Current ESA and commercial observations from space

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WASA INNOVATION CENTER

NOVIA UNIVERSITY OF APPLIED SCIENCES

Southern style buttermilk biscuits

Recipe for remote sensing concepts

- Ingredients
  - electromagnetic radiation
  - three things that happen
  - Earth/Sun system (without atmospheres)
  - sensors
  - Earth/Sun system (with atmospheres)

Recipe for remote sensing concepts

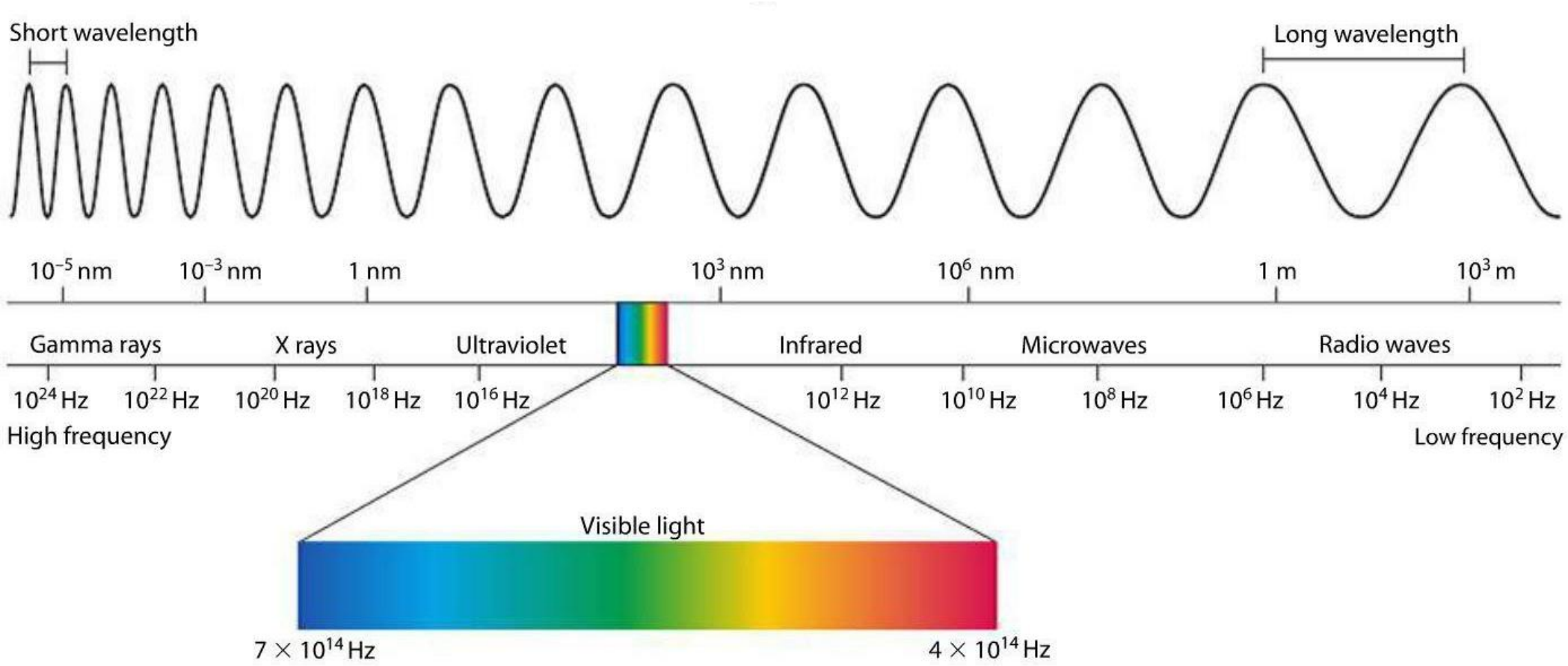
1) electromagnetic radiation: has to do with radiant energy

..a process which **radiates energy through spaces**..

