Mangrove Forest and Radar

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Nathan Thomas (JPL)

Day 1

- 9-9h30:
- 9h30-10: Introduction to remote sensing
- 10-10h30: Introduction to mangrove forests
- 10h30-11: break + photo shoot
- 11-12h30: Availability and source of Radar remote sensing data
- 12h30-14: lunch
- 14-15h30: Diplay and manipulation of radar images.
- 15h30-16h00: break
- 16h00-17h00: Processing radar images

Day 1

9h30 – 10h00	Session 1a Introduction to Mangrove Forest
10h00 – 10h30	Session 1b Introduction to Radar Remote Sensing
10h30 – 11h00	Photo Session/Tea Break
11h00 – 12h30	Session 2 Availability and Sources of Radar Remote Sensing Data
12h30 – 14h00	Lunch Break
14h00 – 15h30	Session 3a Open, display and manipulate radar images with Image processing and GIS Software
15h45 – 16h15	Tea/Coffee Break
16h00-17h00	Session 3b Processing radar images

Day 2

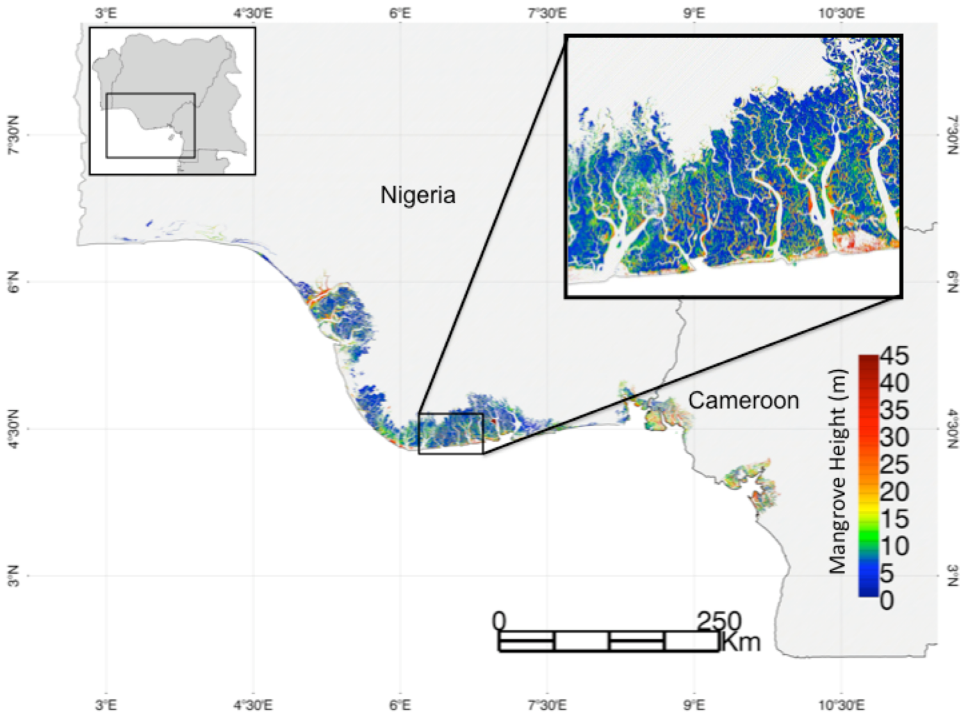
09h00 – 10h30	**Session 4a Change detection in radar images**
10h30 – 11h00	Tea/Coffee Break
11h00– 12h30	Session 4b Spatial Segmentation of Radar Images
13h00 – 14h00	Lunch Break
14h00 – 15h30	Session 4c Land Cover Classification of Radar images
15h30 – 16h00	Tea/Coffee Break
16h00 – 17h00	Session 4d Estimation of above ground biomass with radar images

Day 3

09h00 – 10h30	**Session 5 Packaging and delivery of data products**

Introduction to Mangroves

Height and Biomass Map of All Mangrove Forests of Africa

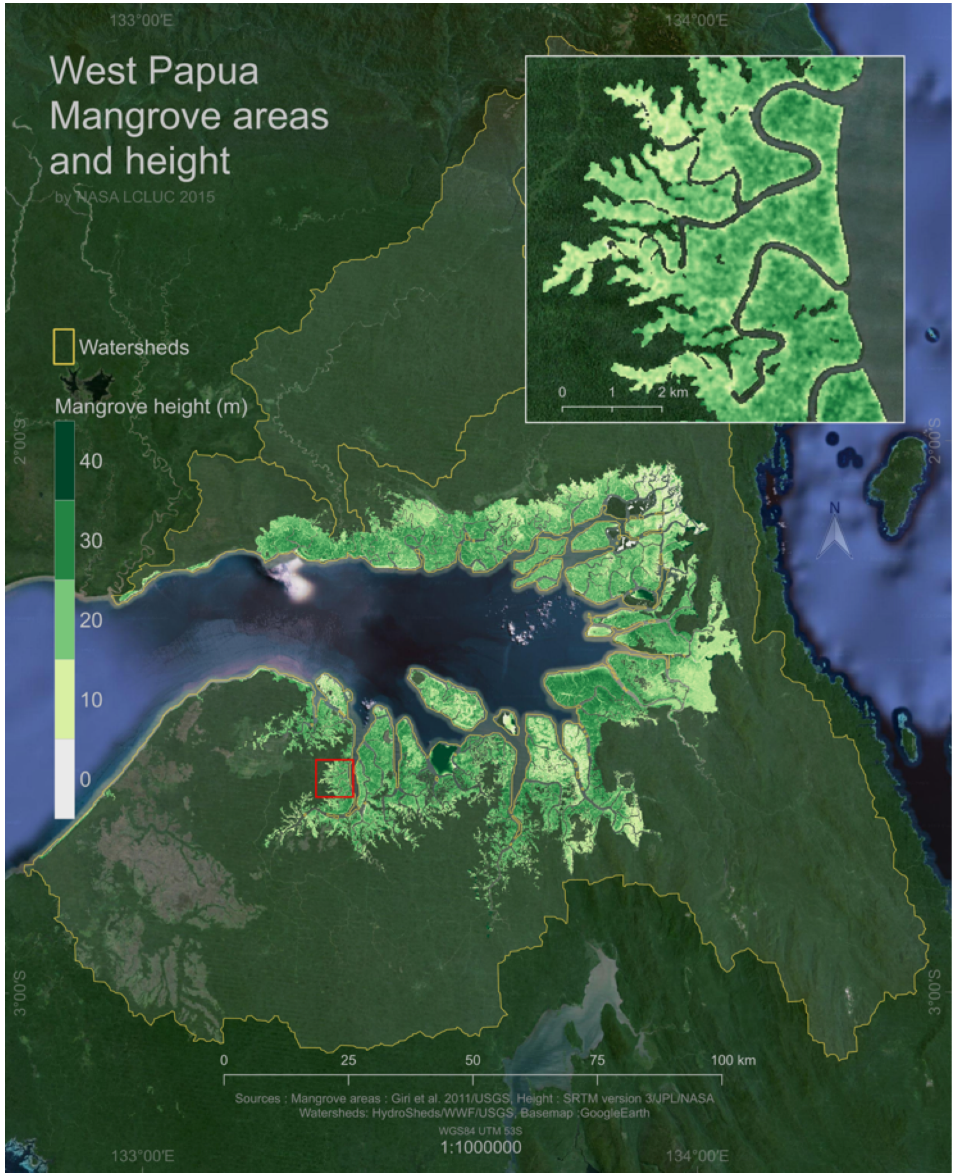


Fatoyinbo & Simard, IJRSE 2012

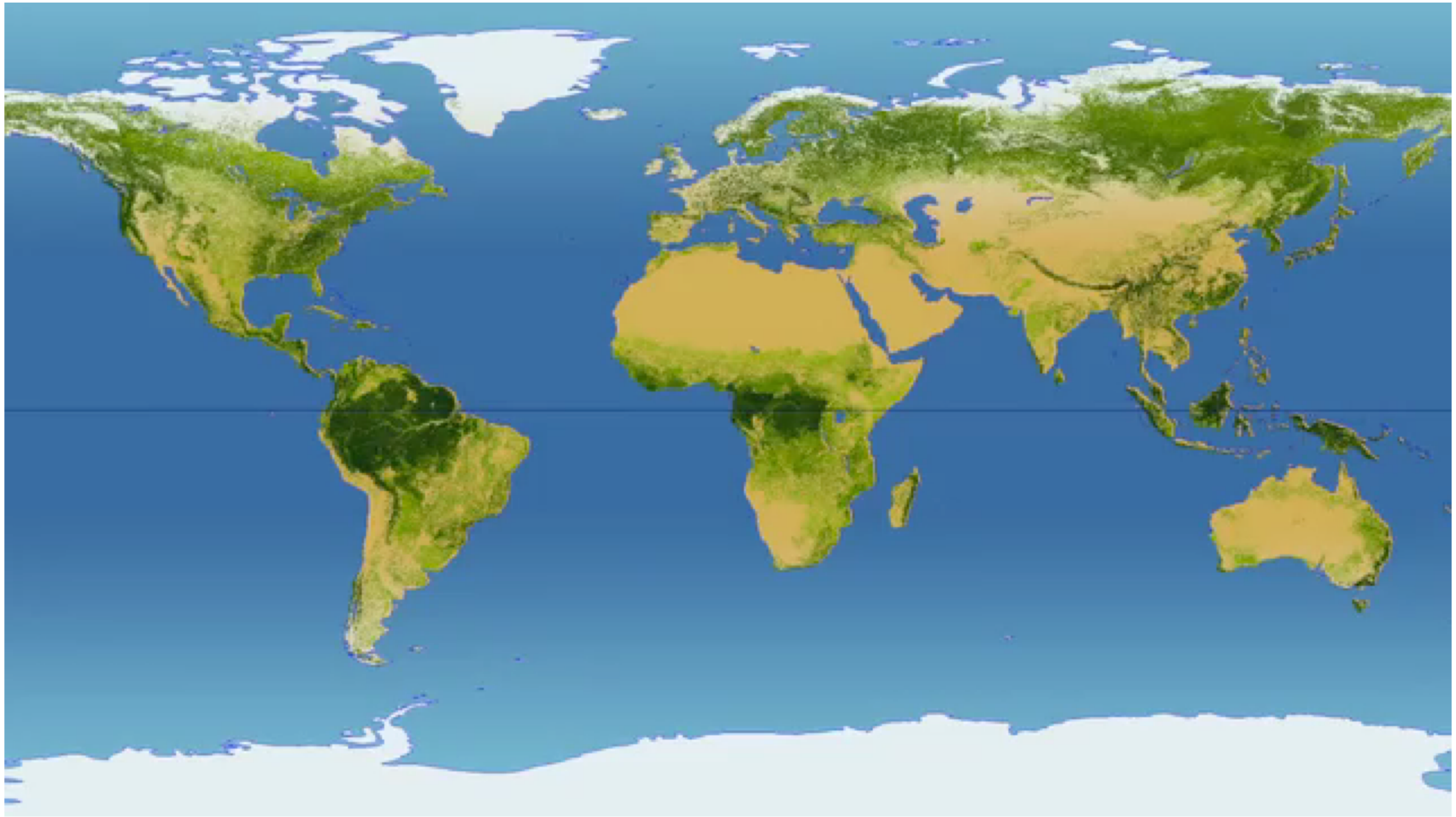
Country	Area in km^2	Total Biomass in Mg	Mean Biomass in Mg/ha
Angola	154	1,441,200	93
Benin	18	137,719	76
Cameroon	1,483	25,334,900	171
Congo	15	267,603	178
Cote d'Ivoire	32	406,516	124
Djibouti	17	1,653,170	90
DRC	183	51,570	140
Egypt	1	8,344	117
Equatorial Guinee	181	2,922,420	161
Eritrea	49	640,038	129
Gabon	1,457	23,840,000	162
Gambia	519.11	5,509,300	106
Ghana	76	742,925	97
Guinea	1,889	18,153,800	108
Guinea Bissao	2,806	31,712,300	113
Kenya	192	2,294,820	119
Liberia	189	2,141,860	113
Madagascar	2,059	24,856,900	121
Mauritania	0.4	4,156	95
Mozambique	3,054	30,974,100	101
Nigeria	8,573	94,788,000	111
Senegal	1,200	11,462,100	95
Sierra Leone	955	10,655,600	112
Somalia	30	436,907	143
Soudan	4	135,626	113
South Africa	12	40,018	100
Togo	2	15,861	78
Tanzania	809	11,037,800	136
Africa	25,960	301,665,553	116

Google earth files: http:www-radar.jpl.nasa.gov/coastal

Management of entire watershed is important to the health of mangrove forests.



Global Distribution of Mangrove Forests



Global Distribution of **Blue Carbon Ecosystems**

Mangroves provides critical ecosystem services to society

- Coastal protection against tsunamis, hurricanes, storm surges, sea level rise and erosion
- Nurseries for fish, crustaceans and amphibians maintaining fish stocks and biodiversity
- Provide lumber and coal to local communities
- Store an extraordinary amount of carbon from the atmosphere and store in soils reducing global warming rates. (up to 1000t/ha including soil C)
  - Note that Carbon is used a mitigation to reduce destruction of mangrove for other unsustainable uses.
- The estimated **economical** value varies between \$200k to **\$900k** per km^2 per year (UNEP report 2006);
  - Note: These numbers need to be updated with our improved knowledge and also information on forest structure which drives their economical value.

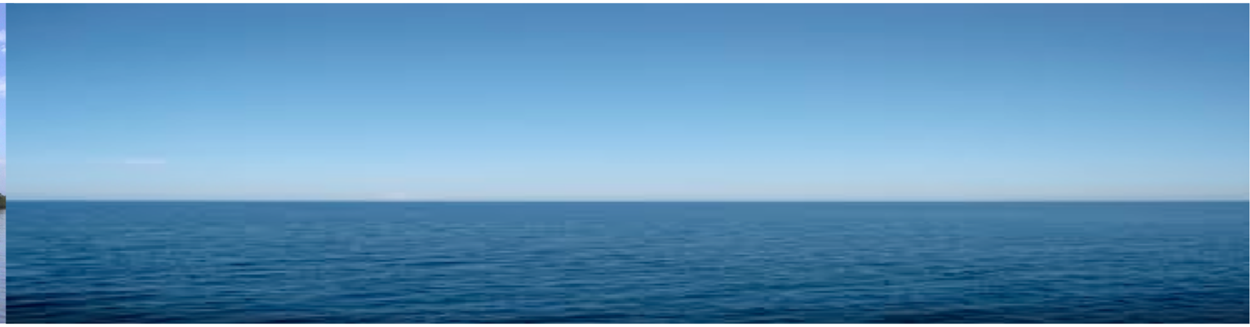
Mangroves are endangered

- Already **35%** of mangrove forests have **disappeared** and **60%** could be lost by **2030;**
- Endangered by climate change: sea level rise
- Mostly threatened by human activity (e.g. Urbanization, over exploitation for lumber, fresh water diversion due to construction of roads, levees and canals, pollution)

Mangrove continuum

Salt-tolerant plants thriving in the intertidal area of tropical coasts

Marshes-Mangroves



Coastal Ocean

Mangrove continuum is threatened by sea level rise

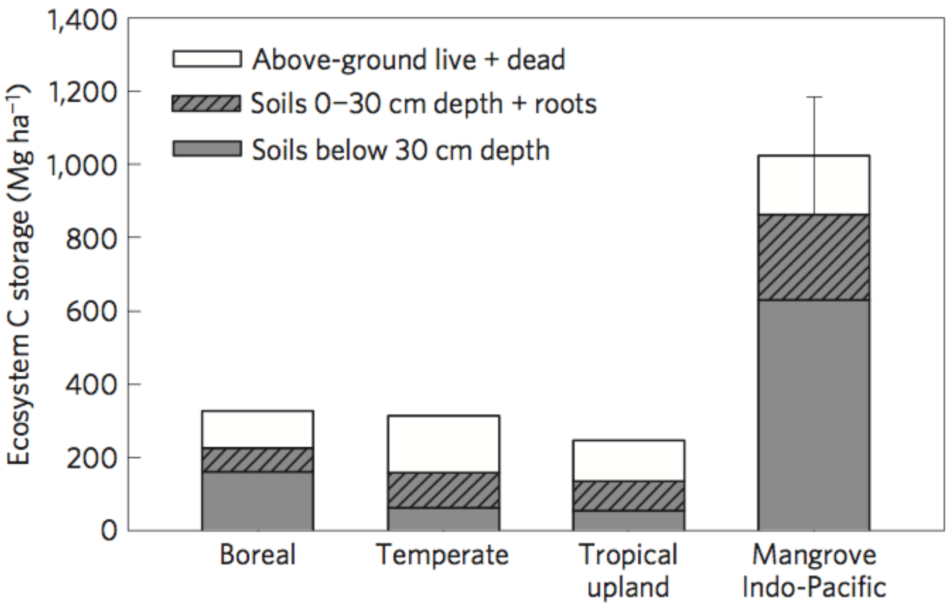
Marshes-Mangroves

Ocean

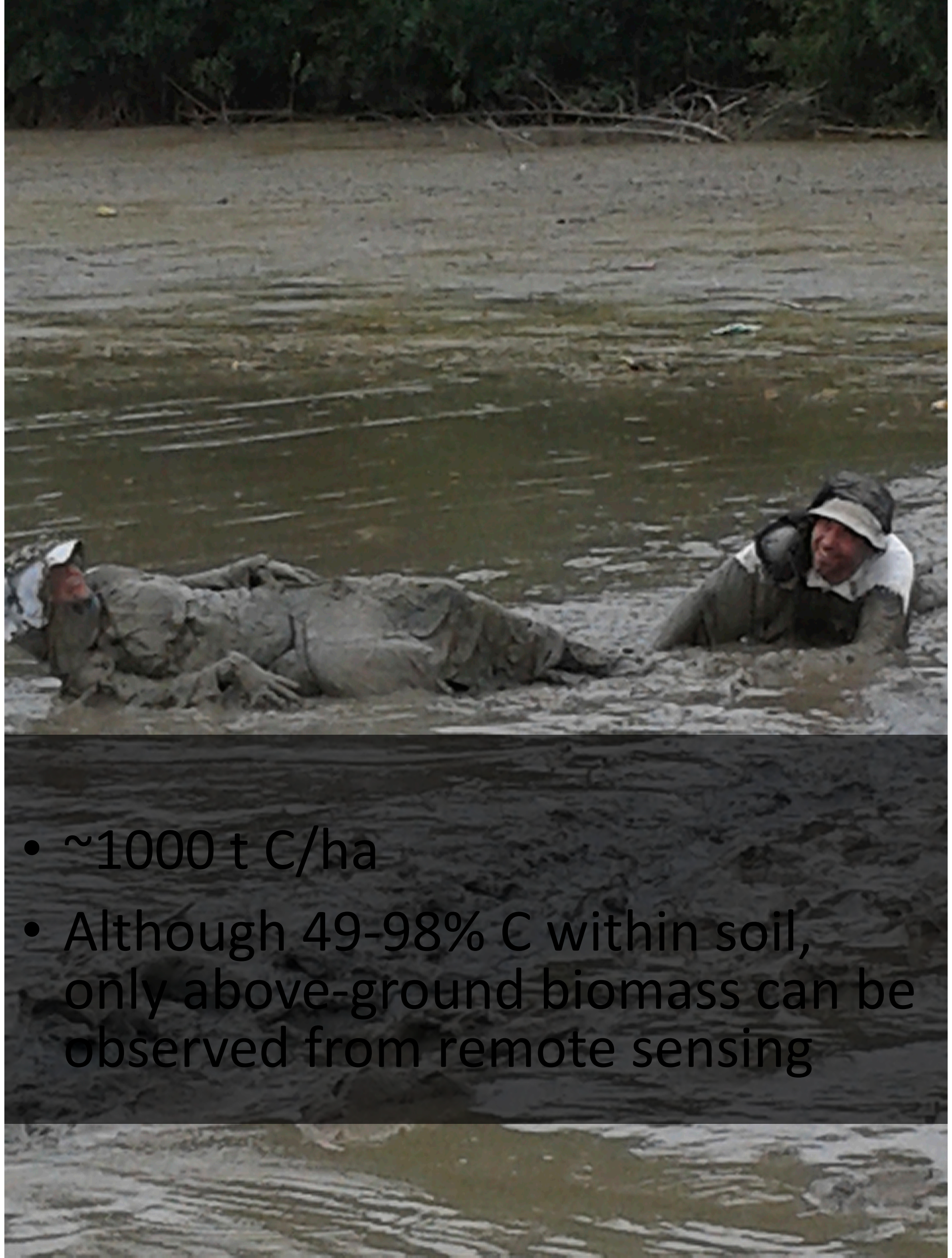
Mangrove continuum is threatened by sea level rise

