Sargassum One

A 3U CubeSat Constellation Mission for Sargassum Monitoring

Speakers: Fausto Rodriguez, Johan Dominguez, Darien Rosario, Marian Duval

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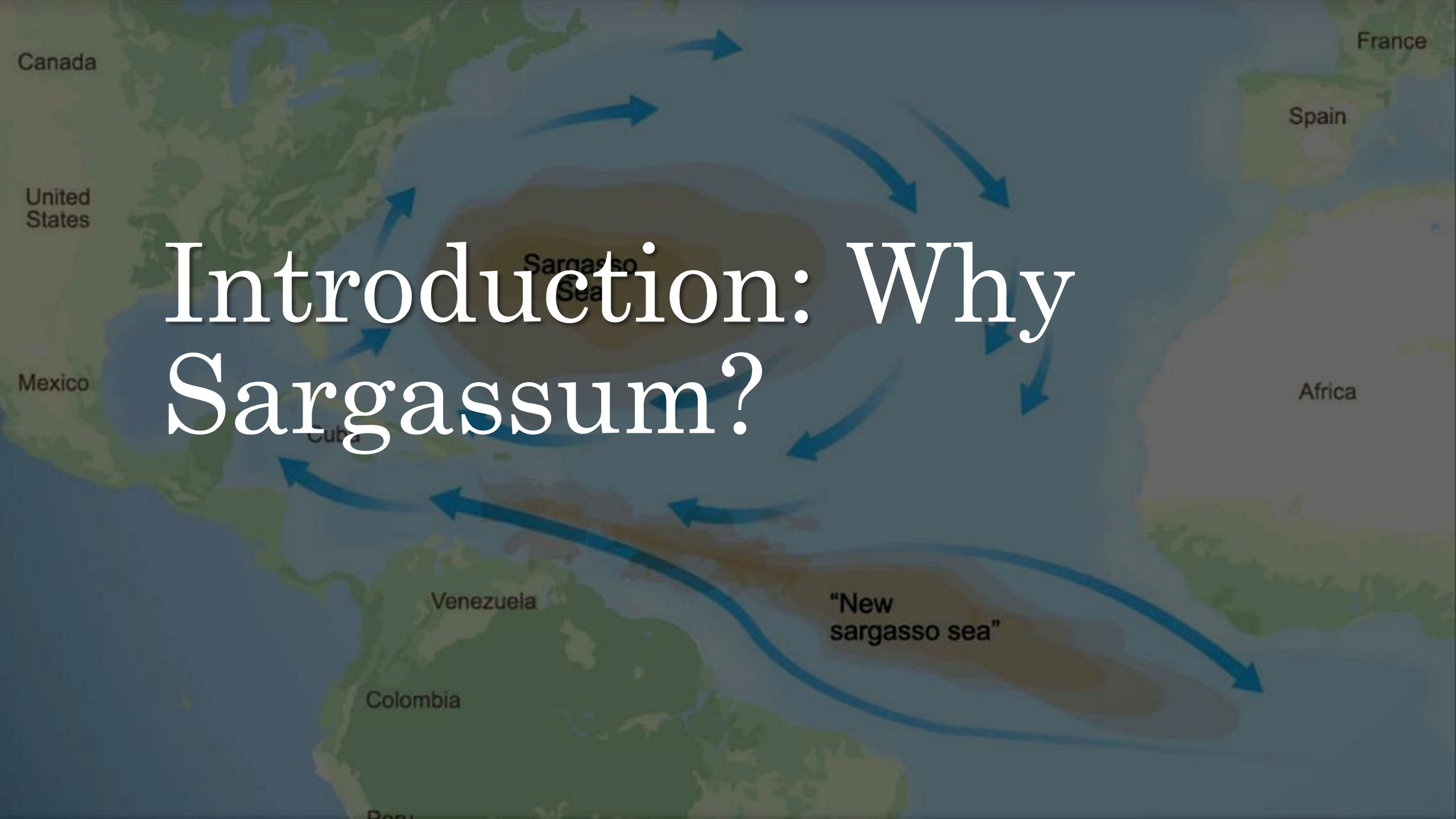
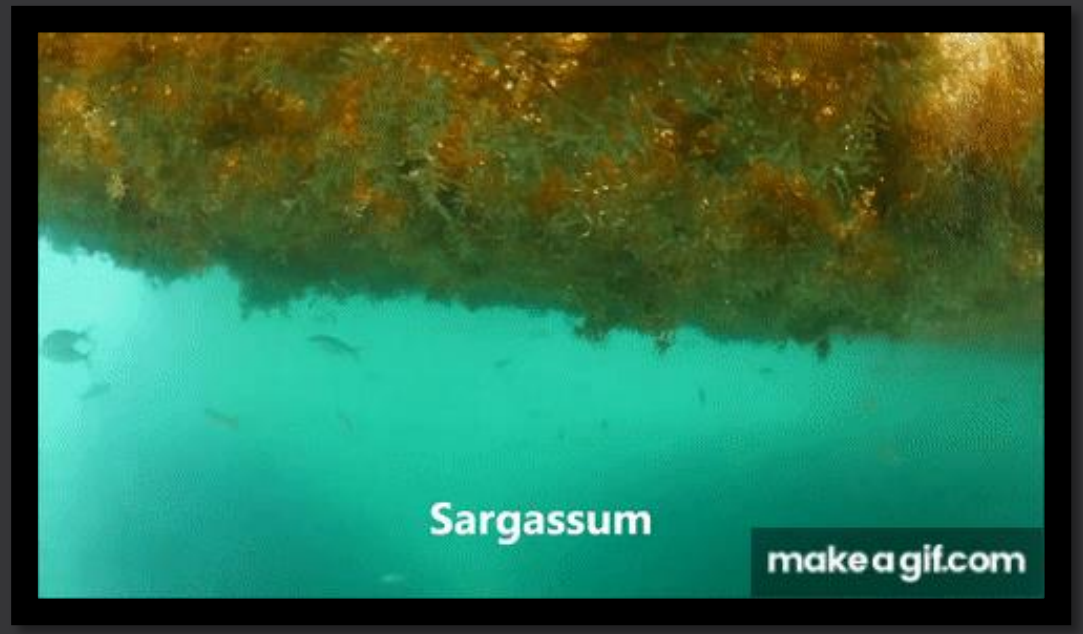