important characteristic

it operates as **well organized waves**

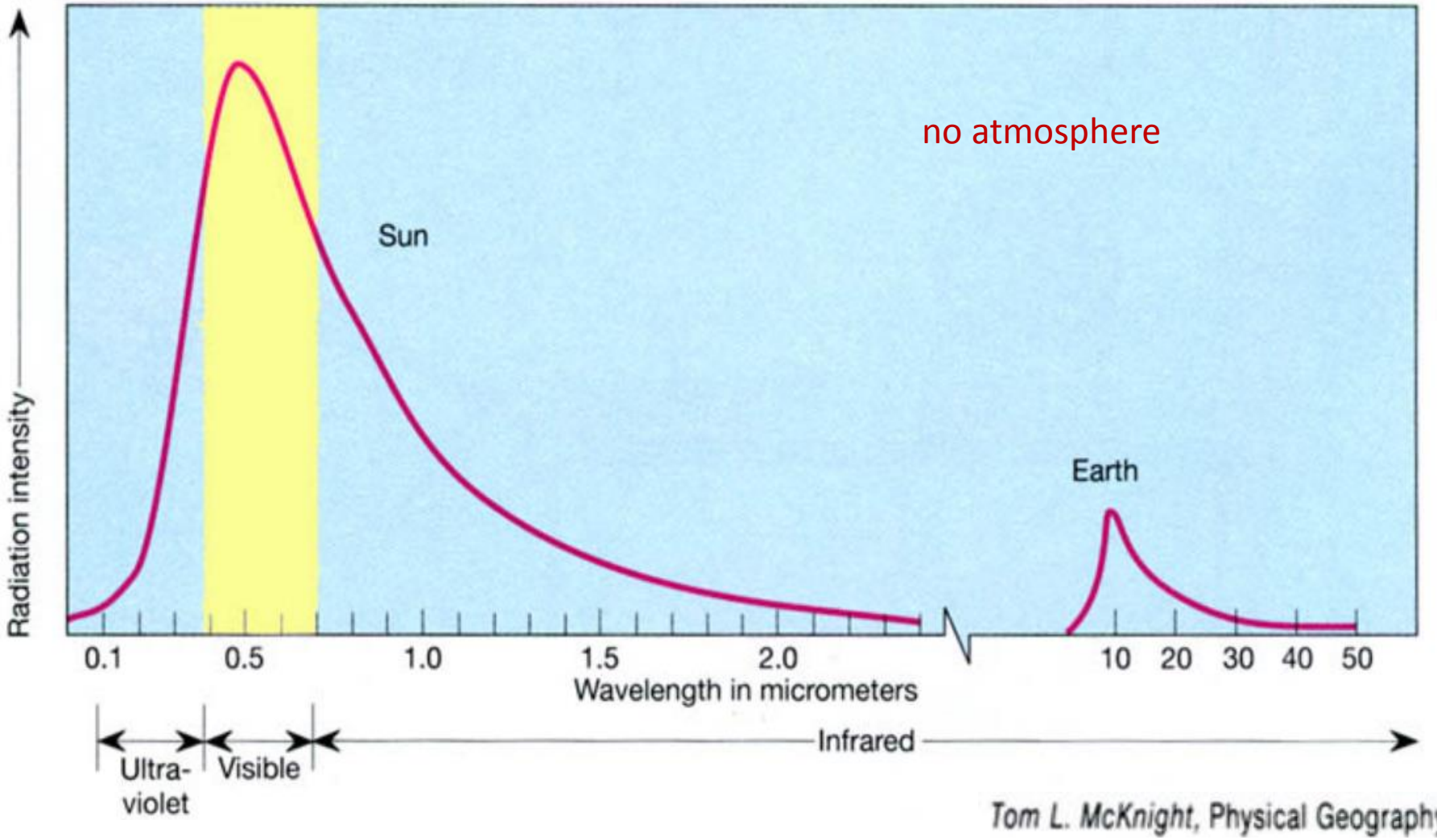
Electromagnetic radiation waves and bands



Recipe for remote sensing concepts

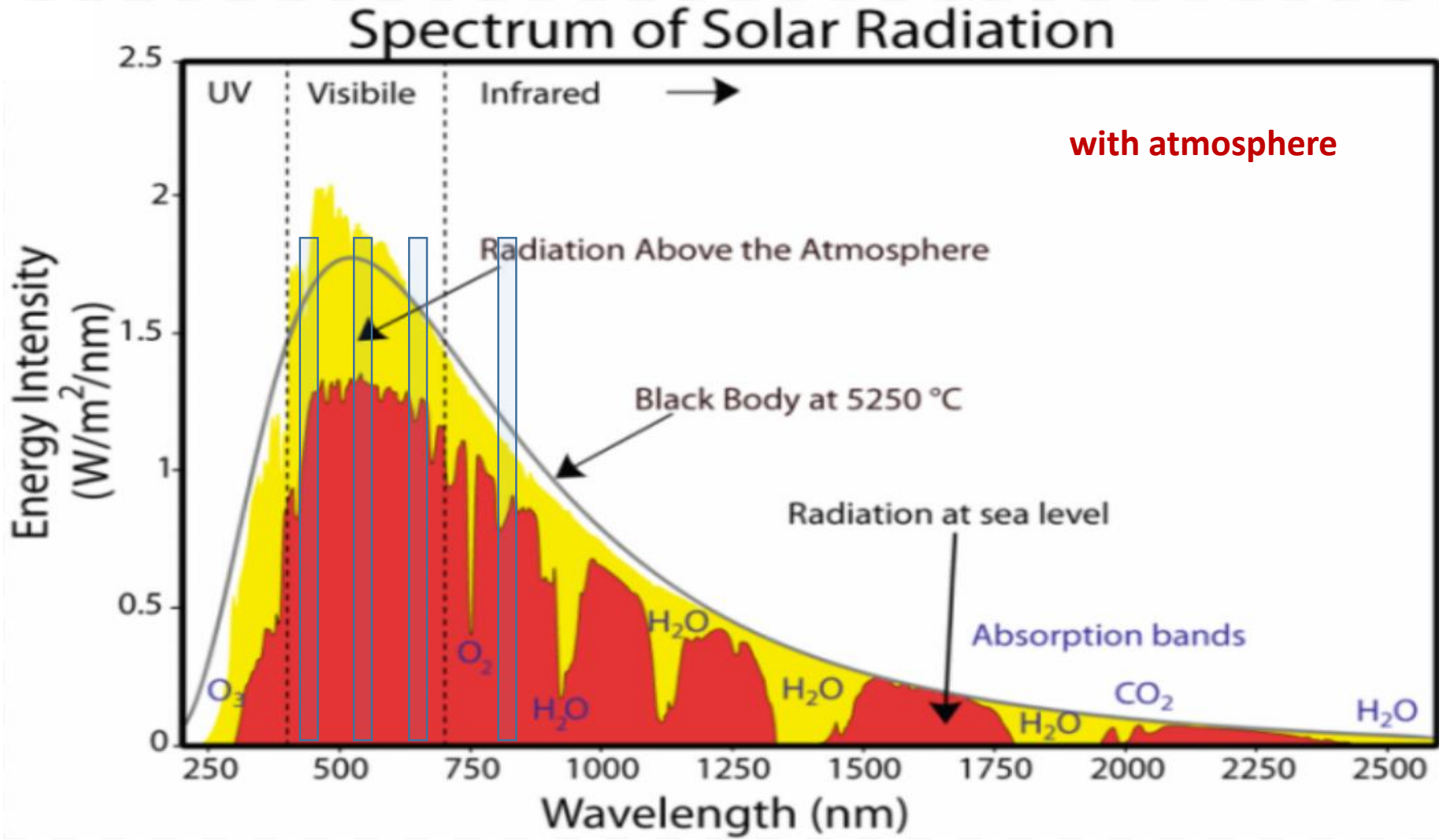
Add Earth/Sun system.. let it radiate.. but no atmosphere