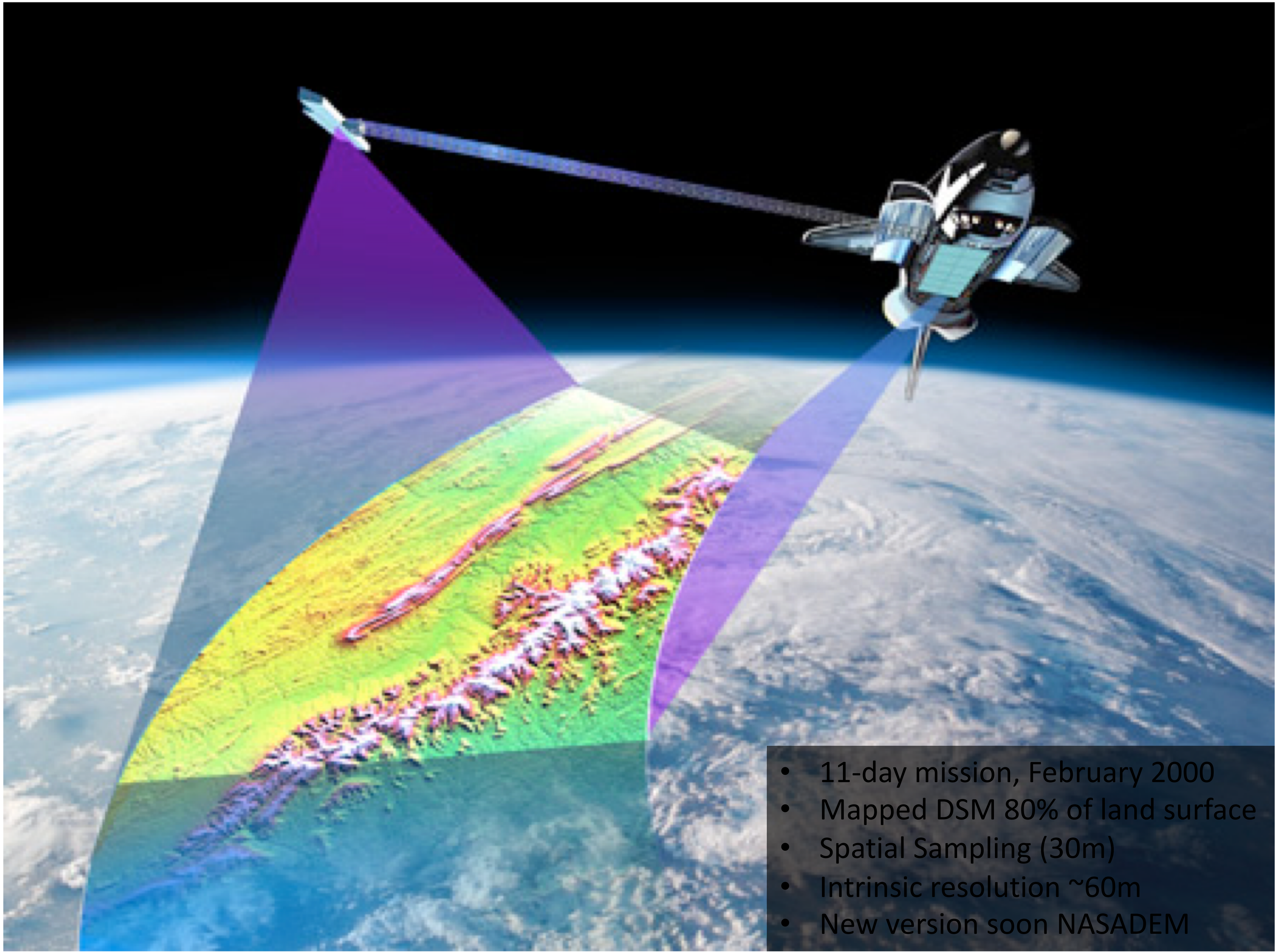
Mangroves and ecosystem services

1. Protection against tsunamis, hurricanes, storm surges, sea level rise and erosion
2. Nurseries for fish, crustaceans and amphibians, maintain fish stocks and biodiversity
3. Provide lumber and coal to local communities
4. **Large carbon sequestration potential:**
   - Average 1,023 Mg carbon per hectare in above and belowground C .
   - Organic-rich soils range from 0.5 m to more than 3 m in depth and account for 49–98% of carbon storage in these systems.



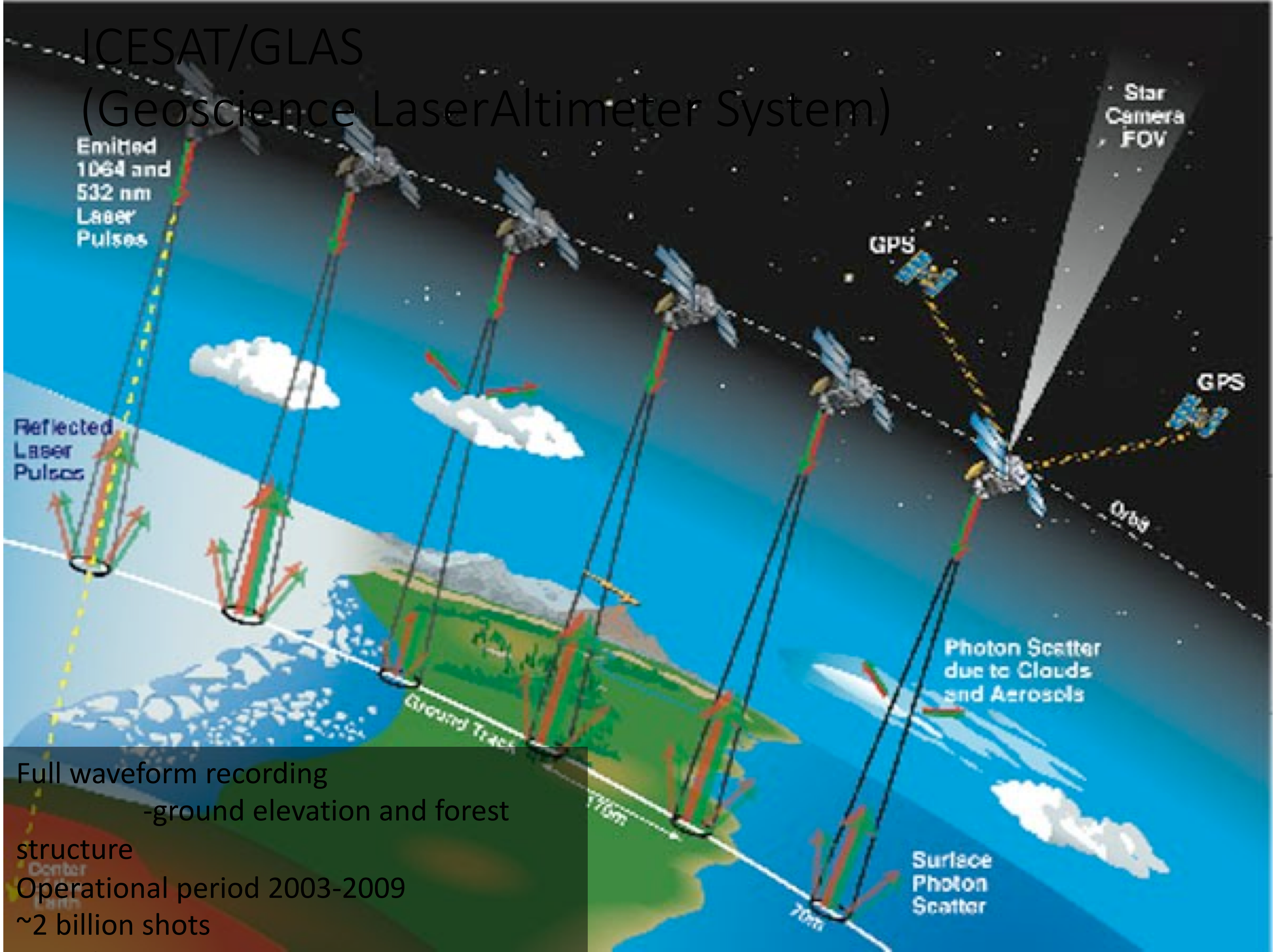
Comparison of mangrove C storage with that of major forest domains (from Donato et al. 2011).


• ~1000 t C/ha
• Although 49-98% C within soil, only above-ground biomass can be observed from remote sensing



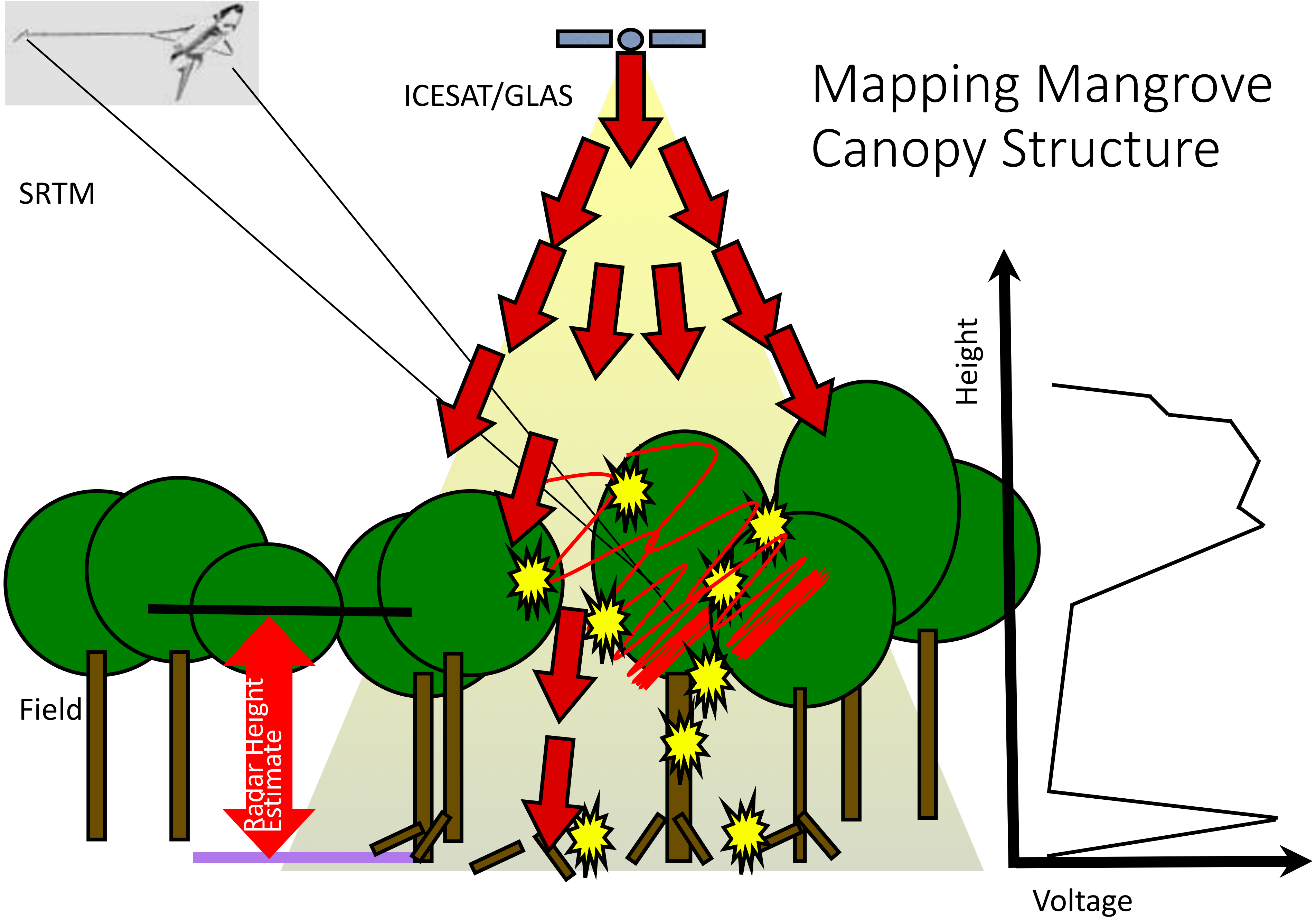
11-day mission, February 2000
Mapped DSM 80% of land surface
Spatial Sampling (30m)
Intrinsic resolution ~60m
New version soon NASADEM

ICESAT/GLAS
(Geoscience LaserAltimeter System)

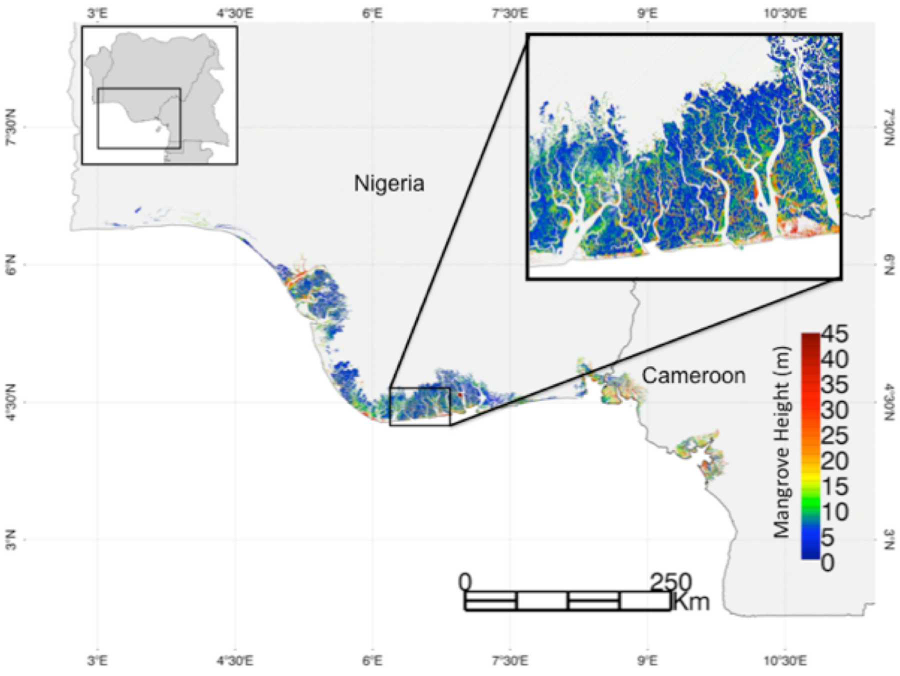


Full waveform recording
-ground elevation and forest structure
Operational period 2003-2009
~2 billion shots

Mapping Mangrove Canopy Structure



Global Map of Mangrove Height and Biomass



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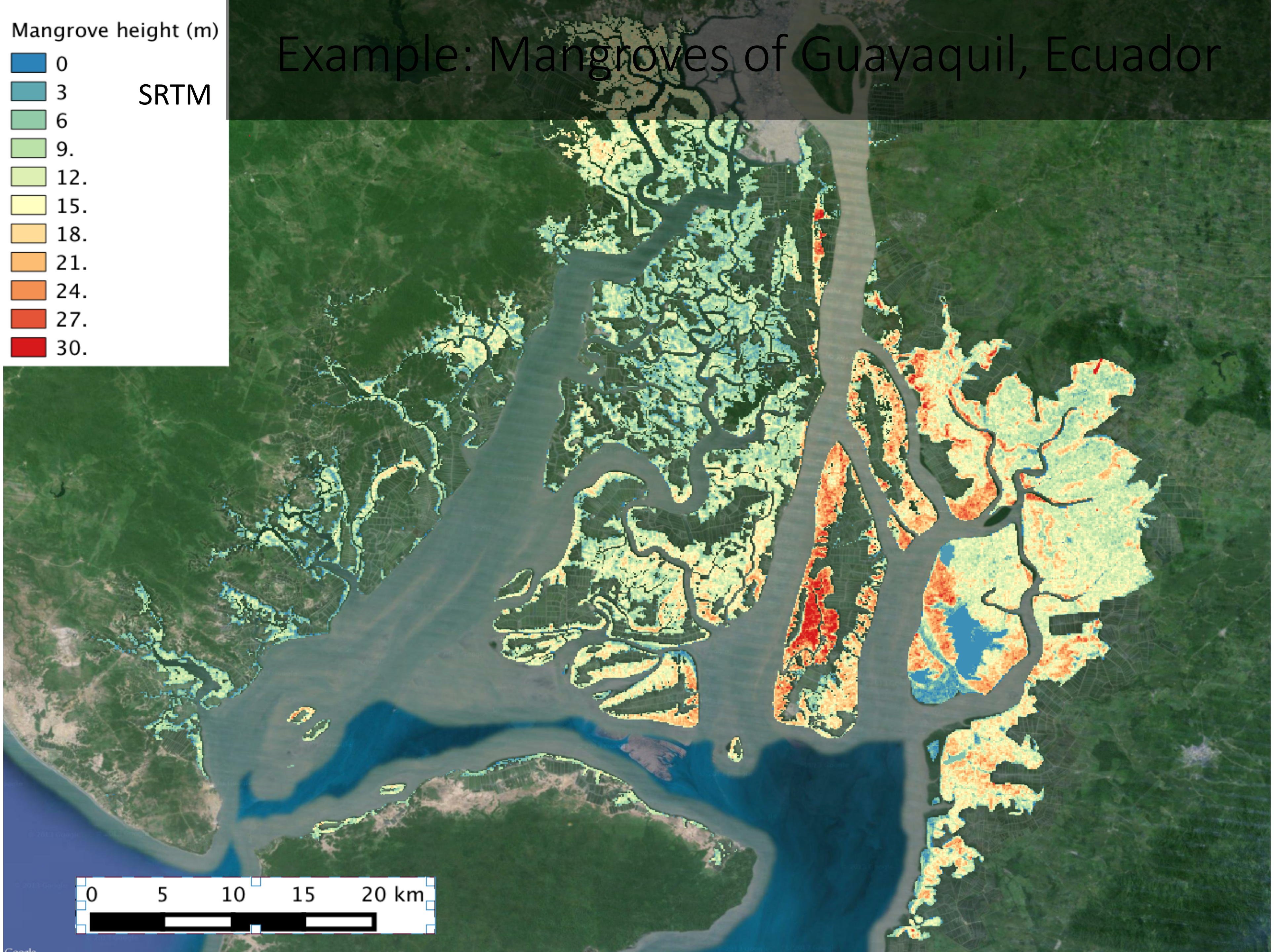
Africa map in Fatoyinbo & Simard, IJRSE 2012
Global baseline map and stats for 2000 era to be submitted June 2017.