Introduction: Why Sargassum?

Why Sargassum?

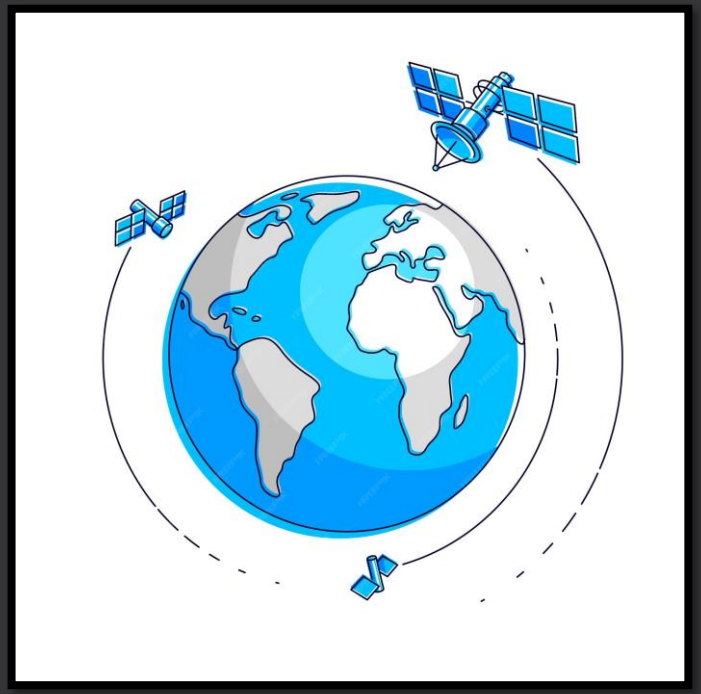


Some reasons as for why Sargassum is serious problem:

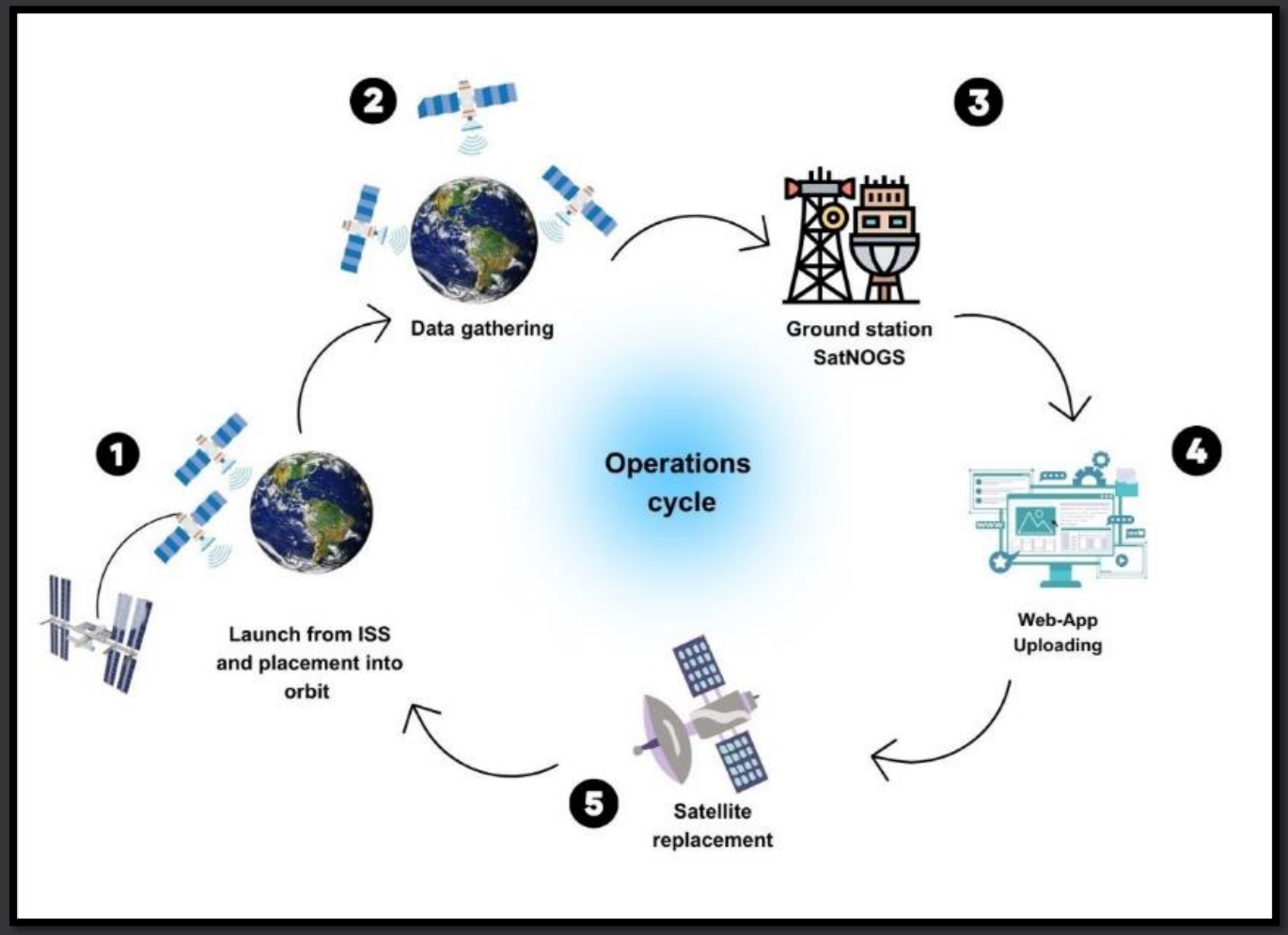
- Tourism Impact
- Odor and Aesthetics
- Fishery Disruption
- Ecological Consequences
- Navigation Hazards