Recipe for remote sensing concepts



Tom L. McKnight, Physical Geography, © 1990, Prentice-Hall, Inc.

Recipe for remote sensing concepts



Example sensor filter bands for measuring visible (true color images.) Bring along a near infrared spectrum for various reasons..

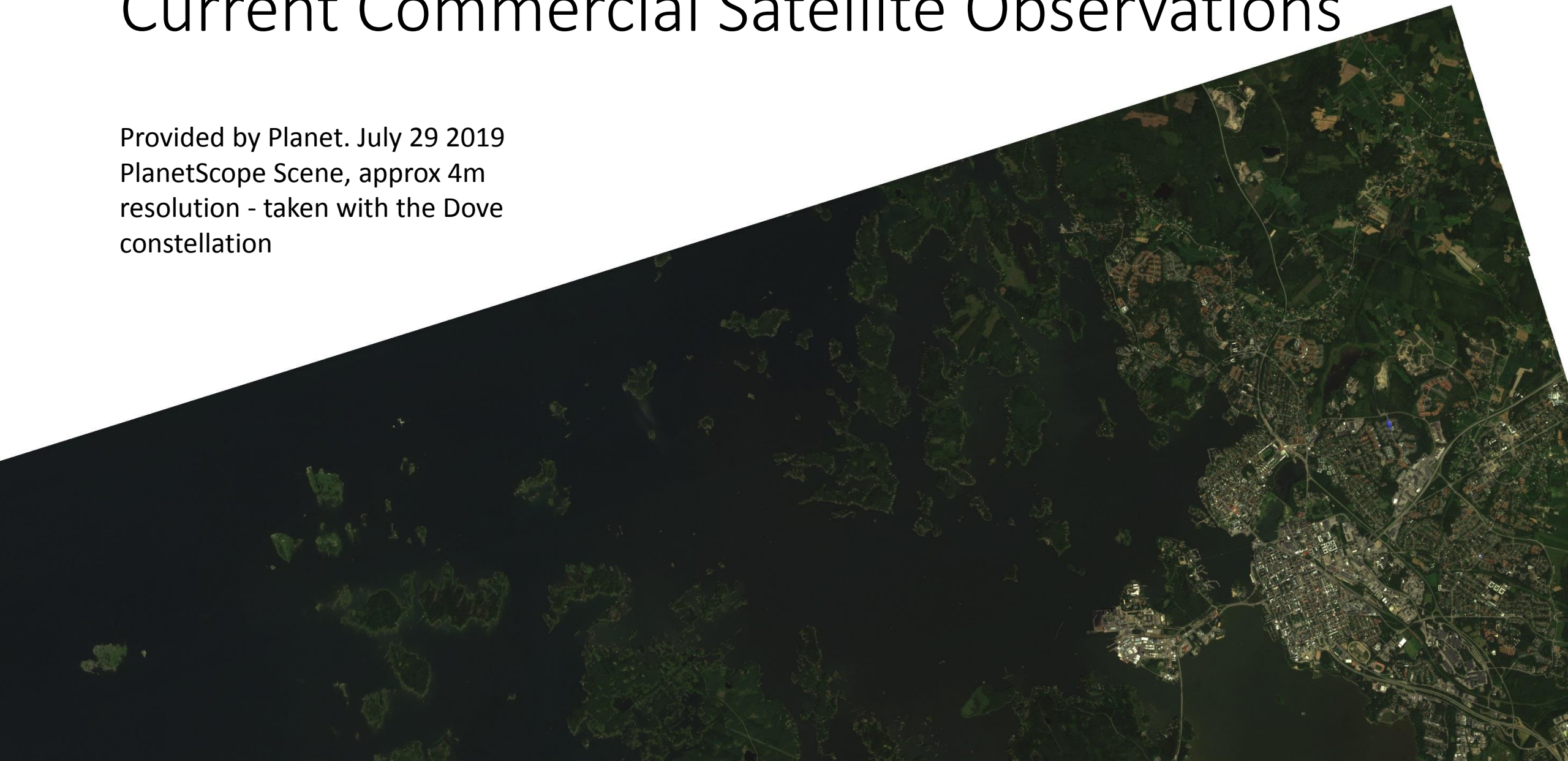
Sensors bands current commercial satellites