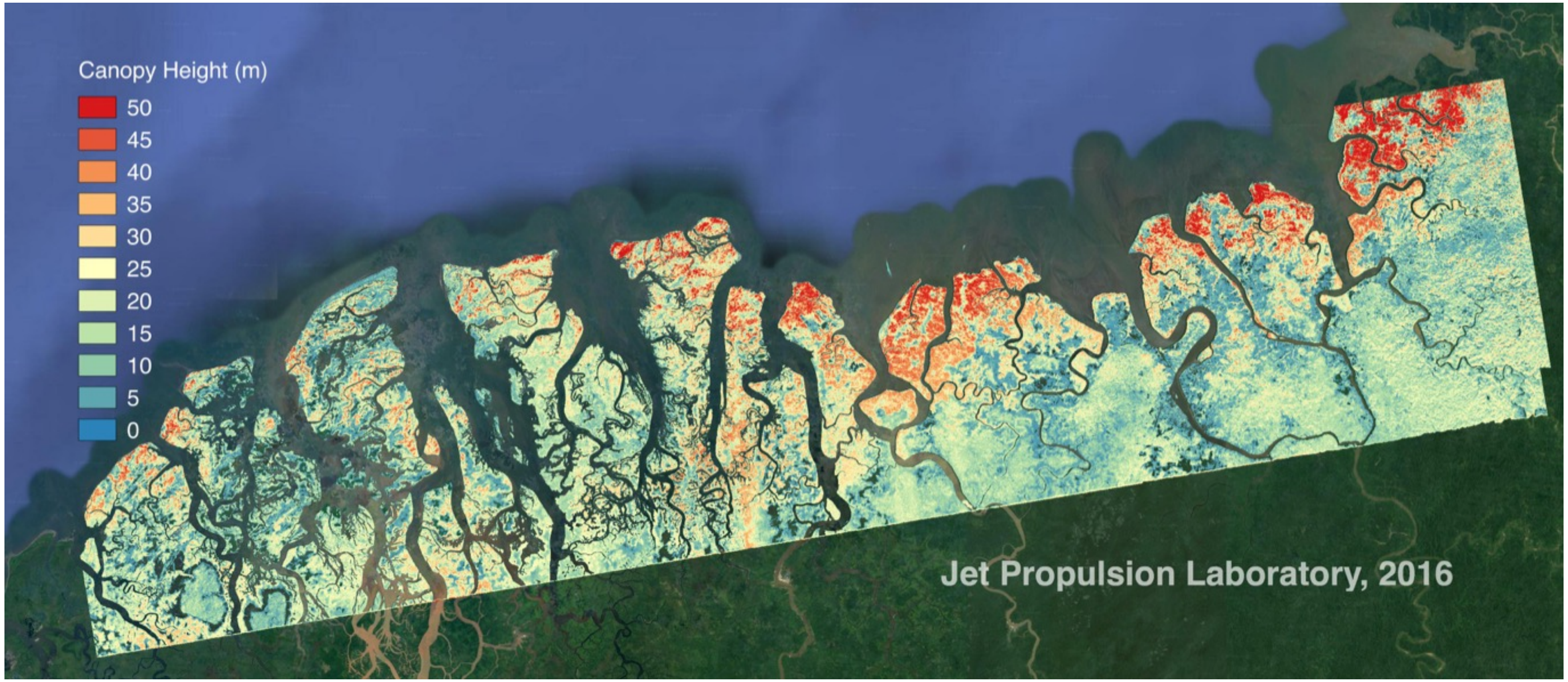
10 Countries with most biomass (tons)

Country	Max Height (m)	Mean height (m)	Max AGB (Mg/ha)	Mean AGB (Mg/ha)	Total AGB (Mg)	Total C (Mg)	Mangrove area (ha)
Indonesia	47.5	24.7	456.4	218.5	578,630,876	1,138,076,289	2,647,499
Papua New Guinea	45.8	28.6	432.5	248.1	114,089,528	206,806,176	459,856
Australia	28.8	12.2	241.8	121.7	111,643,417	333,910,624	914,796
Brazil	40.7	20.3	260.5	94.6	97,367,688	354,985,555	1,023,164
Malaysia	35.6	20.4	308.3	176.5	92,120,954	209,655,257	522,088
Bangladesh	25.5	15.5	421.2	173.0	73,916,017	170,612,893	427,357
Nigeria	33.9	13.9	355.3	99.6	68,016,334	238,906,942	682,688
Venezuela	52.6	31.7	392.8	190.1	45,442,016	98,147,684	238,908
Cameroon	49.2	23.1	627.3	215.1	42,491,621	84,449,634	197,511

Example: Mangroves of Guayaquil, Ecuador

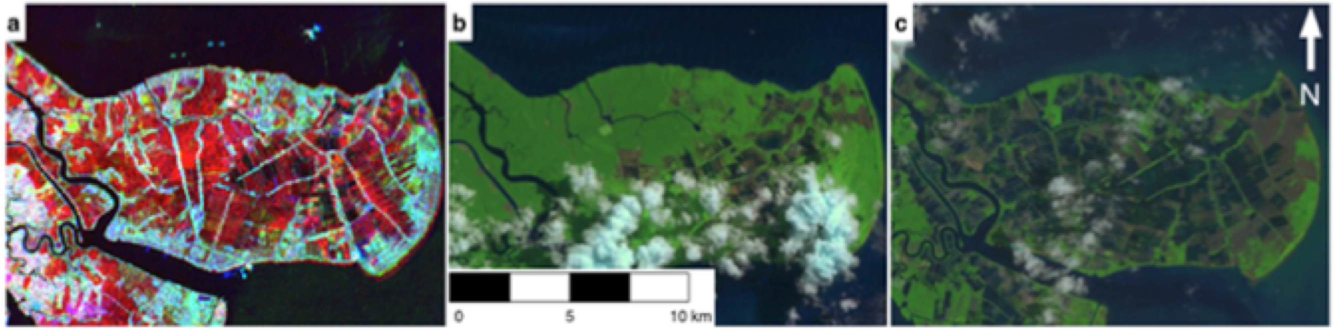


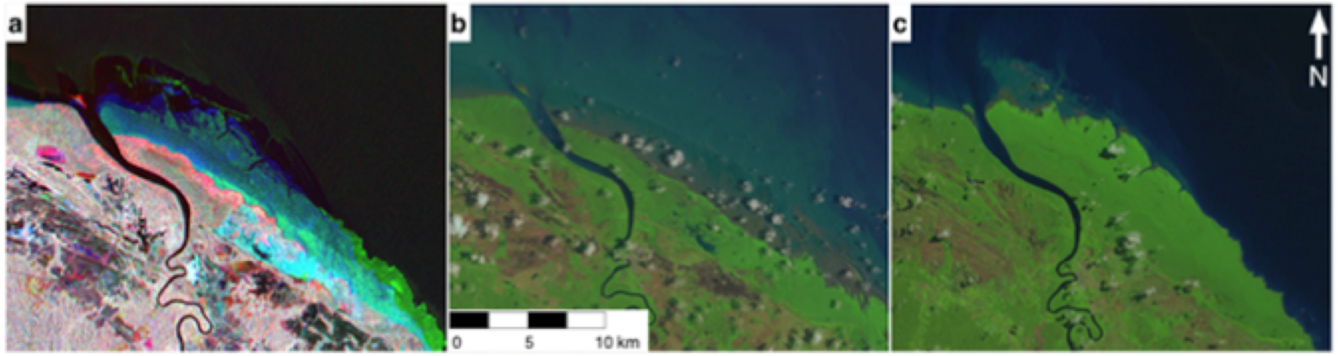
Forest Canopy Height derived from UAVSAR (polinSAR)

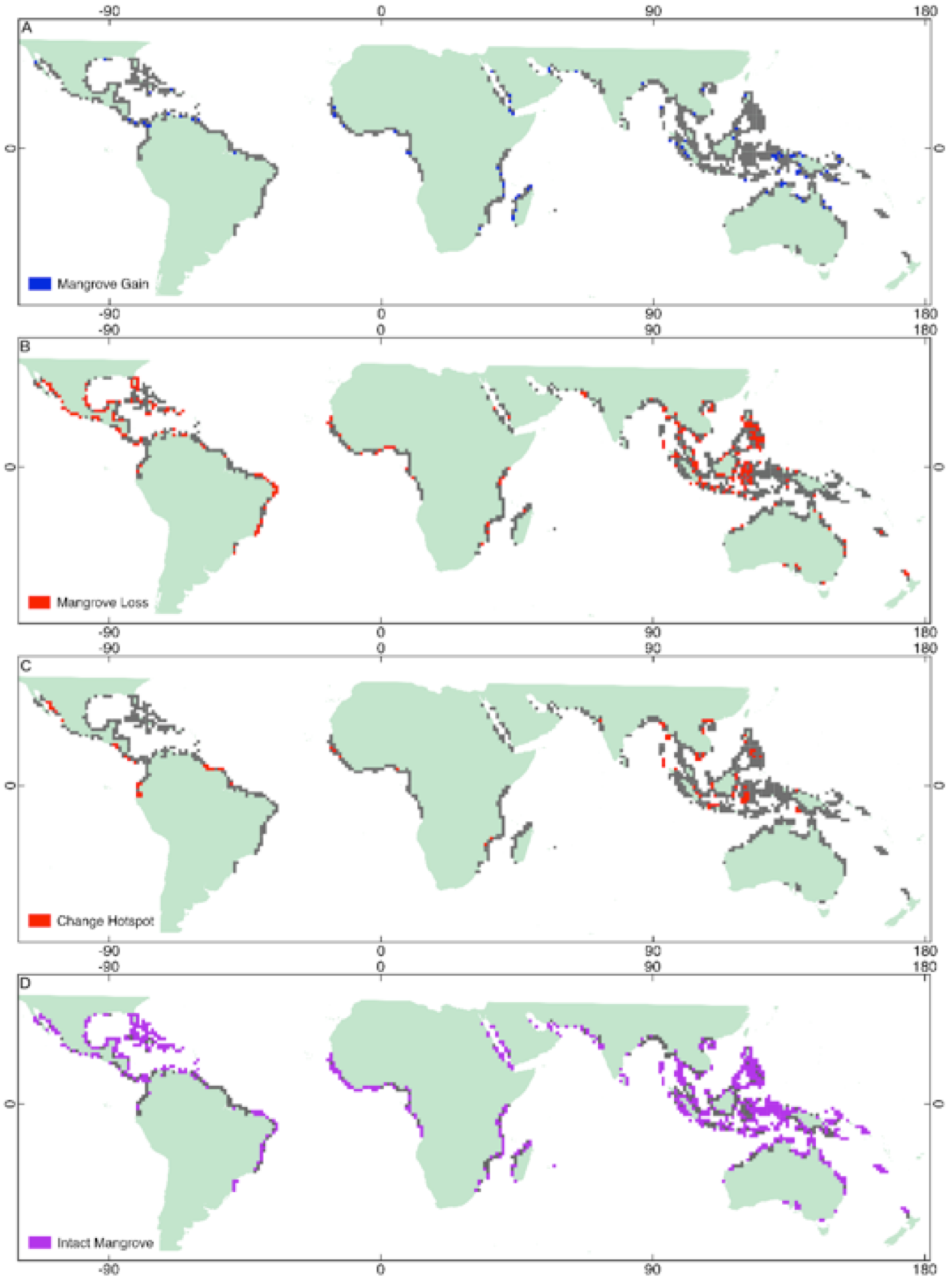


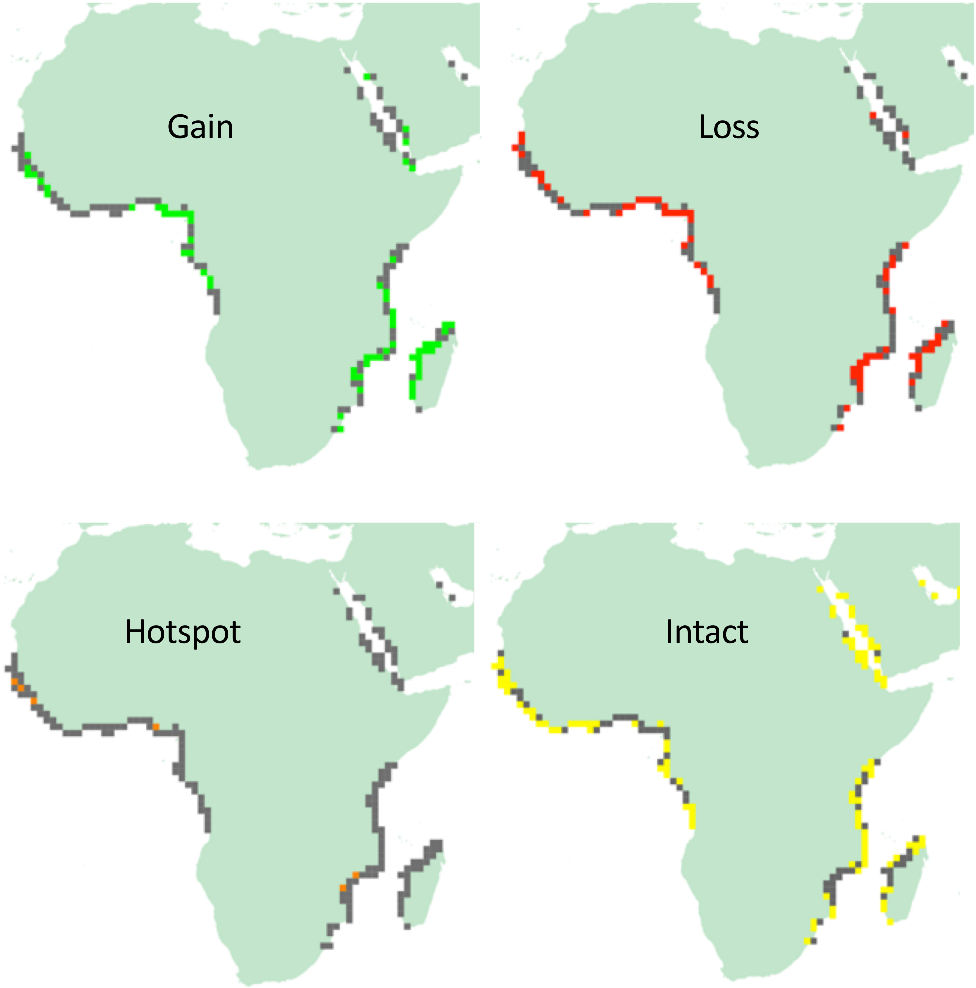
Mapping Change in Mangrove Extent and Identify Proximate Drivers of Changes and Geographical Hotspots.

Distribution and Drivers of Global Mangrove Forest Change, 1996-2010 (Thomas et al., 2017, *PLOS ONE)*





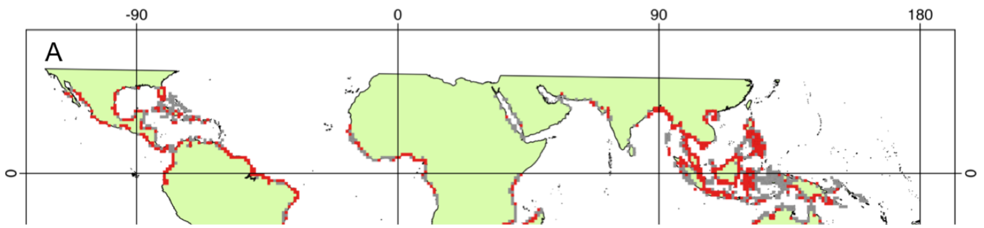


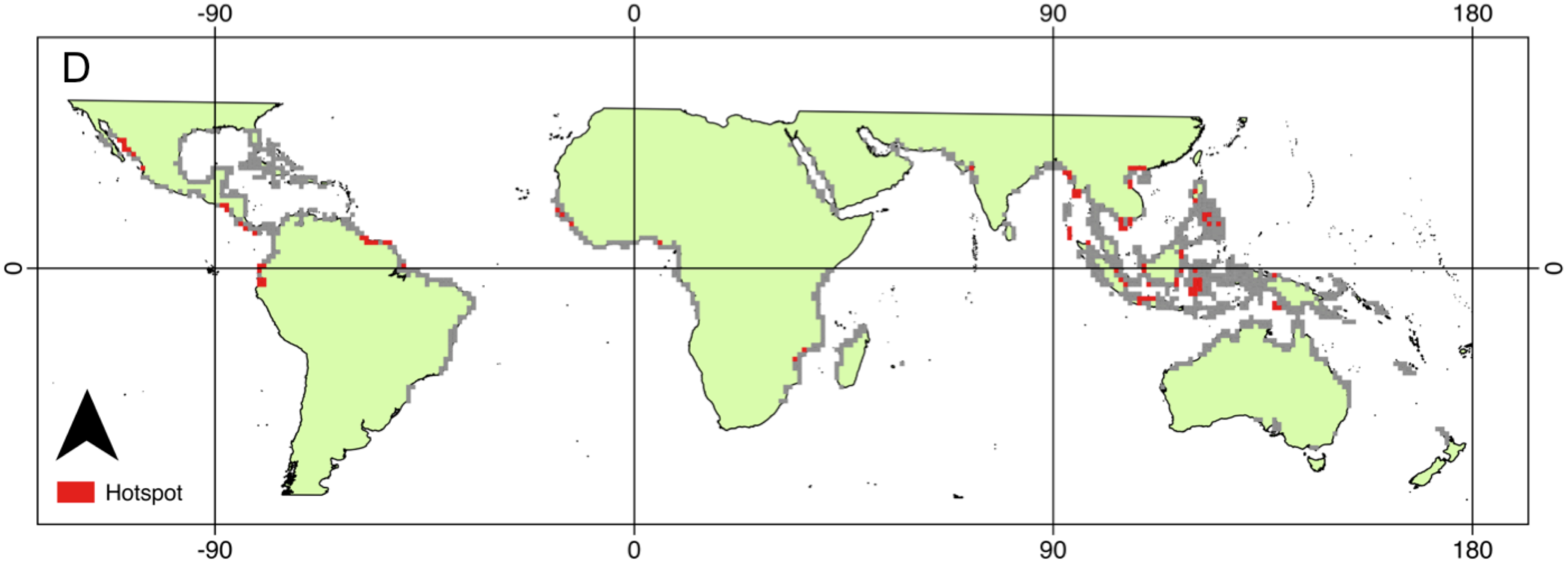


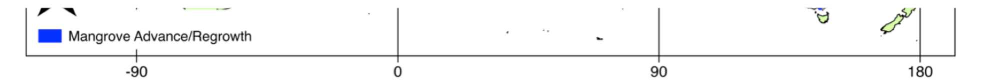
Distribution of different drivers of change in mangrove forest extent

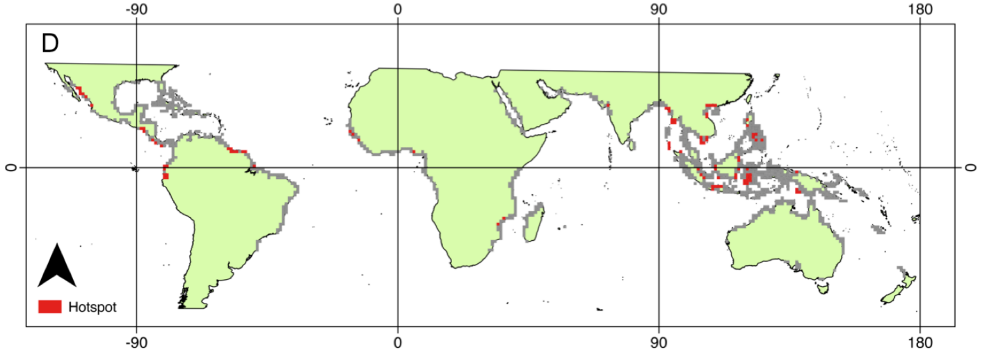
A) Advance and regrowth of mangrove extent (1996-2010)
B) Degradation from anthropogenic drivers of change including evidence of prior disturbance
C) Hotspots where substantial changes in mangrove forest extent were observed (1996-2010)
D) Tiles that contained intact mangrove (1996-2010).

The total distribution of mangrove tiles is provided in gray.

