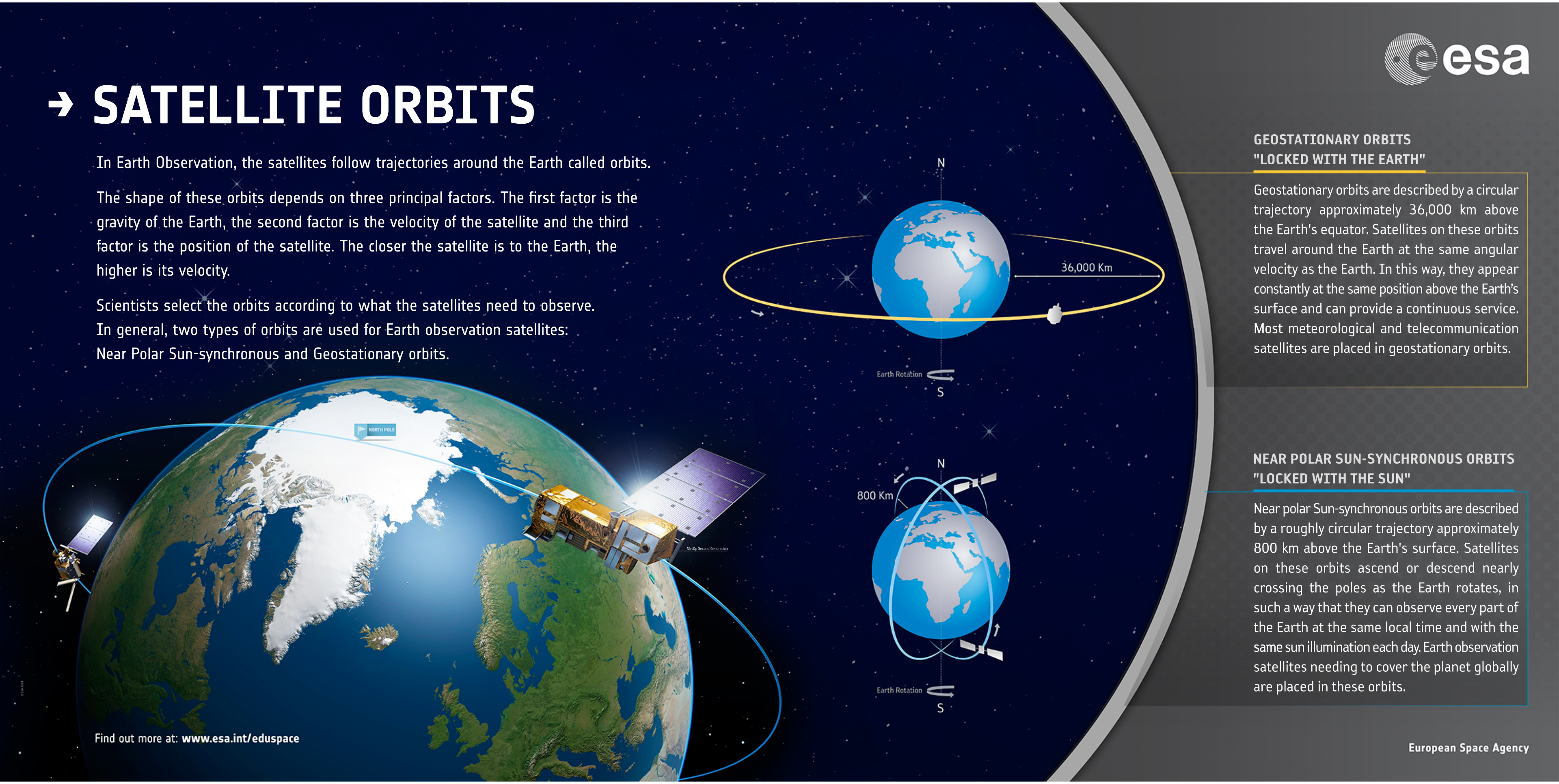

What satelites are commonly used for Earth observation?
What trajectory has the previously mentioned Meteosat MSG (CHMI weather forecast)?

Data portals

ESA Portal - Data and processed outcome examples for public

https://apps.sentinel-hub.com/eo-browser

Profesional data portals

Downloading and further processing of data

Are not so visually attractive

Data availability – commercial vs. open

ESA - https://scihub.copernicus.eu/dhus/#/home

NASA - https://search.earthdata.nasa.gov

Paid providers (AWS - Amazon, Google Earth Engine) – easier access when processing large amounts of data

Next lesson task

Be able to download data

CZ

Copernicus hub na CESNET (https://www.cesnet.cz)

Create account at https://dhr1.cesnet.cz/#/home

Others

ESA Scihub

https://scihub.copernicus.eu/dhus/#/home