- PlanetScope: 4-band multispectral image (blue, green, red, near-infrared)

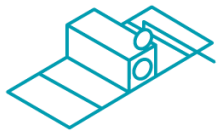
- Iceye: microwave radar with vertically and horizontally transmission and reception

Current Commercial Satellite Observations

Provided by Planet. July 29 2019 PlanetScope Scene, approx 4m resolution - taken with the Dove constellation



• PLANET SATELLITES



Doves (PlanetScope)

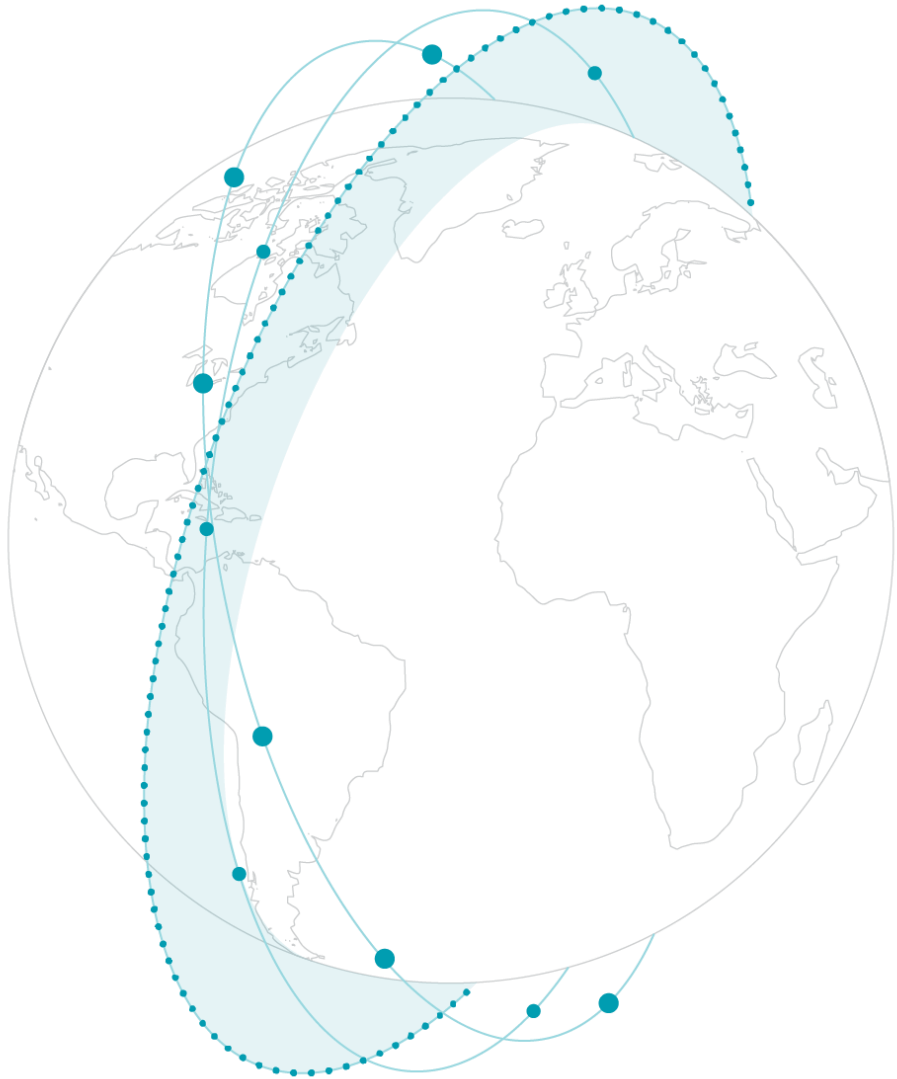

SATELLITES	GSD	CAPACITY
120+	**3.7 m**	**200 M km²**/day 4 band

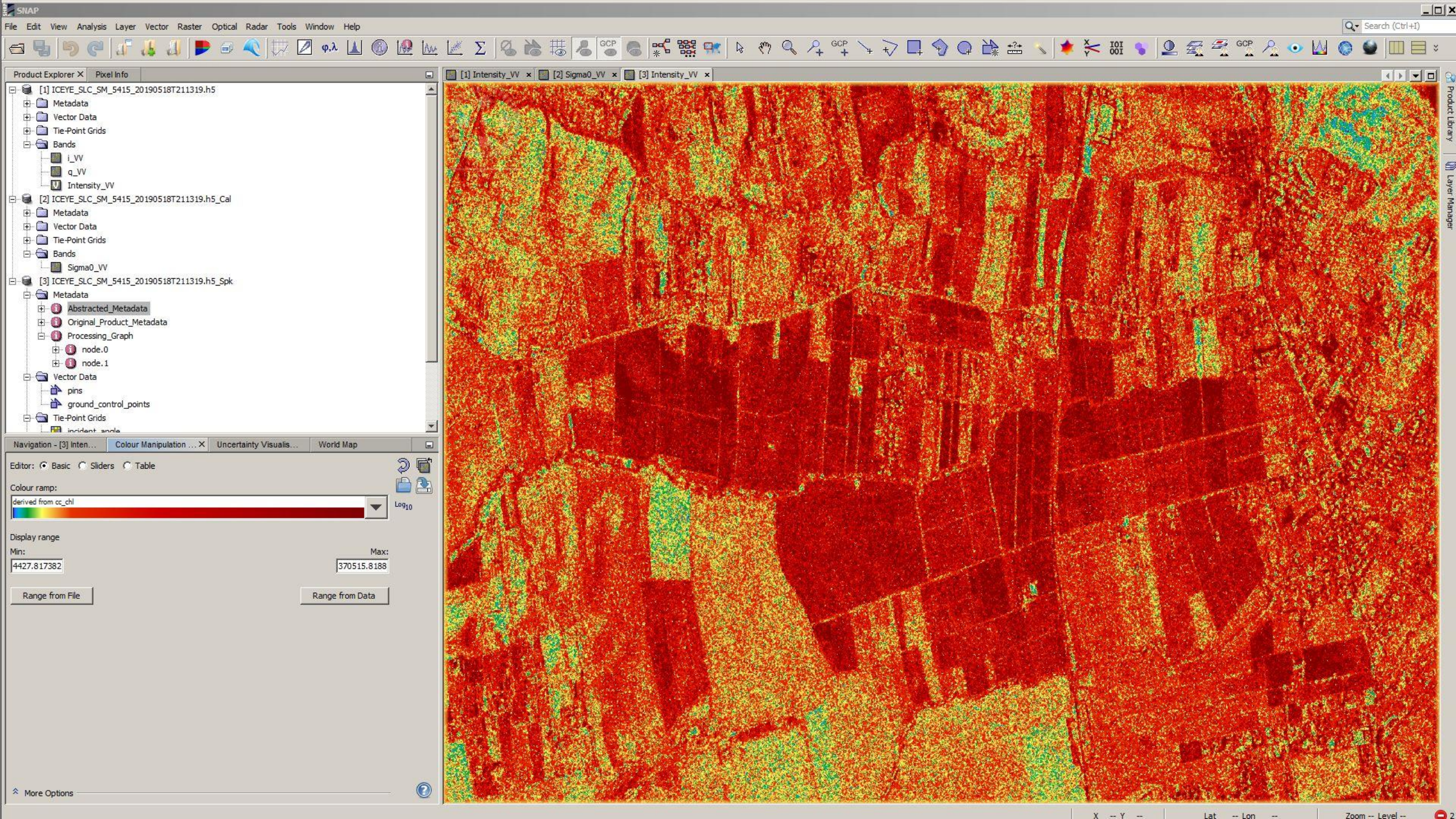