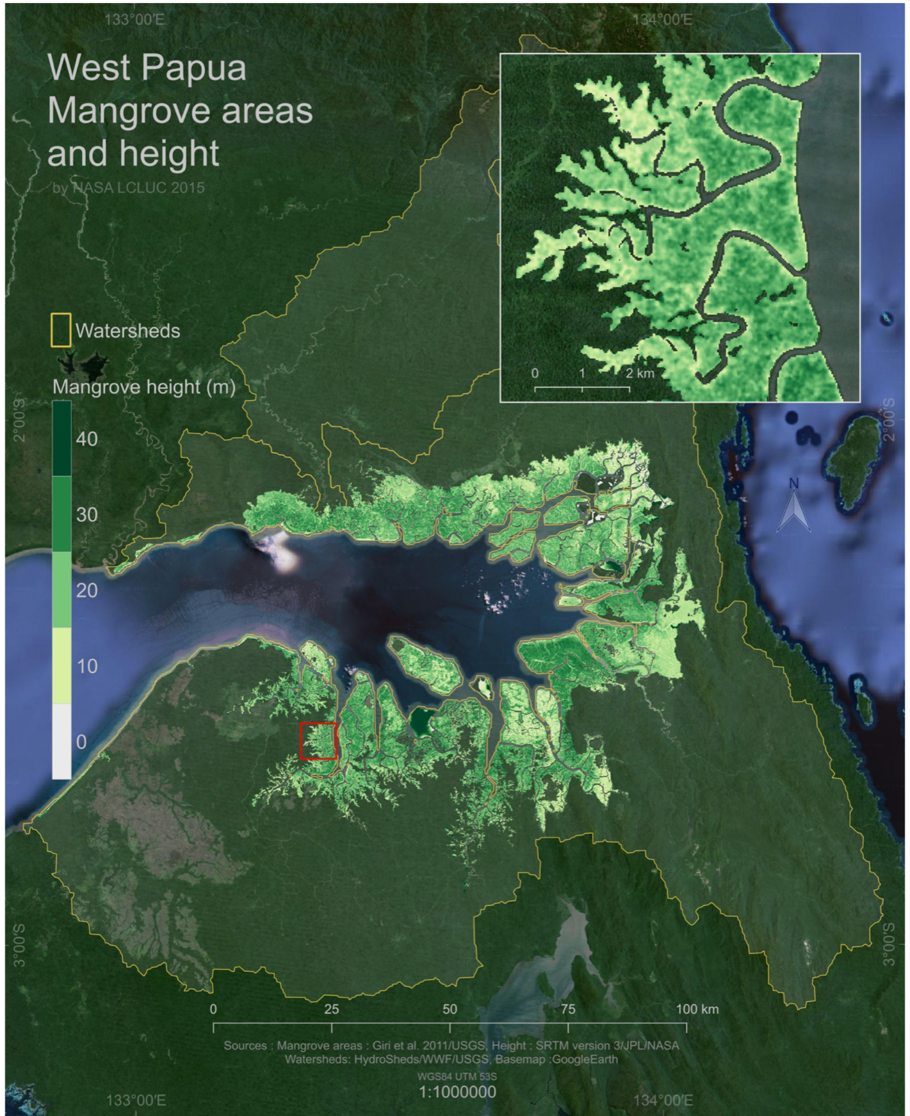

A
-90
0
90
180


D
Hotspot
-90
0
90
180

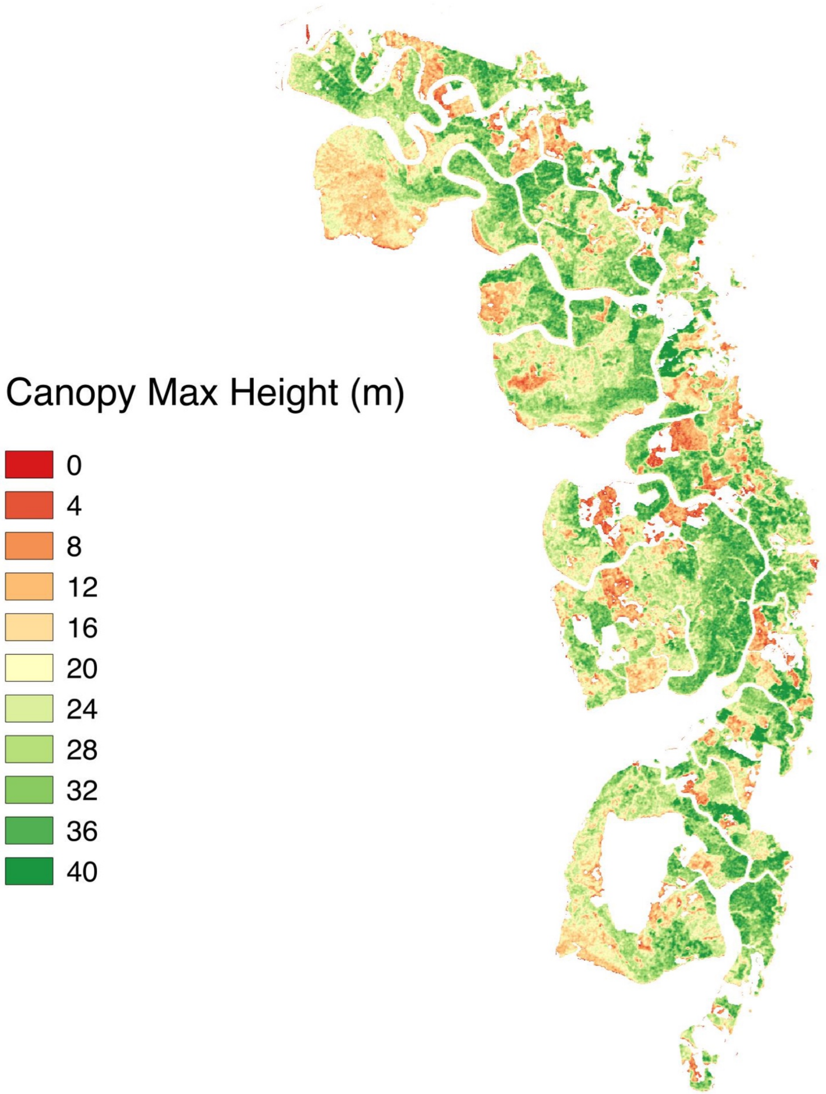

Mangrove Advance/Regrowth
-90
0
90
180


D
Hotspot
-90
0
90
180

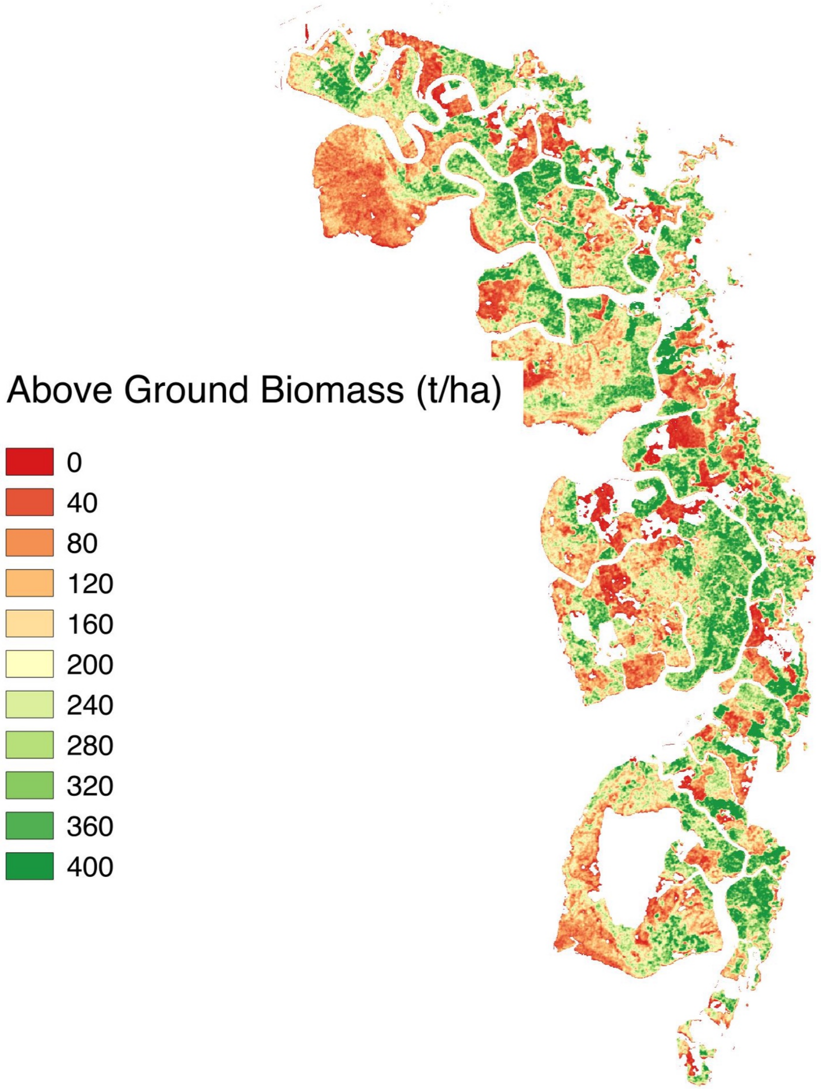
Management of entire watershed is important to the health of mangrove forests.



Maximum Forest Height (m)
Kuala Sepetang



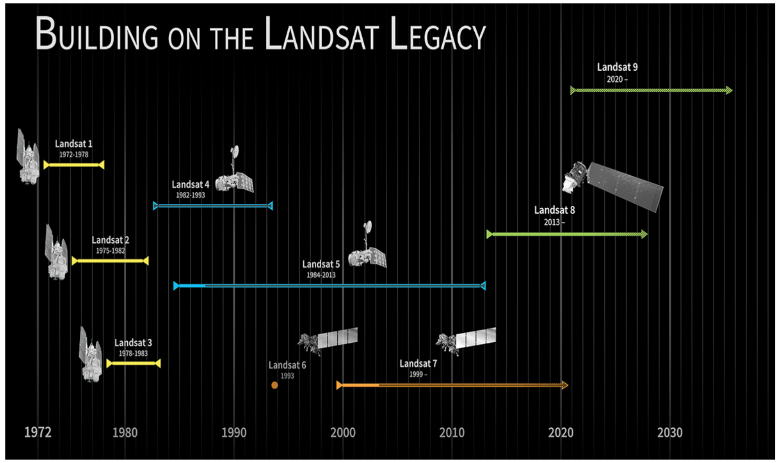
Above Ground Biomass
Kuala Sepetang

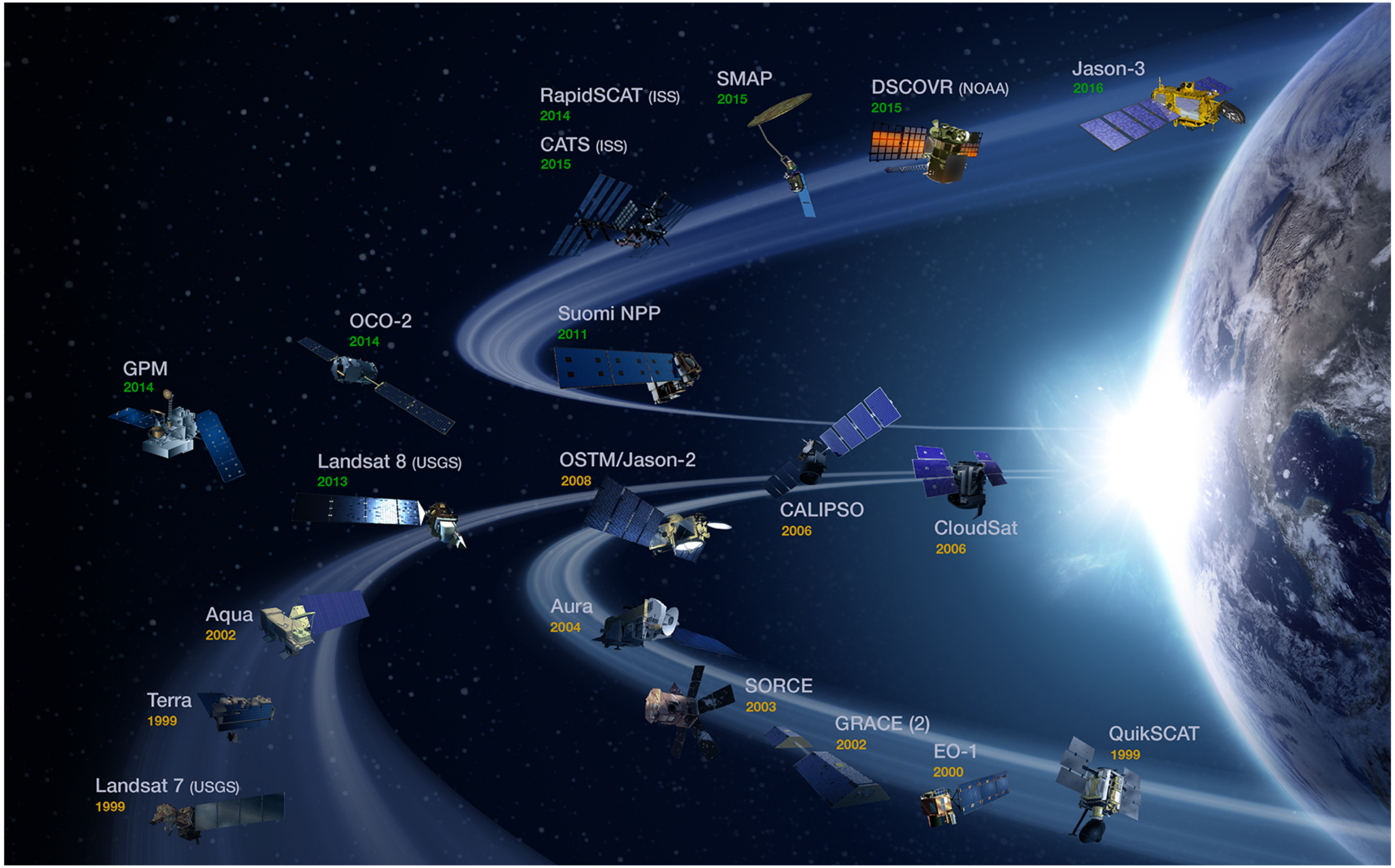


Remote Sensing to estimate Carbon stocks.

- In 2000, there were about 30Mt of above ground biomass in Sepatang.
- 46% of Biomass is Carbon, which implies there were the equivalent of 13.8Mt of carbon
- At 1.7Ringgits/kg means $23.5x10^9$ Ringgits in C stocks.
- \$3.8/3kg=\$1.27/kg means $\$17.5x10^9$ in Carbon stocks in year 2000

Upcoming NASA Missions





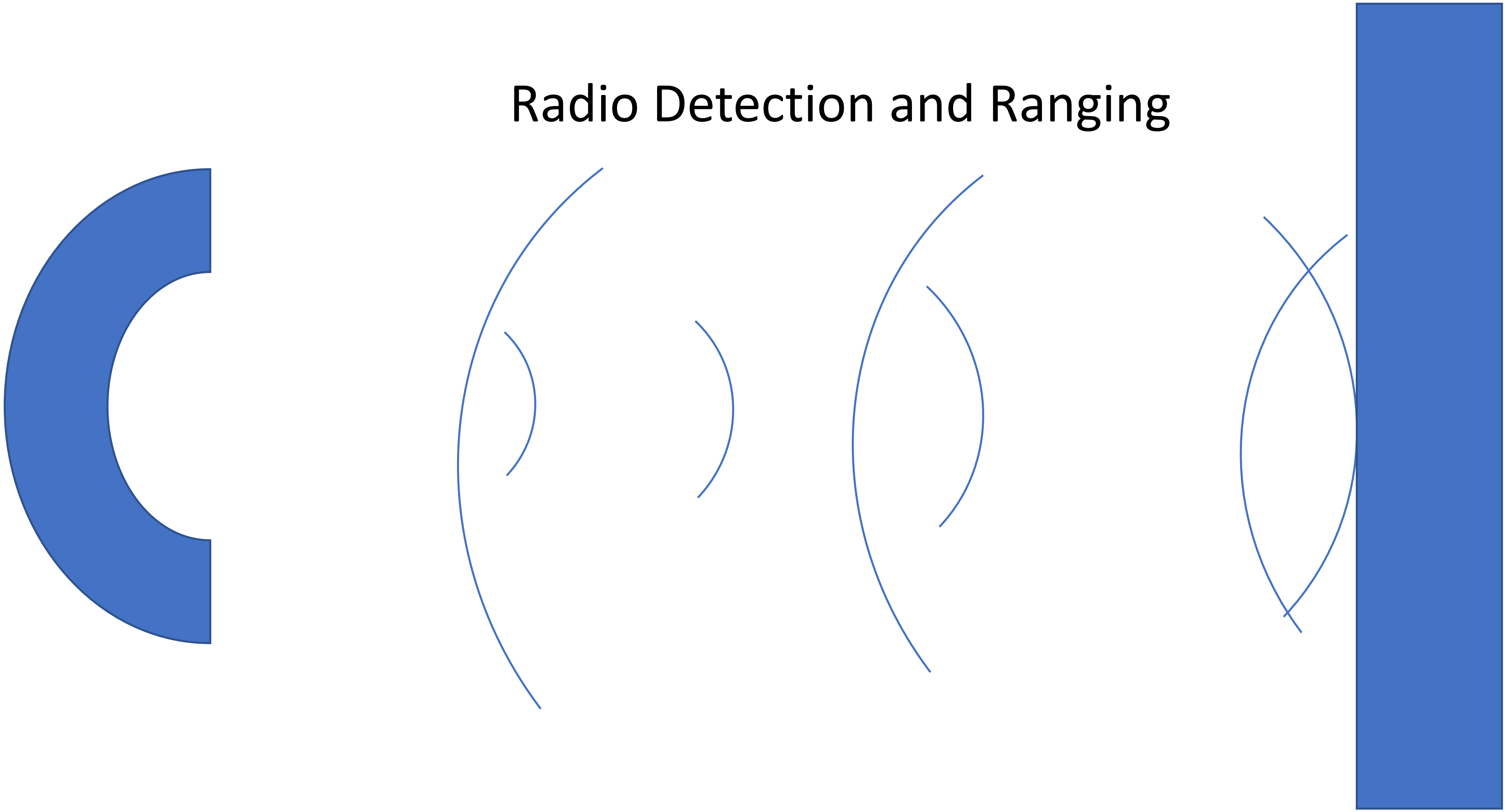
RapidSCAT (ISS)
2014
CATS (ISS)
2015
SMAP
2015
DSCOVR (NOAA)
2015
Jason-3
2016
OCO-2
2014
GPM
2014
Suomi NPP
2011
Landsat 8 (USGS)
2013
OSTM/Jason-2
2008
CALIPSO
2006
CloudSat
2006
Aqua
2002
Aura
2004
Terra
1999
SORCE
2003
GRACE (2)
2002
EO-1
2000
QuikSCAT
1999
Landsat 7 (USGS)
1999

- https://www.youtube.com/watch?v=RjSTKItUUX0

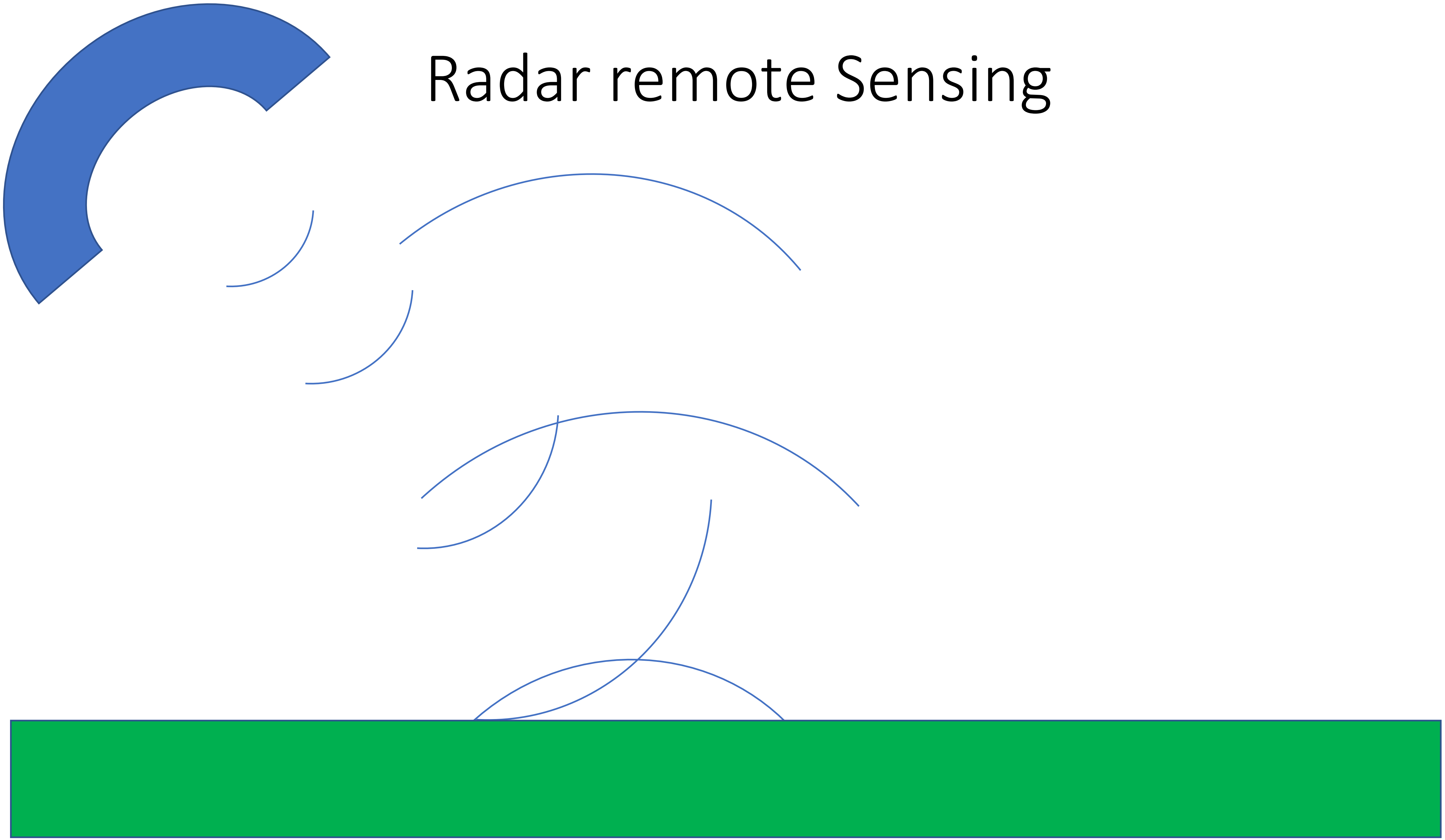
10h00-10h30
Session 1b Introduction to Radar Remote Sensing

Radar?