Mission Objectives

1. Comprehensive Monitoring of Sargassum
2. Health Impact Research
3. Environmental Changes Analysis
4. Scientific Impact
5. Technological Impact
6. Social and Economic Impact



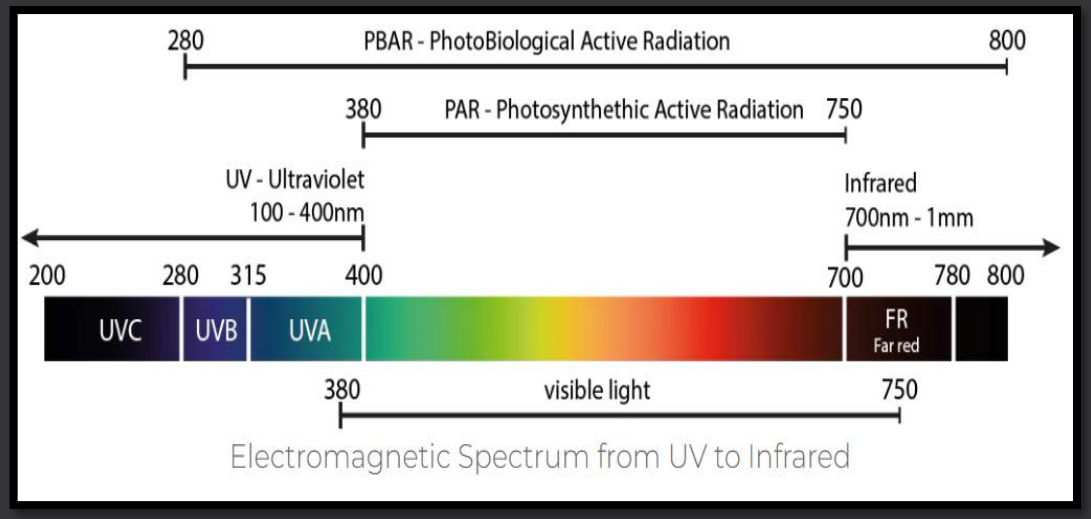
Concept of Operations



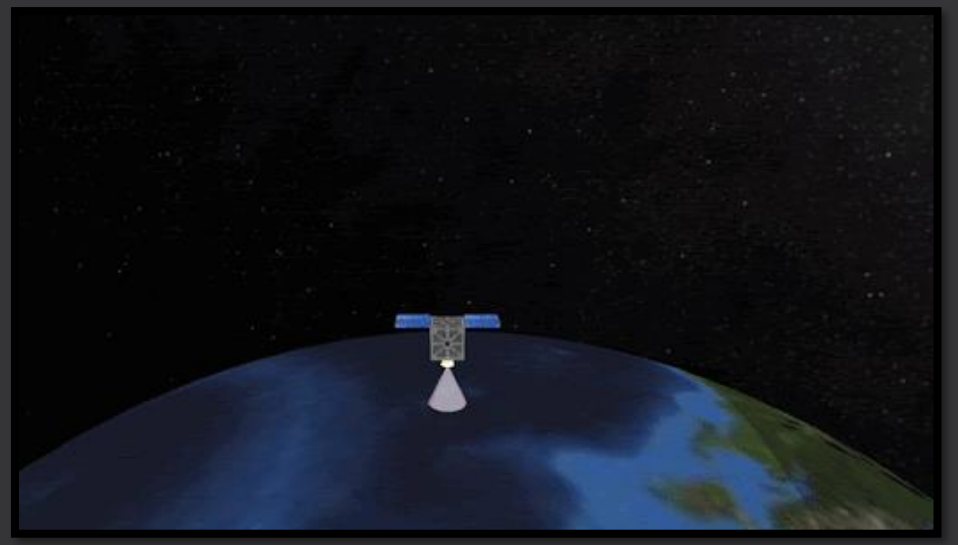
Consists of five Phases.