RapidEye


SATELLITES	GSD	CAPACITY
5	**6.5 m**	**6.5 M km²**/day 5 band

SkySat


SATELLITES	GSD	CAPACITY
14	**0.72 m**	**500 K km²**/day 5 band

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Range from File
Range from Data
More Options
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Lat -- Lon --
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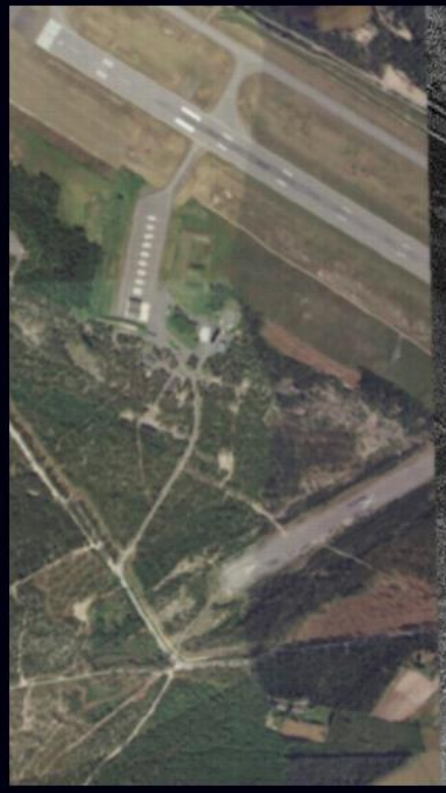
Imaging with radar

At any given time 75% of the world is either dark or cloudy.



Optical instuments require clear skies and daylight to operate.