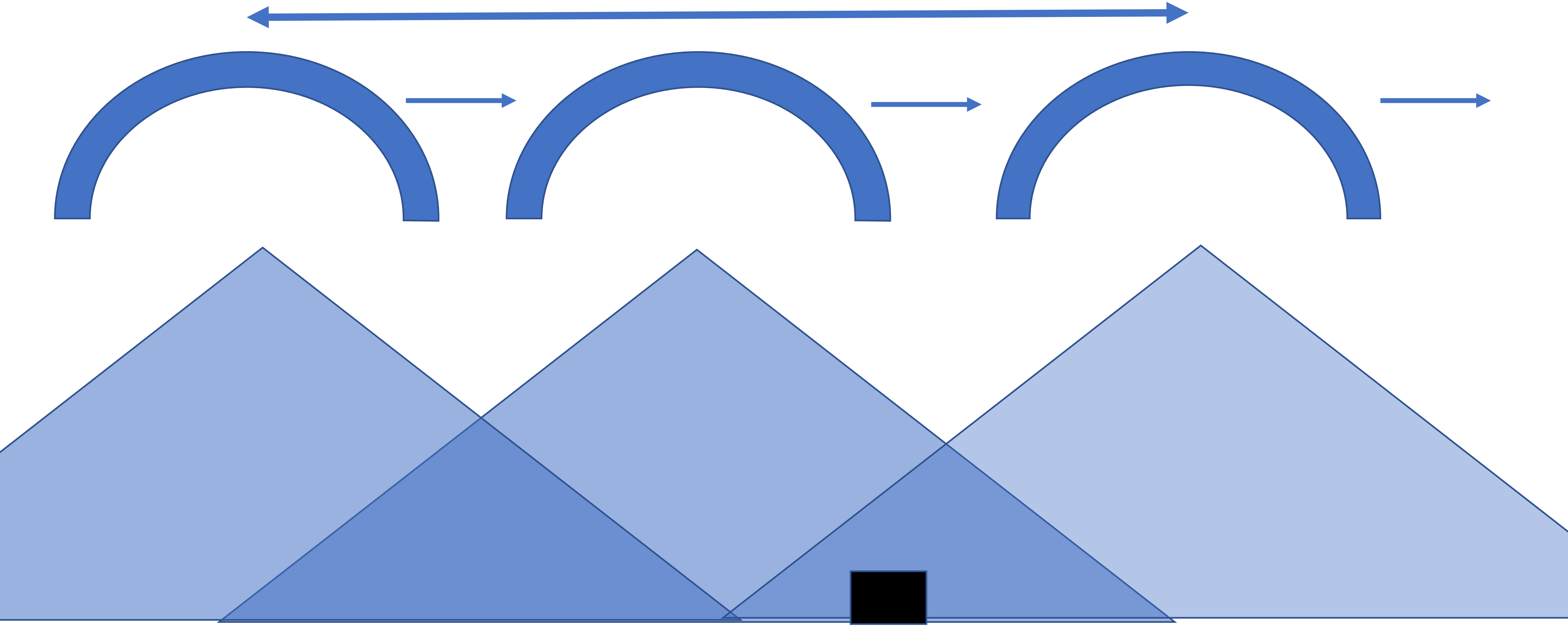
Radio Detection and Ranging

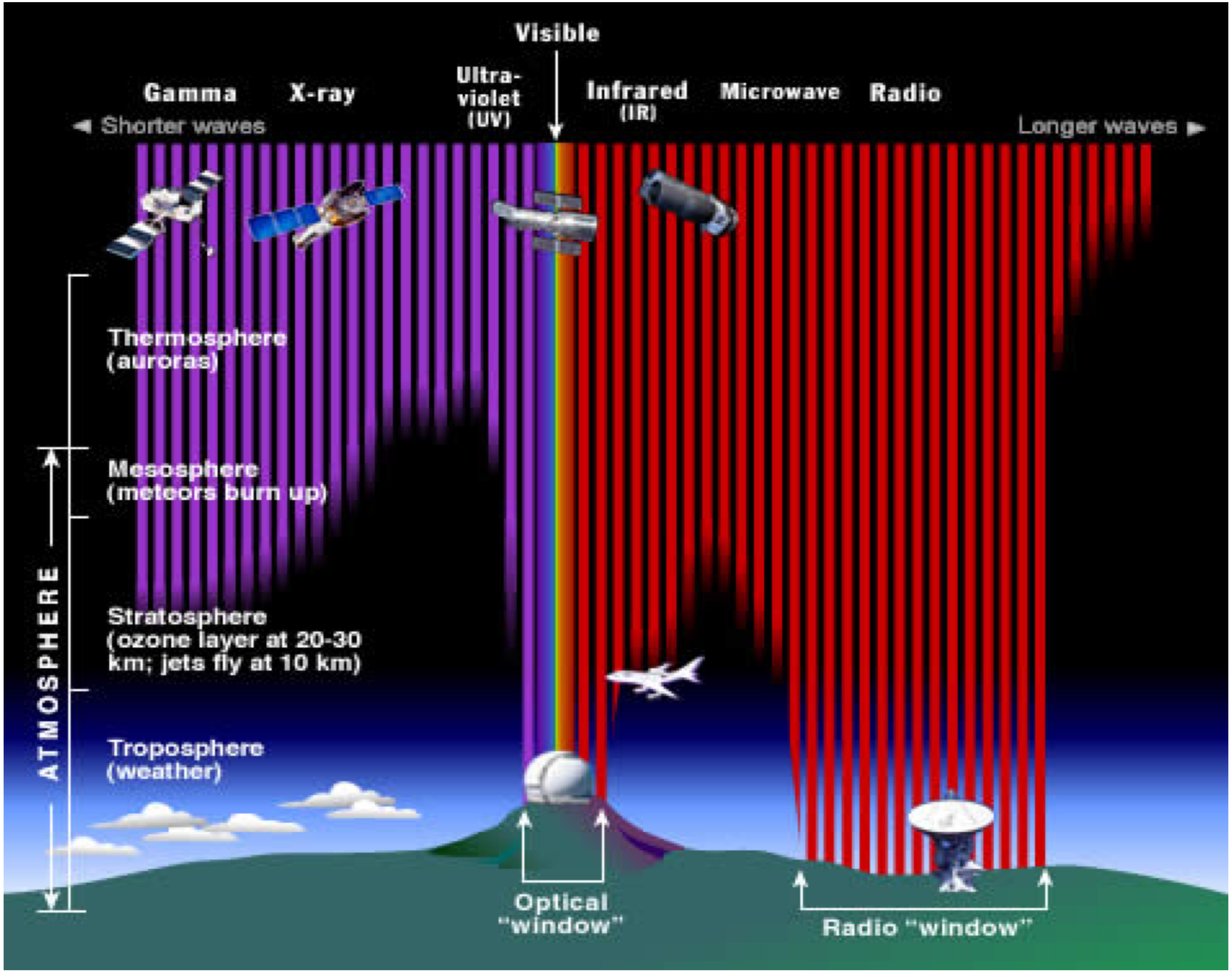


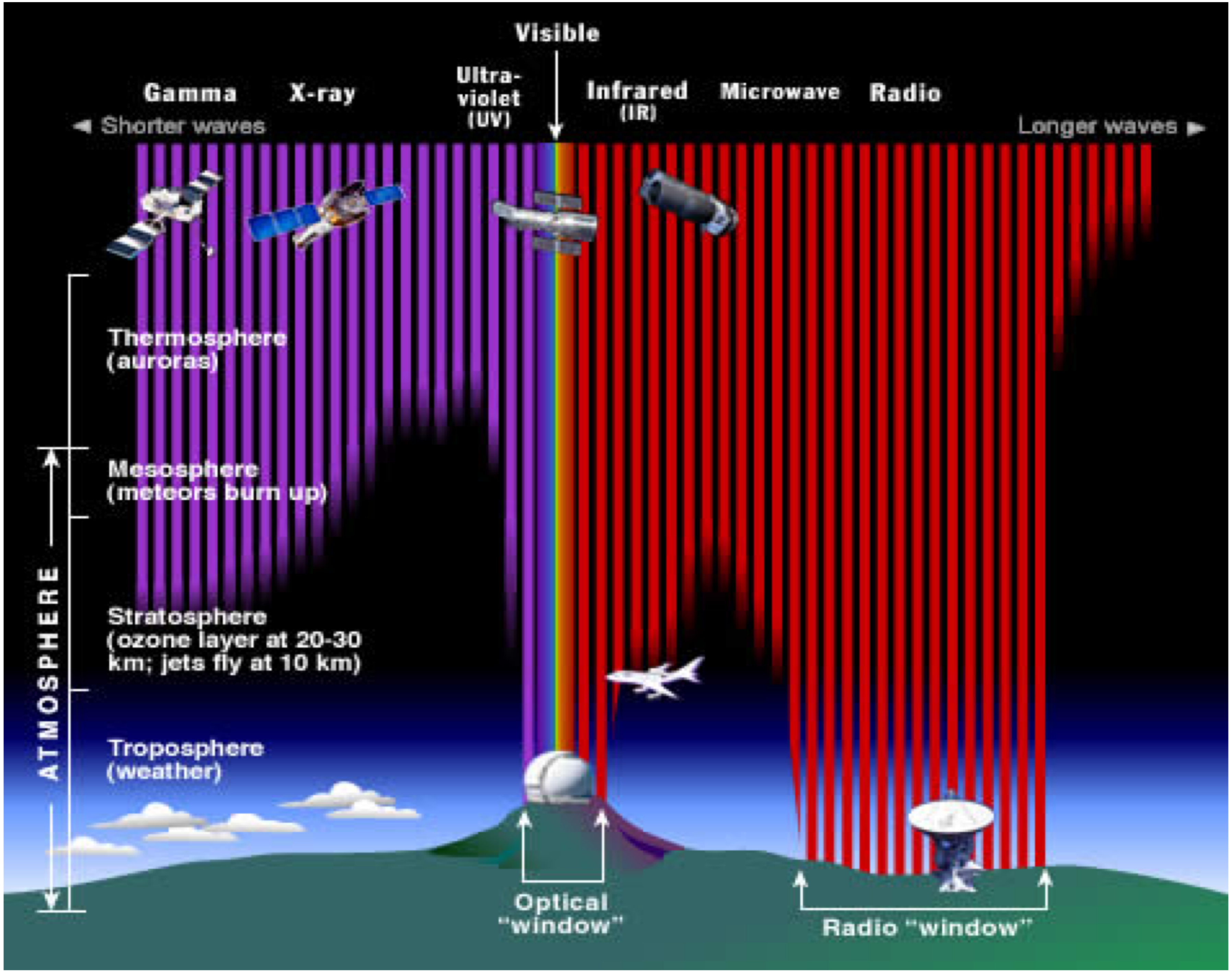
Radar remote Sensing



SAR (Synthetic Aperture Radar)




Visible
Gamma
X-ray
Ultra-
violet
(UV)
Infrared
(IR)
Microwave
Radio
◄ Shorter waves
Longer waves ►
Thermosphere
(auroras)
Mesosphere
(meteors burn up)
Stratosphere
(ozone layer at 20-30
km; jets fly at 10 km)
Troposphere
(weather)
ATMOSPHERE
Optical
"window"
Radio "window"


Visible
Gamma
X-ray
Ultra-
violet
(UV)
Infrared
(IR)
Microwave
Radio
Shorter waves
Longer waves
Thermosphere
(auroras)
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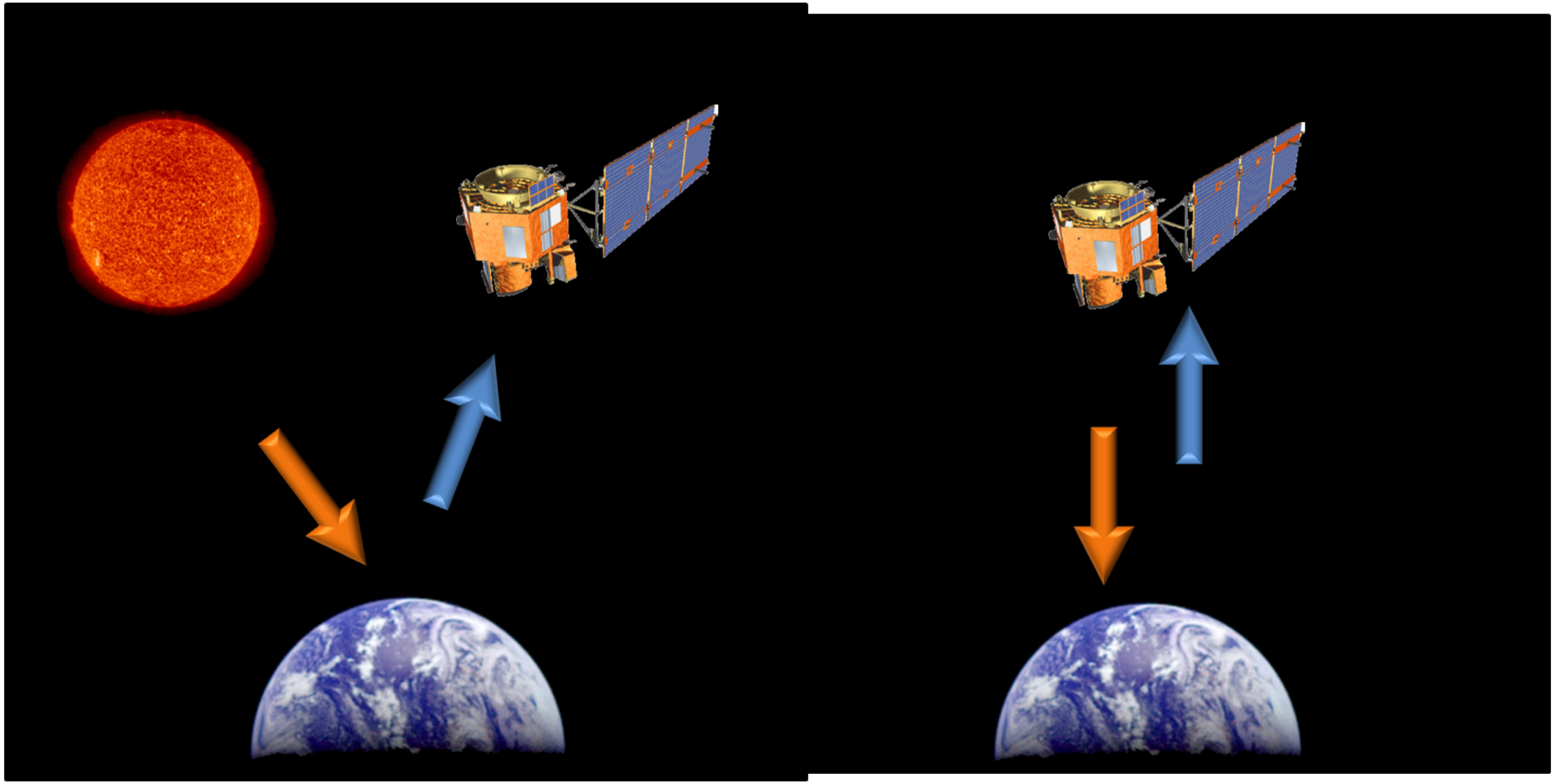
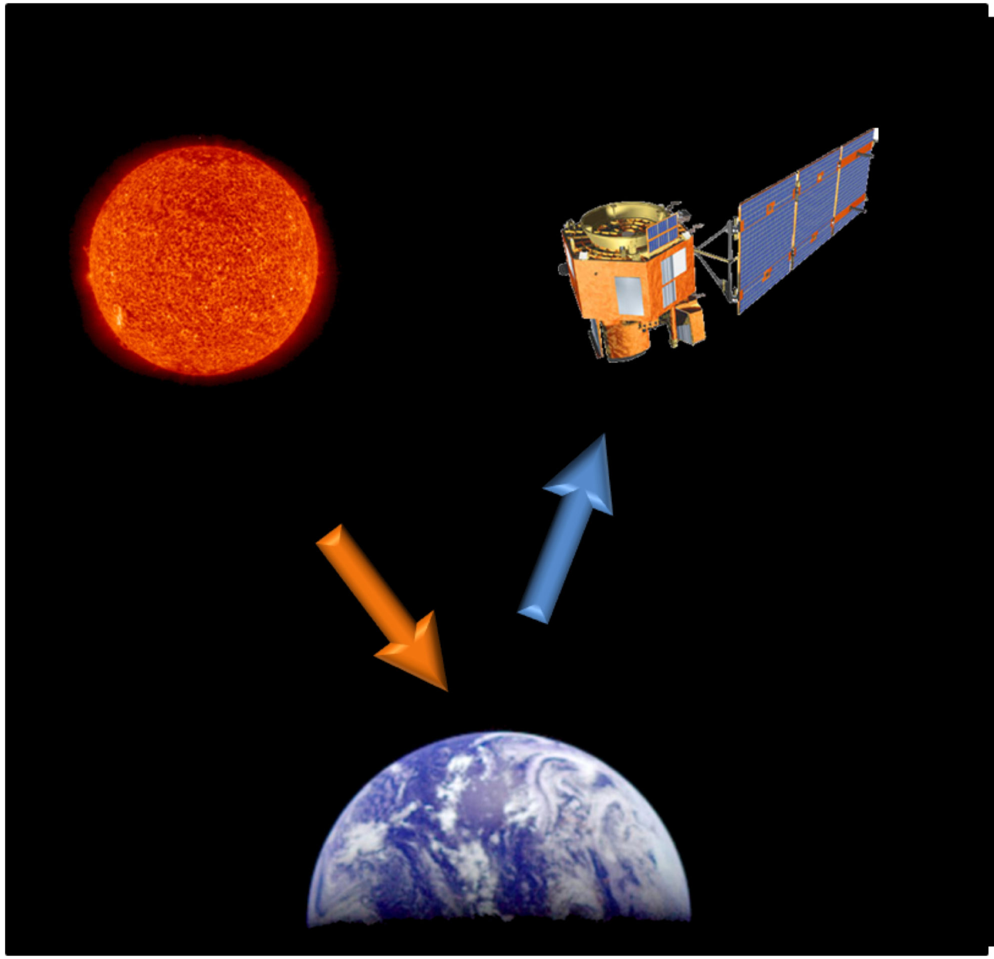
Stratosphere
(ozone layer at 20-30
km; jets fly at 10 km)
Troposphere
(weather)
ATMOSPHERE
Optical
"window"
Radio "window"

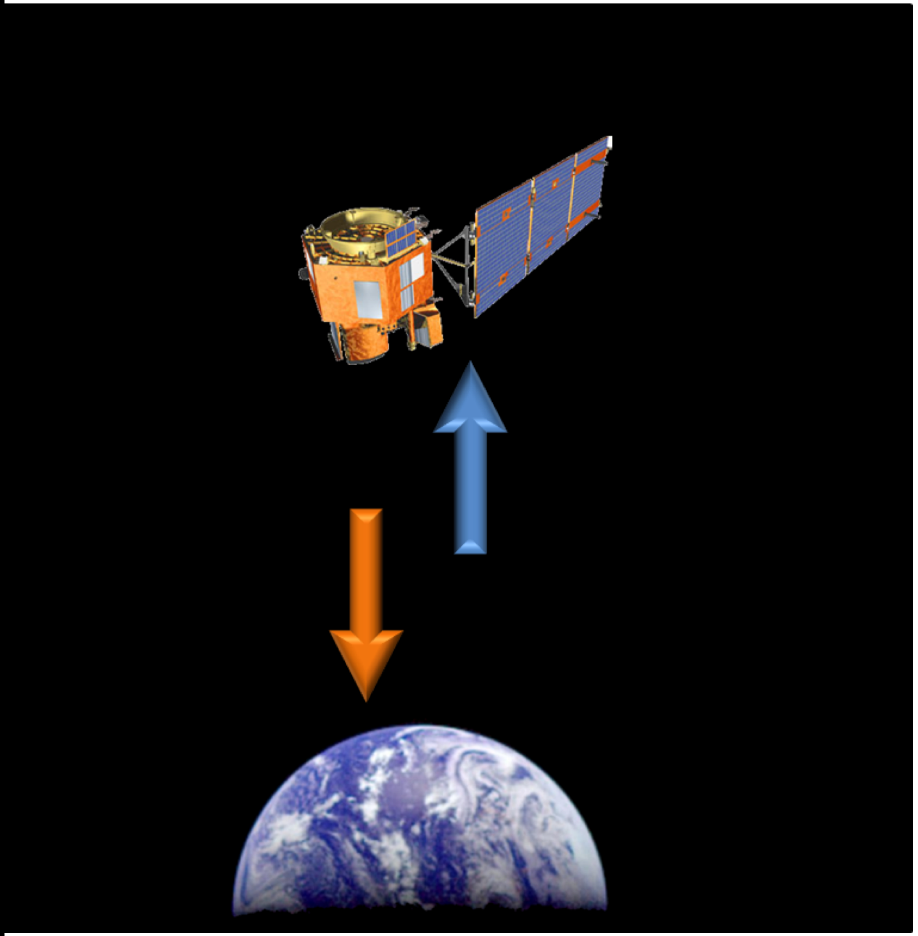
What is a Radar?

Passive Active



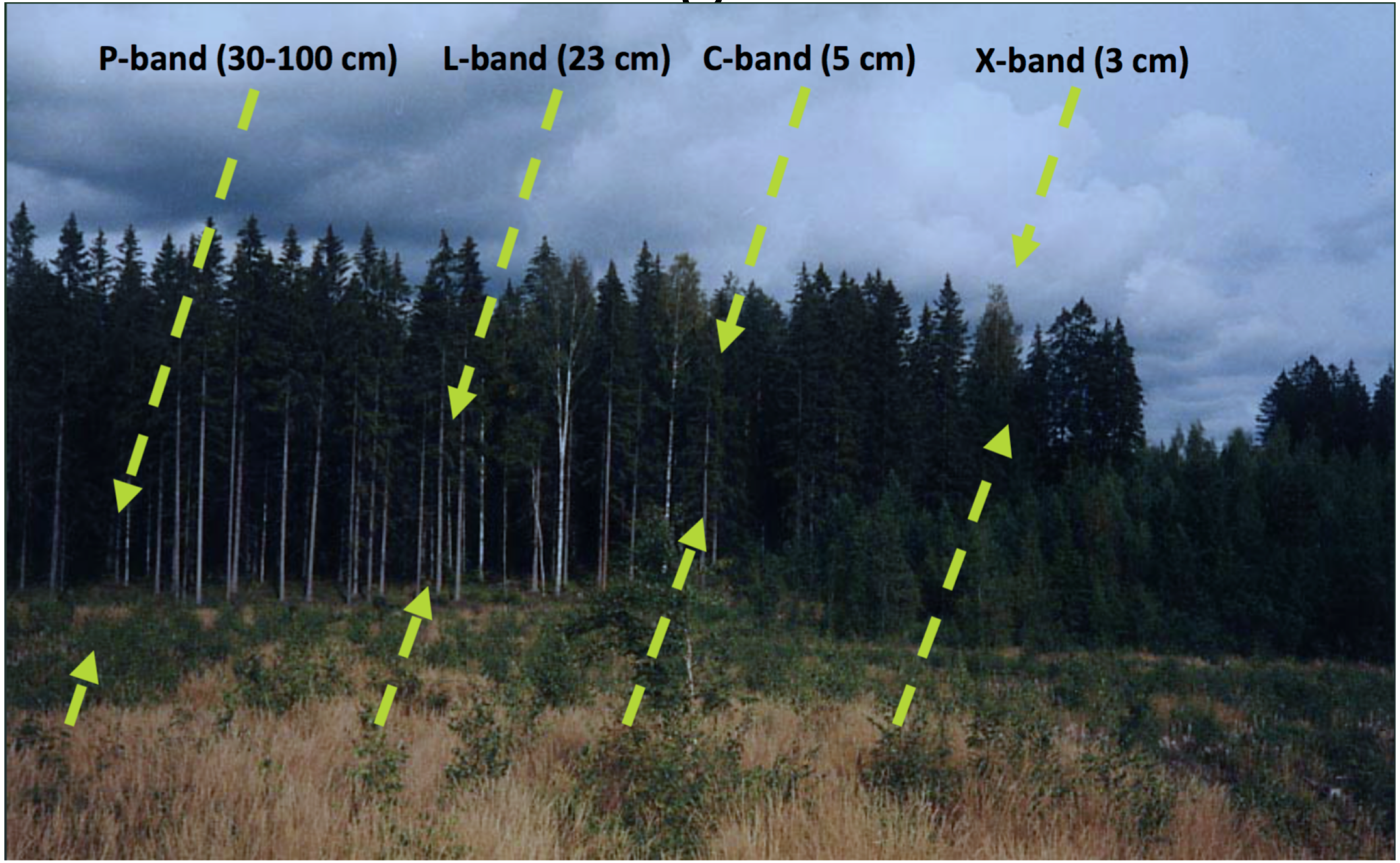
Passive Active





What can a radar observe?

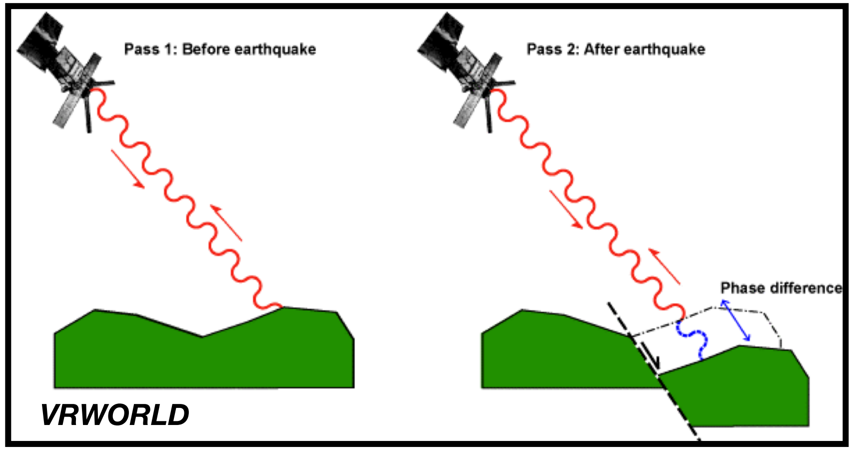
Radar Wavelength Interaction with Vegetation

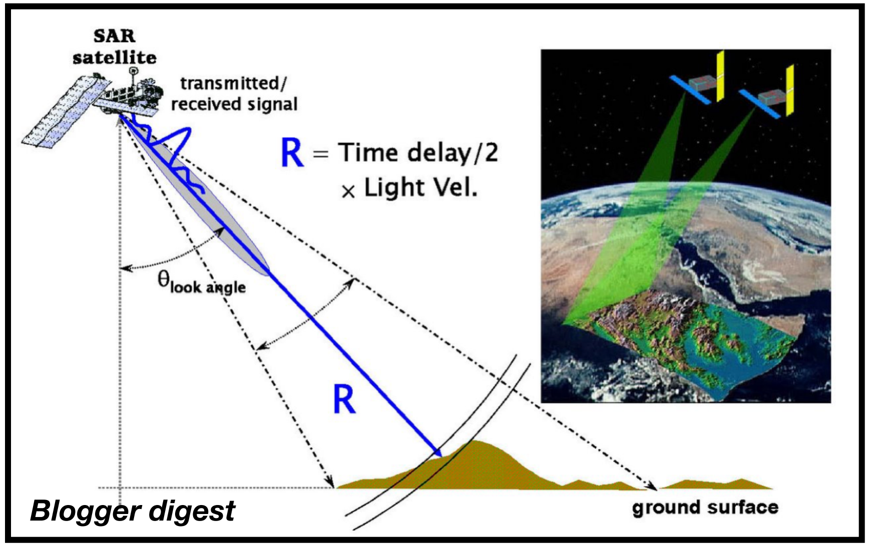


Woods Hole Research Center

Method 2: Radar Interferometry

Radio Detection and Ranging (RaDAR)
(Active RS)





Synthetic Aperture Radar (SAR)

Radar - active illumination system
Reflected signal or echo, is backscattered from the surface and received a fraction of a second later at the same antenna
Coherent radar system - amplitude and phase of the received echo are recorded.
Can penetrate through clouds
Covers larger ground area

Interferometric SAR (InSAR)

InSAR – measure phase changes between two acquisitions
Commonly used to quantify changes and deformation in the Earth

Method 2: Radar Interferometry

l Elevation Measurement (TanDEM-X)

German Space Agency (DLR)

Launched in June 21, 2010 to provide a worldwide high-res DEM:

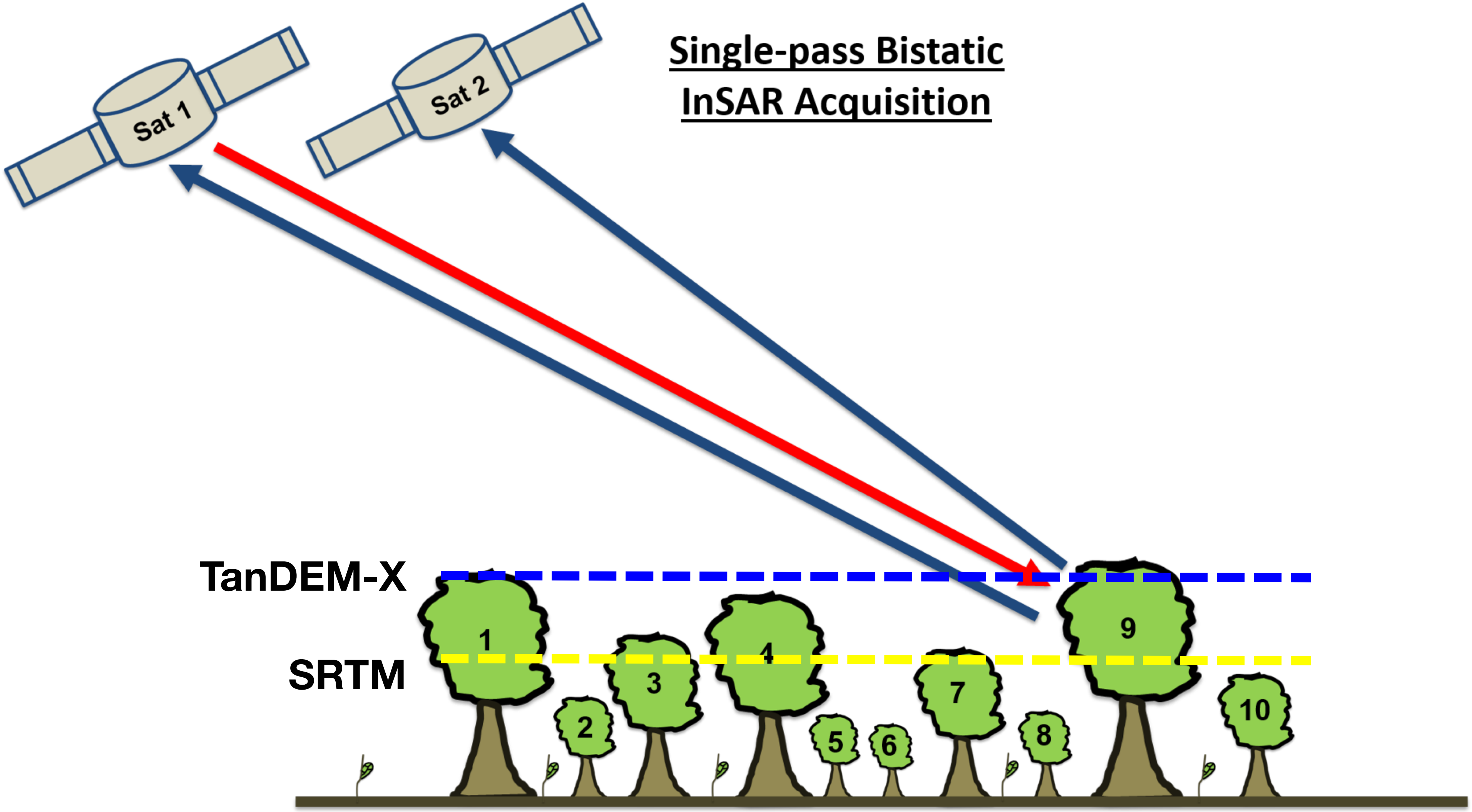
> 2m relative vertical and 12m horizontal accuracy
>
> *SRTM: 16m relative vertical and 30, 90m horizontal accuracy)*

Similar to TSX, but minor modifications.

Distance between TSX and TDX: 250 – 500m.

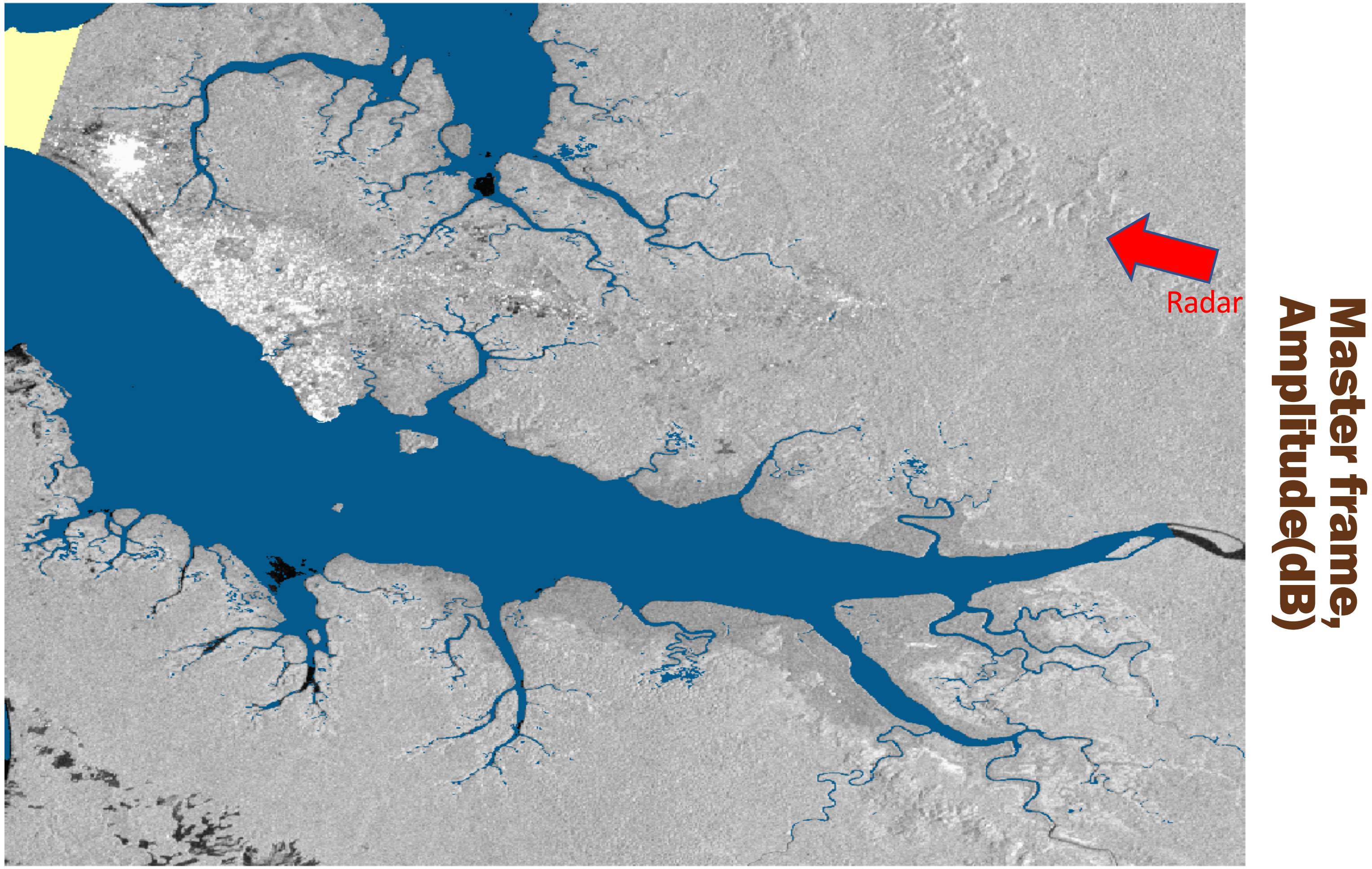
Can be used to validate/calibrate canopy height in conjunction with real elevation data (LiDAR)

Method 2: Radar Interferometry



ALOS/PALSAR L-band Backscatter

Biomass cannot be estimated in dense forest with L-band radar backscatter
Mangrove forest exhibit low backscatter response at high biomass



Past, Current and Future Radar Remote Sensing Instruments

- Canada (Radarsat-1 & -2)
- USA (Seasat, SIR-A –B & -C, SRTM)
- Europe (ERS-1 &-1, ENVISAT, Sentinel-1 and -2)
- Germany (, TanDEM-X)
- Italy (Cosmo-skymed)
- India (
- Japan (JERS-1, ALOS PALSAR-1/2)
- Future Instruments:
  - Argentina +Italy (SAOCOM, 2019)
  - Canada (Radarsat Constellation 2018)
  - USA+INDIA (NISAR 2021)

Satellite SAR Sensors: L-Band

	SEASAT	JERS-1 Japan	ALOS PALSAR Japan	ALOS-2 PALSAR-2 Japan	ALOS-4 PALSAR-3 Japan	SAOCOM, 1A / 1B Argentina	NISAR USA/India
Operation Date	1978 (105 days)	1992-1998	1/2006 4/2011	2014	2020	2018/2019	2022
Frequency Band	L	L	L	L	L	L	L
Polarization	HH	HH	Polarimetric	Polarimetric	Polarimetric	Dual	Dual
Spatial Resolution [m]	20	18	10, 20, 100	3 - 100	3 - 100	10-100	10
Repeat Cycle [days]	17	44	46	14	14	16/8	12

Kellndorfer et al. 2017/11 SAF Meeting Albuquerque

Satellite SAR Sensors: C-Band

	RADARSAT-1 Canada	RADARSAT-2 Canada	RADARSAT Constellation Mission Canada	ERS-1/2 Europe	Envisat Europe	Sentinel-1 ESA
Launch/ Operation Date	1995	2007	2018	1991-2011	2002-2012	2014 (A) 2016 (B)
Frequency Band	C	C	C	C	C	C
Polarization	HH	Quad-pol	Quad-pol	VV	HH, VV, HV	Dual-Pol Interferometric
Spatial Resolution [m]	10-100	3-100	3-100	30	10-100	5-100
Repeat Cycle [days]	24	24	1	3/75/176	35	12/6

Sentinel-1 C/D approved for operations until 2030

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Satellite SAR Sensors: X-Band