Radar waves penetrate clouds. Since the instrument sends its own energy, images look the same day and night.

http://c-sigma.space/c-sigma-VII/briefs/ICEYE_EMSA_C-SIGMA_VII.pdf

ESA Sentinel 2 sensor bands

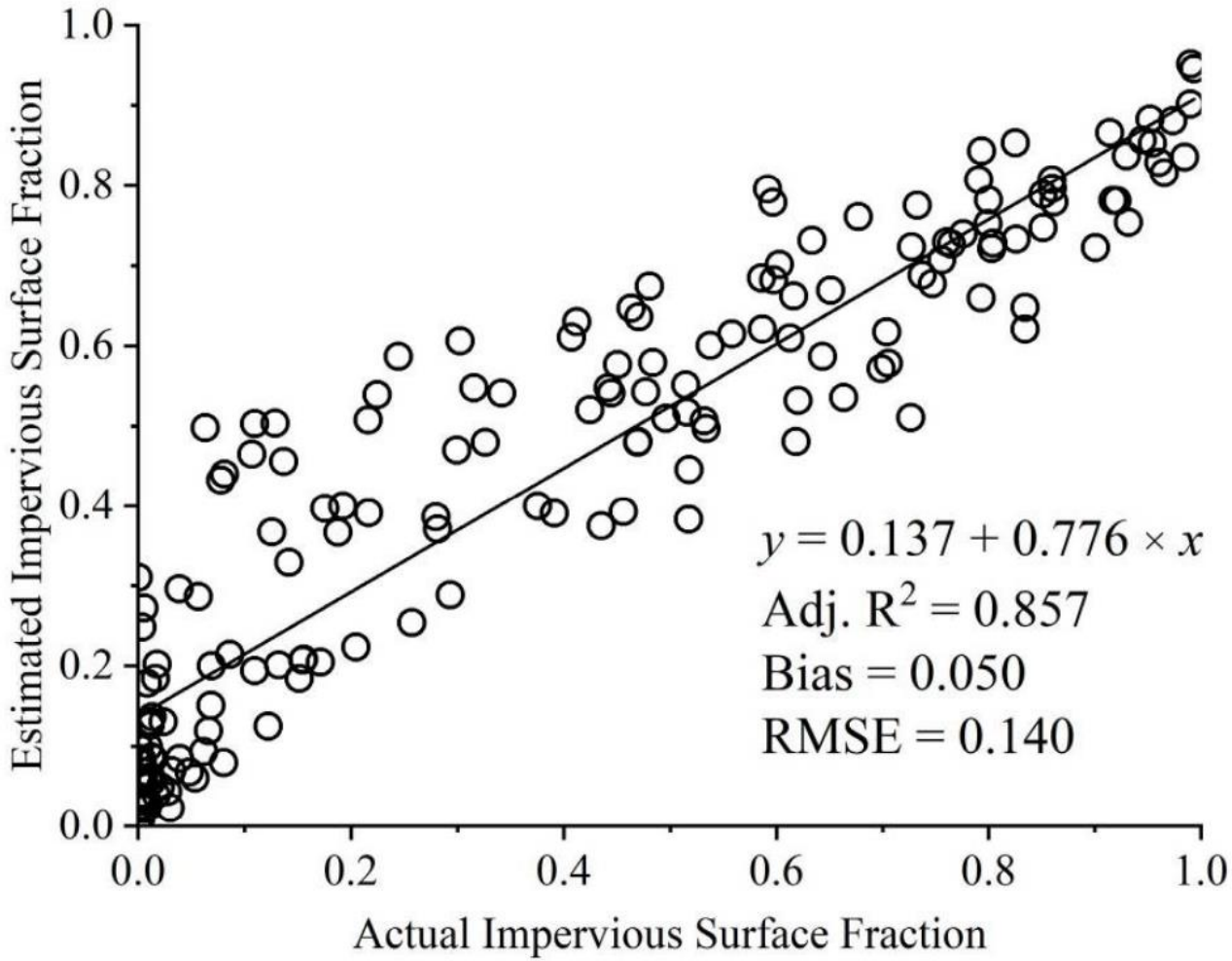
Band	Band	Central wavelength (nm)	Bandwith (nm)	Spatial resolution (m)	Objective
B1	VNIR	443	20	60	Aerosol Correction
B2		490	65	10	Aerosol Correction, Land Measurement Band
B3		560	35	10	Land Measurement Band
B4		665	30	10	Land Measurement Band
B5		705	15	20	Land Measurement Band
B6		740	15	20	Land Measurement Band
B7		783	20	20	Land Measurement Band
B8		842	115	10	Water Vapor Correction, Land Measurement Band
B8a		865	20	20	Water Vapor Correction, Land Measurement Band
B9		945	20	60	Water Vapor Correction
B10	SWIR	1380	20	60	Cirrus Detection
B11		1610	90	20	Land Measurement Band
B12		2190	180	20	Aerosol Correction, Land Measurement Band

The mission supports a broad range of services and applications such as agricultural monitoring, emergencies management, land cover classification or water quality.

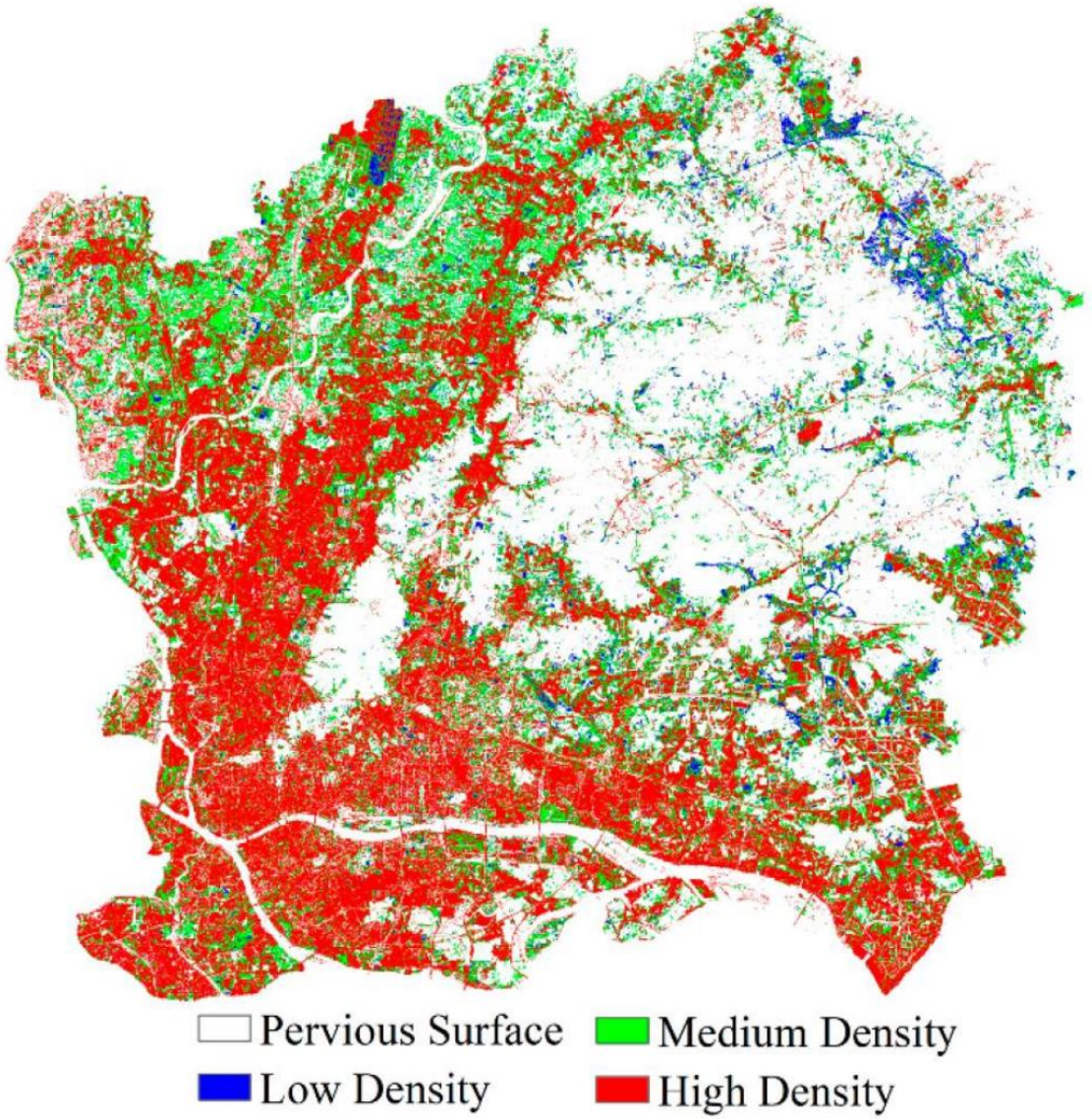
Sensors (Basel). 2018 Sep; 18(9): 2873.
Published online 2018 Aug 31. doi: 10.3390/s18092873
PMCID: PMC6165222
PMID: 30200304

Extraction of High-Precision Urban Impervious Surfaces from Sentinel-2 Multispectral Imagery via Modified Linear Spectral Mixture Analysis

Rudong Xu,[1] Jin Liu,[1,*] and Jianhui Xu[2,3,4]



The city of Guangzhou, China. (22°26′ N - 23°56′ N, 112°57′ E - 114°30′ E)



Sentinel 3 Ocean & Color Land Instrument

SENTINEL-3 OLCI mission supports maritime monitoring, land mapping and monitoring, atmospheric monitoring and climate change monitoring.

Band	λ centre (nm)	Width (nm)	Function
Oa01	400	15	Aerosol correction, improved water constituent retrieval
Oa02	412.5	10	Yellow substance and detrital pigments (turbidity)
Oa03	442.5	10	Chlorophyll absorption maximum, biogeochemistry, vegetation
Oa04	490	10	High Chlorophyll,
Oa05	510	10	Chlorophyll, sediment, turbidity, red tide
Oa06	560	10	Chlorophyll reference (Chlorophyll minimum)
Oa07	620	10	Sediment loading
Oa08	665	10	Chlorophyll (2nd Chlorophyll absorption maximum), sediment, yellow substance/vegetation
Oa09	673.75	7.5	For improved fluorescence retrieval and to better account for smile together with the bands 665 and 680 nm
Oa10	681.25	7.5	Chlorophyll fluorescence peak, red edge
Oa11	708.75	10	Chlorophyll fluorescence baseline, red edge transition
Oa12	753.75	7.5	O2 absorption/clouds, vegetation
Oa13	761.25	2.5	O2 absorption band/aerosol correction.
Oa14	764.375	3.75	Atmospheric correction
Oa15	767.5	2.5	O2A used for cloud top pressure, fluorescence over land
Oa16	778.75	15	Atmos. corr./aerosol corr.
Oa17	865	20	Atmospheric correction/aerosol correction, clouds, pixel co-registration
Oa18	885	10	Water vapour absorption reference band. Common reference band with SLSTR instrument. Vegetation monitoring
Oa19	900	10	Water vapour absorption/vegetation monitoring (maximum reflectance)
Oa20	940	20	Water vapour absorption, Atmospheric correction/aerosol correction
Oa21	1 020	40	Atmospheric correction/aerosol correction

https://sentinel.esa.int/web/sentinel/user-guides/sentinel-3-olci/resolutions/radiometric

Sentinel 3 Ocean Color processing demonstration

Copernicus Sentinel data 2017. Gulf of Oman.