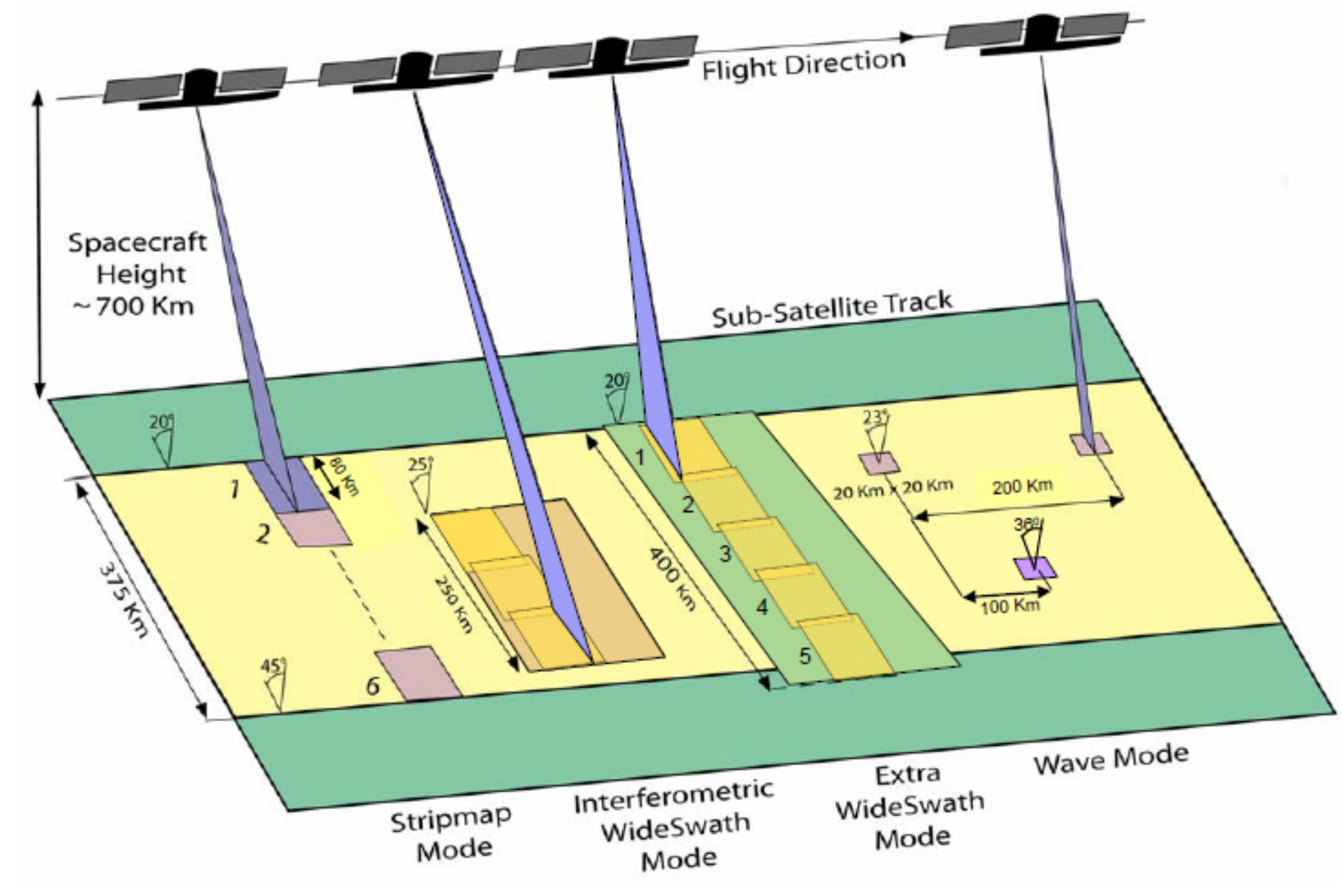
	TerraSAR-X Tandem-X DLR/InfoTerra	Cosmo SKYMED Constallation, ASI, eGeos
Operation Date	4/2007 2009 Tandem-X	2007
Frequency Band	X	X
Polarization	Polarimetric Interferometric	Polarimetric Interferometric
Spatial Resolution [m]	Up to 1	Up to 1
Repeat Cycle [days]	11	16

Revisit cycles much lower through antenna steering

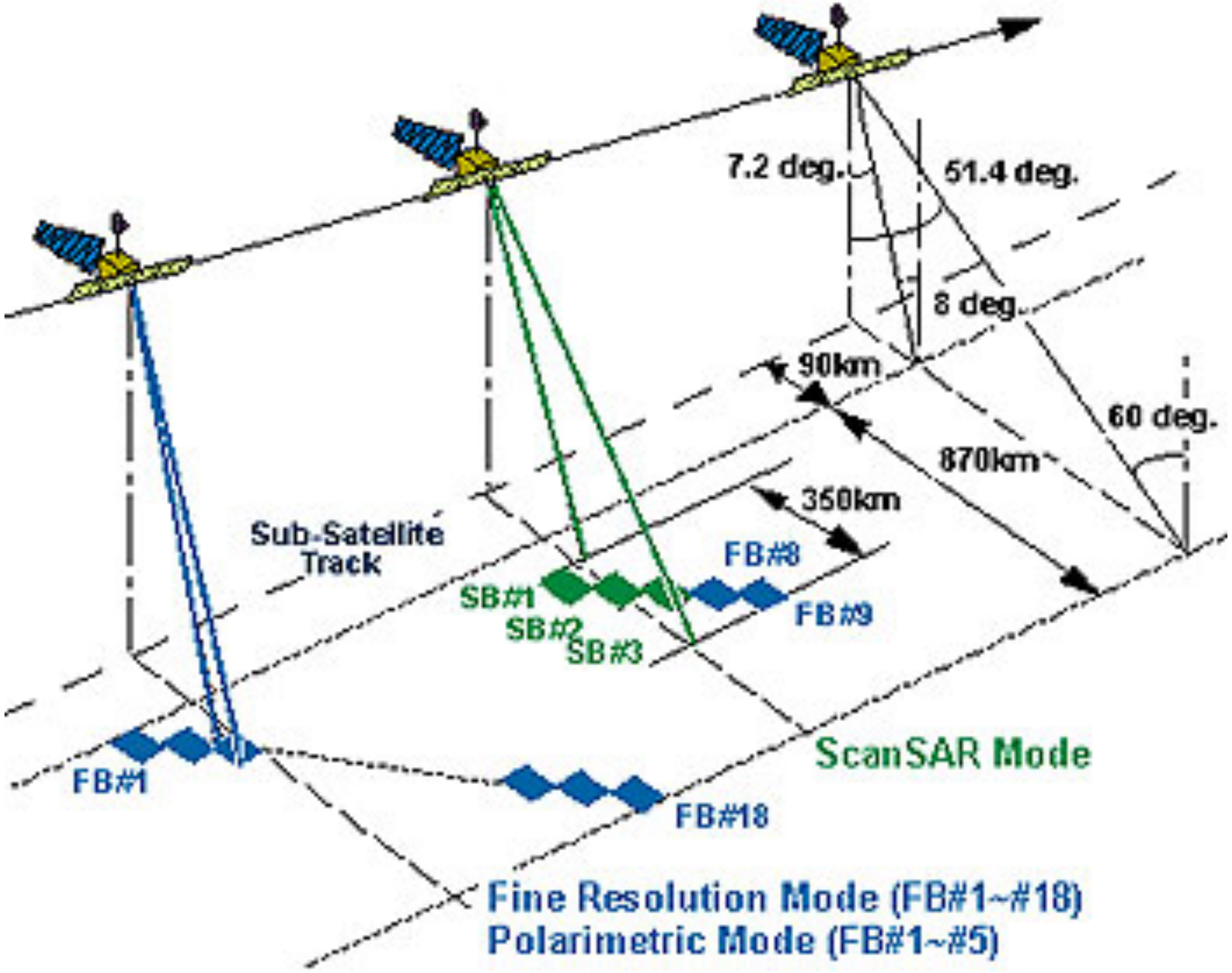
Satellite SAR Sensors: Other Bands

	ESA Biomass Mission Europe	NISAR USA/India
Operation Date	2018	2020
Frequency Band	P	S
Polarization	Polarimetric Interferometric	Polarimetric Interferometric
Spatial Resolution [m]	50-200	~3
Repeat Cycle [days]	25	12

SAR instrument acquisition modes Sentinel



ALOS PALSAR MODES



ALOS PALSAR MODES

PALSAR Characteristic				
Mode	Fine		ScanSAR	Polarimetric (Experimental mode)*1
Center Frequency	1270 MHz(L-band)			
Chirp Bandwidth	28MHz	14MHz	14MHz,28MHz	14MHz
Polarization	HH or VV	HH+HV or VV+VH	HH or VV	HH+HV+VH+VV
Incident angle	8 to 60deg.	8 to 60deg.	18 to 43deg.	8 to 30deg.
Range Resolution	7 to 44m	14 to 88m	100m (multi look)	24 to 89m
Observation Swath	40 to 70km	40 to 70km	250 to 350km	20 to 65km
Bit Length	5 bits	5 bits	5 bits	3 or 5bits
Data rate	240Mbps	240Mbps	120Mbps,240Mbps	240Mbps
NE sigma zero *2	< -23dB (Swath Width 70km) < -25dB (Swath Width 60km)		< -25dB	< -29dB
S/A *2,*3	> 16dB (Swath Width 70km) > 21dB (Swath Width 60km)		> 21dB	> 19dB
Radiometric accuracy	scene: 1dB / orbit: 1.5 dB			

Break 10h30-11h00

Session 2: 11h00 – 12h30
FREE Availability and Sources of Radar Remote Sensing Data

- ALOS PALSAR -1 (Images and mosaics)
- ALOS PALSAR -2 (Mosaic only, images with proposals)
- JERS-1 Mosaics
- Sentinel-1 a/b (images)

Download | STEP

step.esa.int/main/ 50%

JPL Mangroves

step
science toolbox exploitation platform

esa

ESA | STEP | TOOLBOXES | DOWNLOAD | GALLERY | DOCUMENTATION | COMMUNITY | THIRD PARTY PLUGINS

- SNAP
- Sentinel 1 Toolbox
- Sentinel 2 Toolbox
- Sentinel-3 Toolbox
- SMOS Toolbox
- Download
- Community
- Useful Links

Search...

Home > Download

Download

Here you can download the latest installers for SNAP and the Sentinel Toolboxes.

Data provision is available to all users via the **Sentinel Data Hub**.

Important note: While the current official version is still SNAP 5.0, the new SNAP 6.0 beta release is available to be downloaded and tested at your own risk. The beta version is not fully tested, but it contains new features and fixes to many issues found in SNAP 5.0. The SNAP 6.0 beta release is provided "as is" and is not supported, but we are interested in your feedback and bug reports and intend to fix the reported bugs in the SNAP 6.0 official version. The details and download links for SNAP 5.0 and SNAP 6.0 beta are below.

Current Version

The current version is **5.0.0** (05.12.2016 **14:40**).

For detailed information about changes made for this release please have a look at the release notes of the different projects: SNAP, S1TBX, S2TBX, S3TBX, SMOS Box, PROBA-V Toolbox

We offer three different installers for your convenience. Choose the one from the following table which suits your needs. During the installation process, each toolbox can be excluded from the installation. Toolboxes which are not initially installed via the installer can be later downloaded and installed using the plugin manager. Please note that SNAP and the individual Sentinel Toolboxes also support numerous sensors other than Sentinel.

	Windows 64-Bit	Windows 32-Bit	Mac OS X	Unix 64-bit
Sentinel Toolboxes	These installers contain the **Sentinel-1**, **Sentinel-2**, **Sentinel-3** Toolboxes			
	Download	Download	Download	Download
SMOS Toolbox	These installer contains only the **SMOS Toolbox**. Download also the Format Conversion Tool (Earth Explorer to NetCDF) and the user manual.			
	Download	Download	Download	Download
All Toolboxes	These installers contain the **Sentinel-1**, **Sentinel-2**, **Sentinel-3** Toolboxes, **SMOS** and **PROBA-V** Toolbox			
	Download	Download	Download	Download

If you later decide to install an additional toolbox to your installation you can follow this step-by-step guide.

We are happy to **get your feedback** on the software installation procedure, functionalities, encountered issues, etc on the **Forum**. You may also watch the **Blog** to be informed about SNAP news such as new software releases or interesting events.

seom
scientific exploitation of operational missions

2017

EO Open Science 2017

7th Advanced Land Training Course

ESA POLinSAR 2017 Workshop

2016

Colour and Light in the Ocean from Earth Observation

Earth Observation Open Science 2016 Conference

ESA EO summer school on "Earth System Monitoring & Modelling"

Advanced Land Observing Satellite ●●● DAICHI-2·DAICHI ALOS-2·ALOS
ALOS Research and Application Project of EORC, JAXA

Image Library
ALOS-2 Project
Calibration&Validation
ALOS Observation Strategy
Use DATA
Dataset
Conference & Workshop
Kyoto & Carbon Initiative
Research Announcement

Home > Dataset > Global PALSAR-2/PALSAR/JERS-1 Mosaic and Forest/Non-Forest map

Global PALSAR-2/PALSAR/JERS-1 Mosaic and Forest/Non-Forest map

1. Updates

Oct. 2, 2017:	Dataset description document has been updated (Ver. E).
Jun. 20, 2017:	[NEW!]Replaced 9 tiles of 2015 dataset. The replaced tiles are as follows: N16E145,N16E146,N17E145,N17E146,N18E145,N18E146,N19E145,N19E146,N20E145
May. 24, 2017:	About data utilization has been added.
Apr. 27, 2017:	PALSAR-2 global mosaic and forest/non-forest map in 2016 are released. Reprocessed version of PALSAR-2 global mosaic and forest/non-forest map in 2015 are released. Dataset description document has been updated (Ver.D). * The data around Japan will be available in the near future.
Jan. 11, 2017:	JERS-1 SAR yearly mosaic for tropical regions from 1993 to 1998 are released. Dataset description document has been updated (Ver. C).
Oct. 31, 2016:	JERS-1 SAR global mosaic in 1996 are released. Dataset description document has been updated (Ver. B).
May. 10, 2016:	Dataset description document has been updated (Ver. A).
Apr. 6, 2016:	(Correction) of a figure 1 used in [Global 25m Resolution PALSAR-2/PALSAR Mosaic and Forest/Non-Forest Map]
Mar. 28, 2016:	PALSAR-2 global mosaic and forest/non-forest map for Japan in 2015 are released.
Mar. 28, 2016:	Low resolution forest/non-forest maps (0.25 degrees and 1km) are released.
Jan. 25, 2016:	PALSAR-2 global mosaic and forest/non-forest map in 2015. * Data for Japan (using polarimetry mode) will be available soon.
Jan. 16, 2014:	PALSAR global mosaic and forest/non-forest map in 2007, 2008, 2009 and 2010.

2. Overview

Global 25m resolutions PALSAR-2/PALSAR mosaic and forest/non-forest map are free and open dataset generated by applying JAXA's powerful processing and sophisticated analysis method/techniques to a lot of images obtained with Japanese L-band Synthetic Aperture Radars (PALSAR and PALSAR-2) on Advanced Land Observing Satellite (ALOS) and Advanced Land Observing Satellite-2 (ALOS-2).

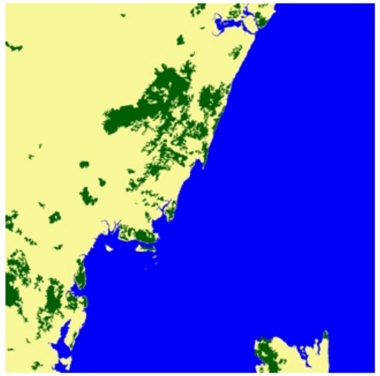
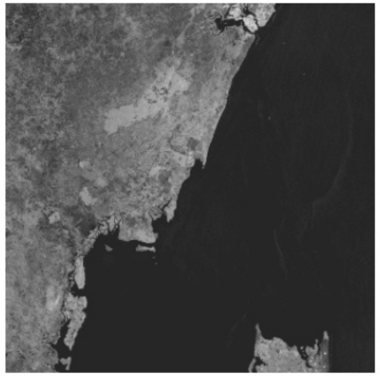
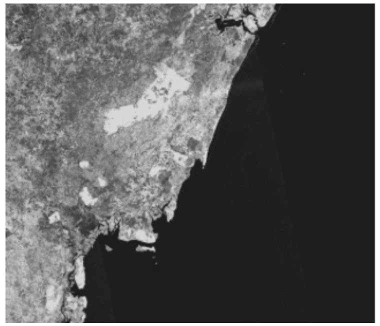
For understanding and responding to global environmental changes such as global warming and loss of biodiversity, timely assessment of deforestation and forest degradation is essential. Global monitoring with satellite remote sensing is one of the most effective approaches to detect land surface changes because satellites can provide wall-to-wall images covering wide areas periodically. L-band Synthetic Aperture Radars (SAR) on ALOS and ALOS-2 can observe the land surface even under clouds, and therefore the L-band SAR data have been providing useful information about forest changes in tropical region.

The global 25m resolutions PALSAR/PALSAR-2 mosaic is a seamless global SAR image created by

Global PALSAR-2/PALSAR/JERS-1 Mosaic and Forest/Non-Forest map

EORC, JAXA

S04E039_2007

Year	Type	Image	Download
2007	FNF		Download
	HH		Download
	HV		

vertex.daac.asf.alaska.edu

Vertex: ASF's Data Portal | Download | www.eorc.jaxa.jp/ALOS/en/palsar_... | Download_JERS-1 Mosaic | kenya utm zone - Google Search

EARTHDATA Data Discovery DAACs Community Science Disciplines

UAF ALASKA SATELLITE FACILITY

Vertex is the Alaska Satellite Facility's data portal for remotely sensed imagery of the Earth.

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Geospatial | Granule

Missions

Geographic Region

Option 1: Click on map and move cursor

Option 2: Enter coordinates:

39.04,-5.36,39.8,-5.36,39.8,-3.89,39.04,

e.g., -102,37.59,-94,37,-94,39,-102,39,-102,37.59

Counterclockwise, decimal degrees, (long,lat)

Date

☐ Seasonal Search

Start Date (yyyy-mm-dd)

1978-01-01

End Date (yyyy-mm-dd)

2018-04-12

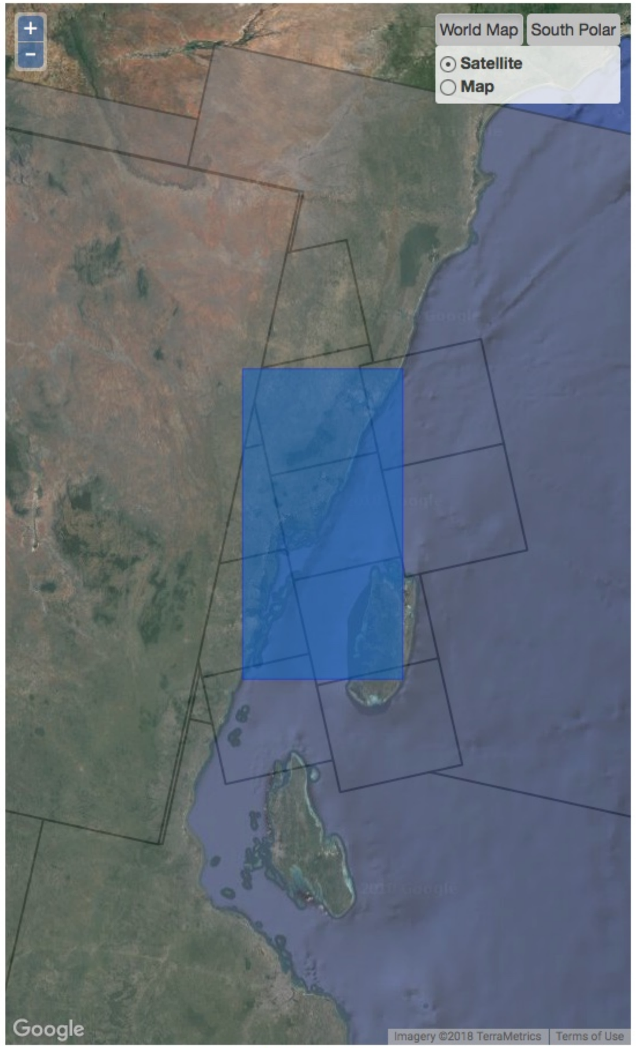
Dataset

Select: All | None

Dataset	Info
☐ Sentinel-1B	2016-now
☐ Sentinel-1A	2014-now
☐ SMAP	2015-now
☐ UAVSAR	2008-now
☑ ALOS PALSAR	2006-2011
☐ RADARSAT-1	1995-2008
☐ ERS-2	1995-2011
☐ JERS-1	1992-1998
☐ ERS-1	1991-1997
☐ AIRSAR	1990-2004
☐ SEASAT	1978-1978

Path & Frame (optional)

Path Start End



Number of Frames

1 | 2-5 | 6-15 | 16-20 | 21+

Find

Showing 1 to 17 of 17 entries

ALOS PALSAR WB1 2009-04-20
ALPSRS172453750
Frame 3750, Path 233
Off-Nadir 27.1°
Matching Frames 0
Data source
JAXA/METI
Details | Queue

ALOS PALSAR WB1 2009-04-20
ALPSRS172453700
Frame 3700, Path 233
Off-Nadir 27.1°
Matching Frames 0
Data source
JAXA/METI
Details | Queue

ALOS PALSAR WB1 2009-04-15
ALPSRS171723750
Frame 3750, Path 230
Off-Nadir 27.1°
Matching Frames 0
Data source
JAXA/METI
Details | Queue

ALOS PALSAR WB1 2009-04-15
ALPSRS171723700
Frame 3700, Path 230
Off-Nadir 27.1°
Matching Frames 0
Data source
JAXA/METI
Details | Queue

ALOS PALSAR WB1 2008-01-04

Previous | Next

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SAR Datasets / ALOS PALSAR / AL... | Download | www.eorc.jaxa.jp/ALOS/en/palsar_... | Download_JERS-1 Mosaic | kenya utm zone - Google Search

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Making remote-sensing data accessible since 1991

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  - How to Cite
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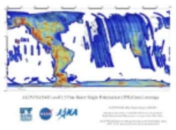
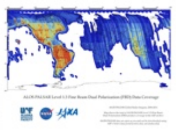
- AIRSAR
- ERS-1
- ERS-2
- InSAR
- JERS-1
- RADARSAT-1
- Sea Ice MEaSUREs
- Seasat
- SMAP
- Terrestrial Ecology
- UAVSAR
- Wetlands MEaSUREs

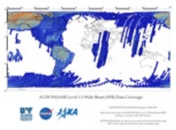
ALOS Coverage Maps



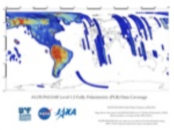
ALOS L1.5 FBS Coverage Map



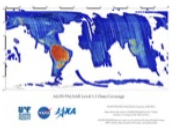
ALOS L1.5 FBD Coverage Map



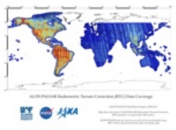
ALOS L1.5 Wide Beam Coverage Map



ALOS L1.5 Polarimetric Coverage Map



ALOS L1.1 Coverage Map



ALOS RTC Coverage Map

Get SAR Data

Feedback

ALASKA SATELLITE FACILITY

About Us

The Alaska Satellite Facility downlinks, processes, archives, and distributes remote-sensing data to scientific users around the world. ASF's mission is to make remote-sensing data accessible.

Contact Info

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Contact Us

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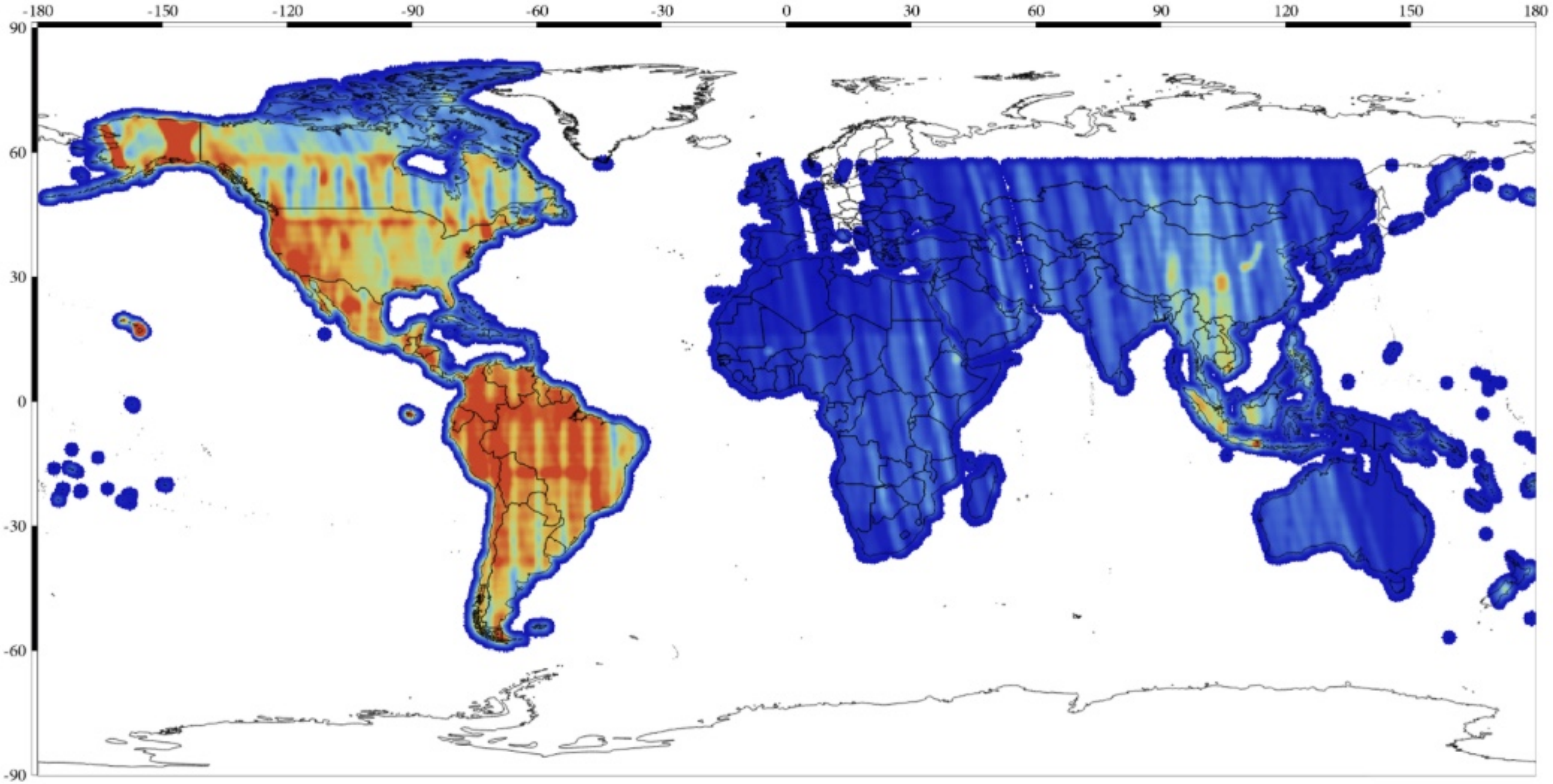
alos-rtc-map.png 3,507×2,480 pixels | Download | www.eorc.jaxa.jp/ALOS/en/palsar_... | Download_JERS-1 Mosaic | kenya utm zone - Google Search



ALOS PALSAR Radiometric Terrain Correction (RTC) Data Coverage

ALOS PALSAR Global Radar Imagery, 2006-2011

Map shows the total of ALOS PALSAR Radiometric Terrain Correction (RTC) product coverage in the ASF archive

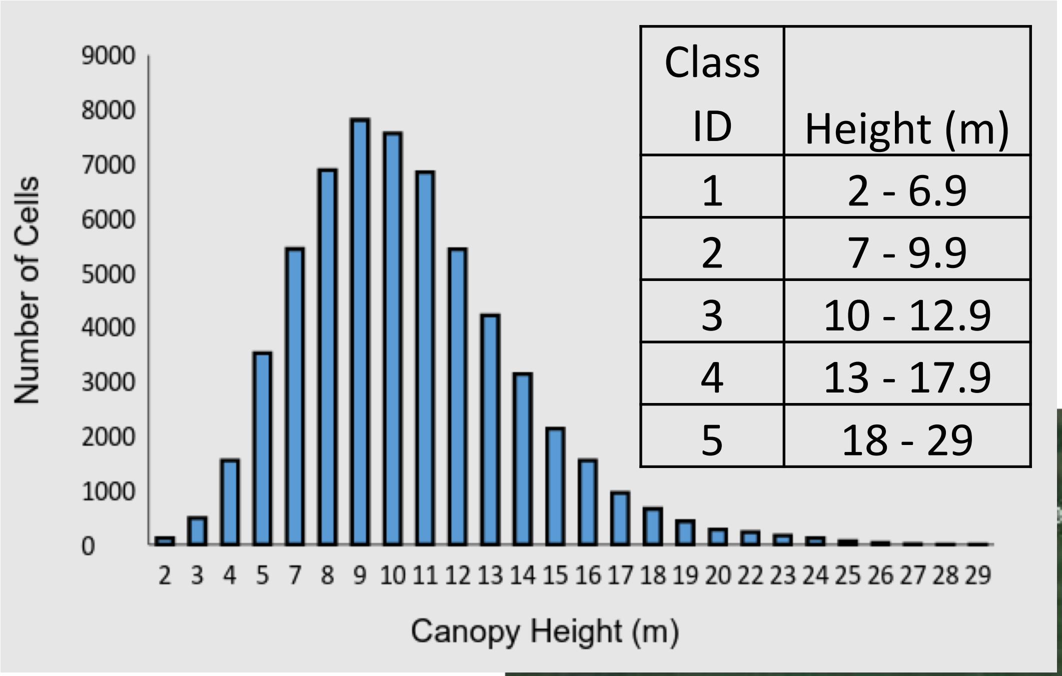
ALOS-PALSAR data are open access and can be downloaded using ASF's Vertex data portal [vertex.daac.asf.alaska.edu]

Session 3a 14h-15h30
Open, display and manipulate radar images with Image processing and GIS Software

- Open images in SNAP
- Manipulate with GDAL
- Open in QGIS
- dB conversion

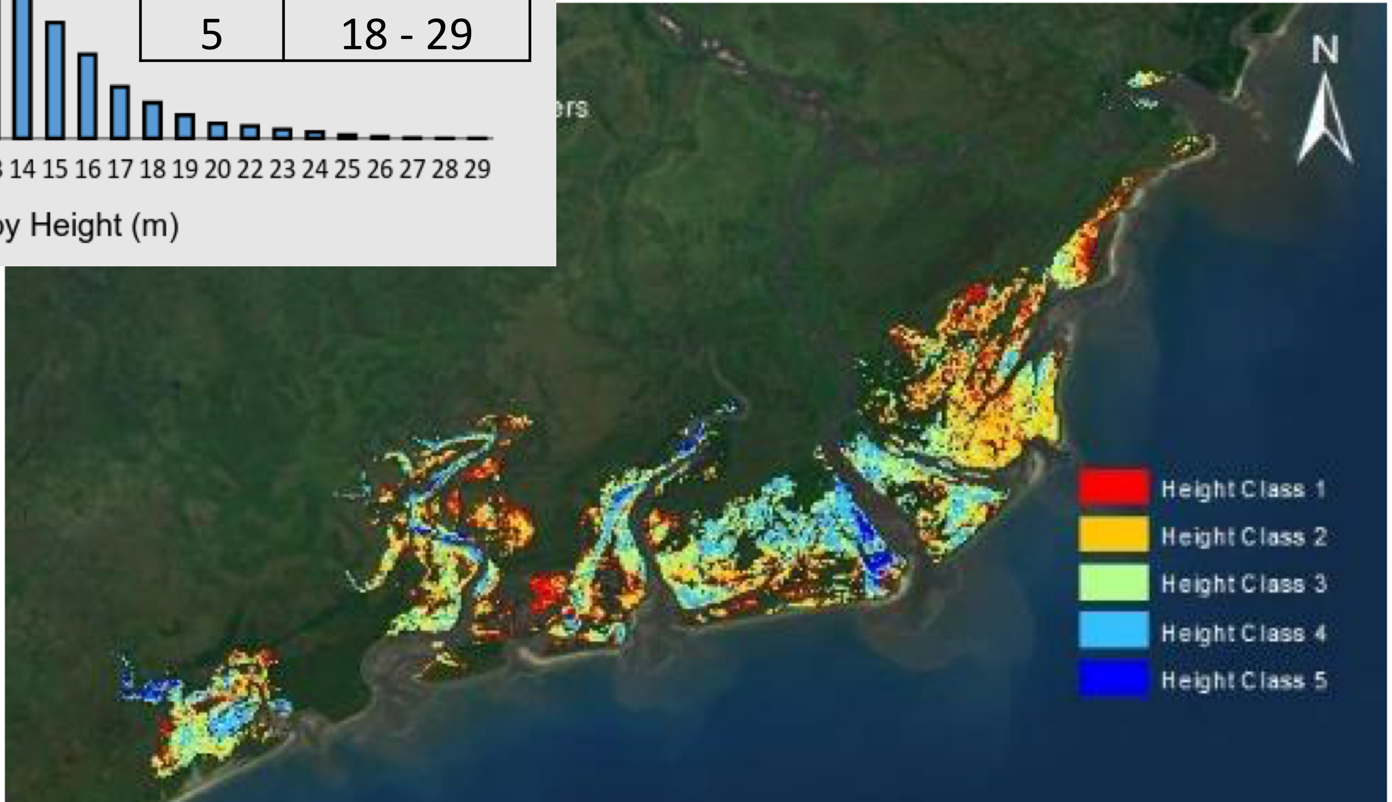
Session 3b 16h-17h
Processing radar images

- Radiometric Calibration



Class ID	Height (m)
1	2 - 6.9
2	7 - 9.9
3	10 - 12.9
4	13 - 17.9
5	18 - 29

Because canopy height is functionally related to biomass, it's a sound basis for stratification



Above Ground Biomass Allometry

Tree Allometry for Aboveground Biomass Estimation

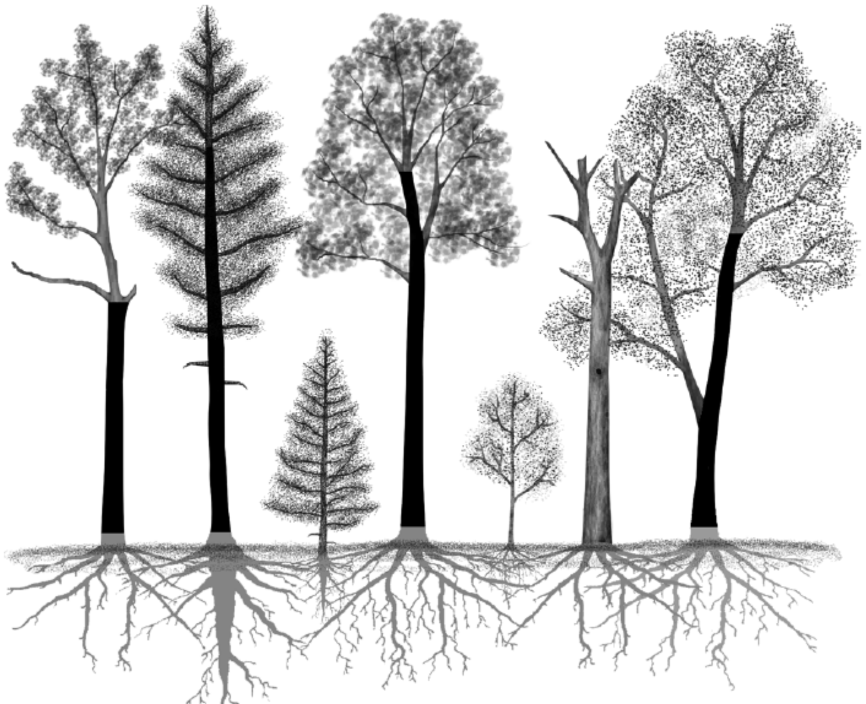
Above Ground Biomass Density (AGBD) = Vol_{wood} x W

$$AGBD = \frac{1}{A}\sum_i \frac{pD_i^2}{4} H_i T_i W_i$$

$$Vol = \frac{1}{A}\sum_i \frac{pD_i^2}{4} H_i$$

$$BA = \frac{1}{A}\sum_i \frac{pD_i^2}{4}$$

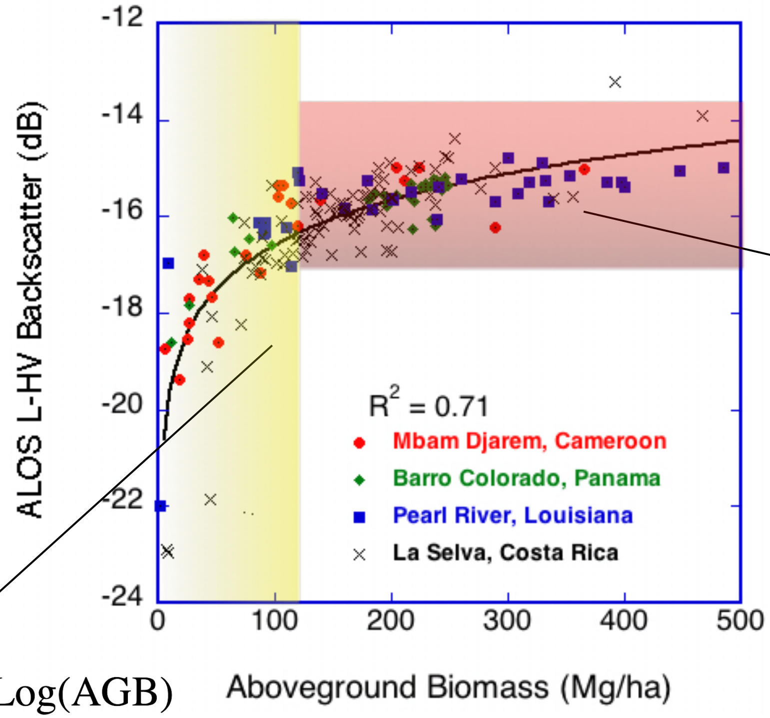
A: Area sampled
D: Diameter at Breast Height, DBH
H: Tree Height
T: Tapering Factor (species dependent)
W: Wood Density (species dependent)



Wood density decreases as a function of tree height

Water content(dielectric constant) increases as a function of tree height

Radar Sensitivity to Biomass



High Priority Fusion Region
Lower to no sensitivity of radar
Domain of data fusion and synergism
with GEDI and BIOMASS

$$\text{LHV (dB)} = -22.5 + 3.0\text{Log(AGB)}$$

Biomass < 100 Mg/ha
Low Priority Fusion Region
Higher sensitivity of radar
Domain of NISAR Performance

Global Biomass Product must be derived from Fusion Approach

For low biomass density (100 Mg/ha) radar sensitivity is high but impacted by structure & environment

For high biomass density (>100 Mg/ha) data fusion with GEDI and/or BIOMASS required

Day 1

- Find data
  - JERS-1 and ALOS/palsar mosaics
  - ASF ALOS and sentinel-1 and others
- SRTM mangrove canopy height
- REMAP
  - Classification
- Cut images to polygon
  - Populate polygons
- Derive AGB from radar backscatter
  - Calibrate radar data to dB
  - Invert AGB from dB image

Day 2

- Used gdal to translate file format
  - geotiff to HDF5
  - Hdr to geotiff
- Speckle filtering of ALOS mosaic
  - Lee, refined lee
  - Window size
  - Save and transform to dB
- Generate AGB map using HV backscatter relationship to AGB
  - Using and modifying code to read/write files and perform math on pixel values.
  - Using QGIS band math
- Estimate total AGB within park boundary
  - Delimited park boundary
  - Calculated area
  - Calculate sum of AGB densities

Day 3

- Find Sentinel-1 a or b data covering ALOS mosaic
- Process in SNAP
  - Radiometric calibration
  - Terrain flattening
  - Georeferencing
- Generate AGB map from Sentinel-1
  - Find C-band backscatter to AGB relationship (ask Google)
- Determine total AGB within same park as Day 2
- Compare HV backscatter from C- and L-band within
  - Agricultural region
  - Forest region

- gdal
- Code
  - Read/write image
  - Transform image
  - Segment image
- Segmentation
- Vectorization
- Populate
- Georeference
- SNAP
  - Open images
  - Calibrate radiometry