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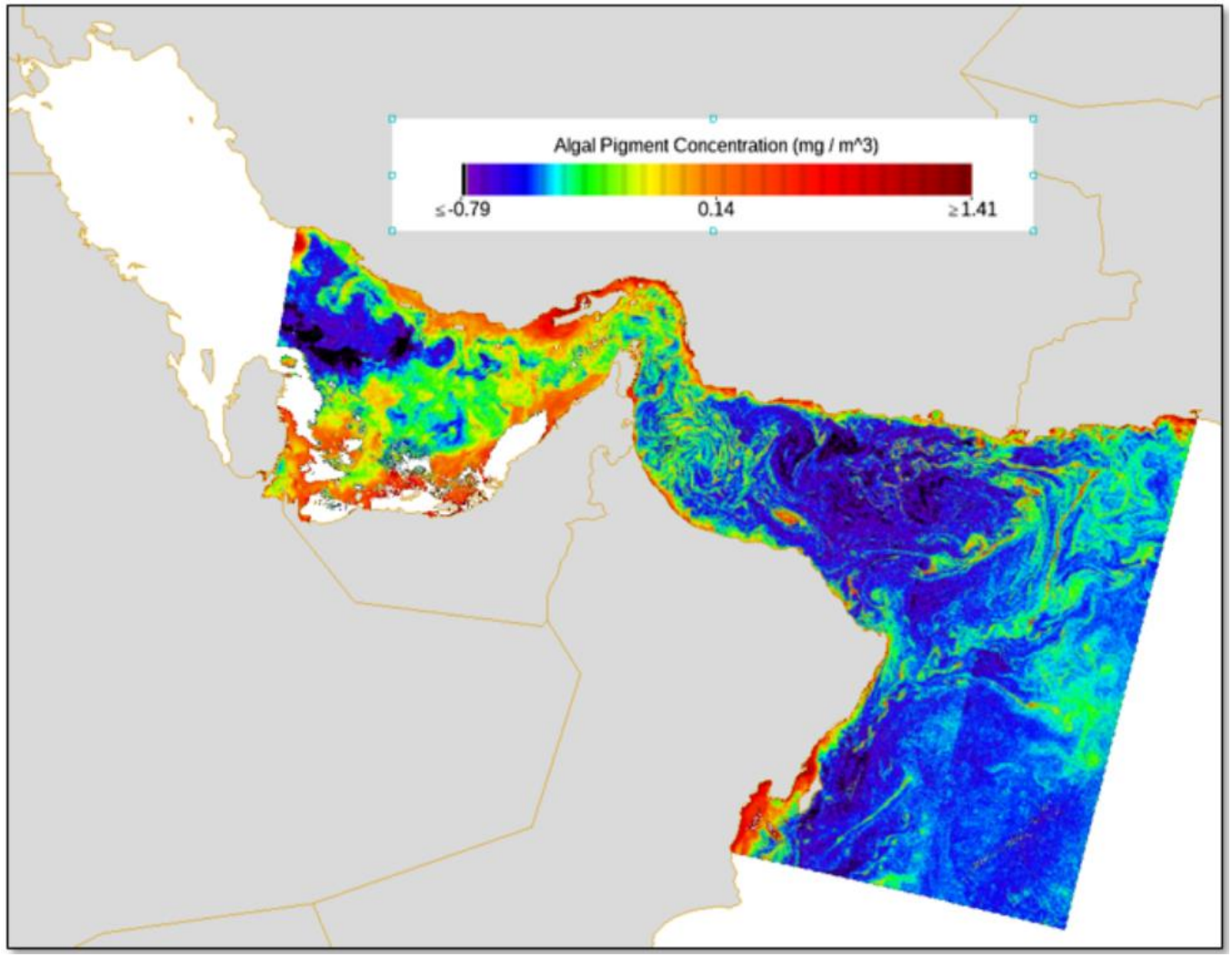

https://www.harrisgeospatial.com/docs/Sentinel3MarineDataTutorial.html

Thank you

Recipe: Southern style buttermilk biscuits

Makes 12 large buscuits

2.5 cups white flour
1 cup buttermilk
¼ teaspoon baking soda
¼ reaspoon baking powder
¼ cup corn oil
1/3 cup melted butter

Mix and knead dough
Heaping tablespoon of dough onto waxpaper with dry flour roll until ball
Flatten each onto baking paper covered cookie pan
Sprinkle each lightly with water before baking

Bake 15 minutes 225 deg C