CubeSat Design: Key performance

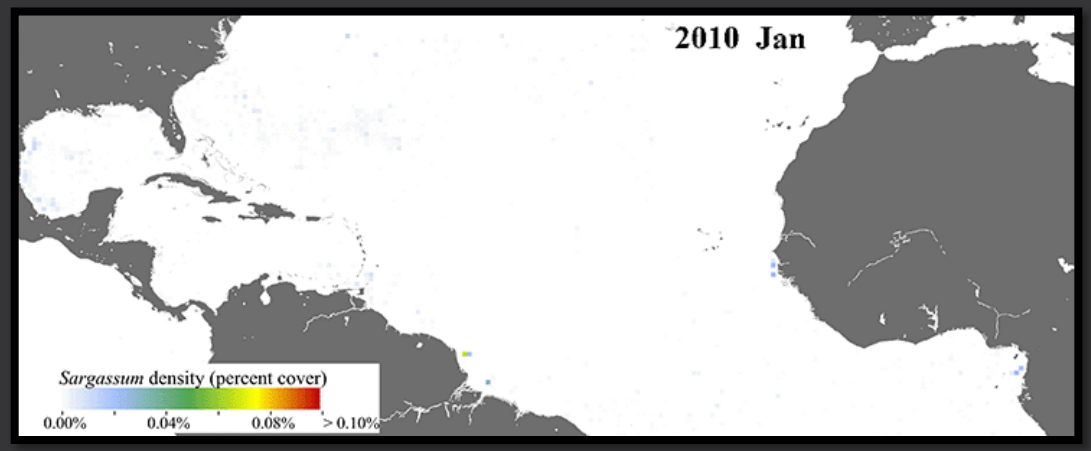
- Sargassum spectrum (242 a 664 nm)



- Data stream

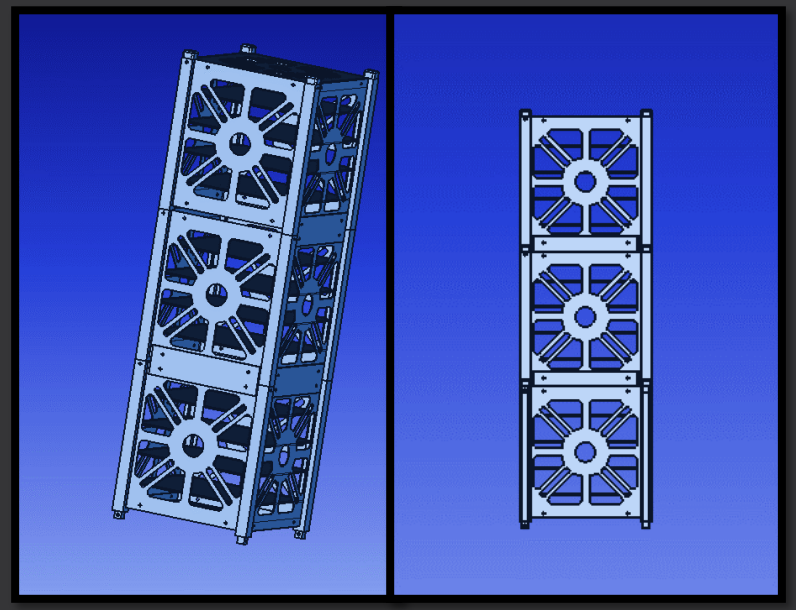


- Sargassum Concentration



CubeSat Design: Space Segment

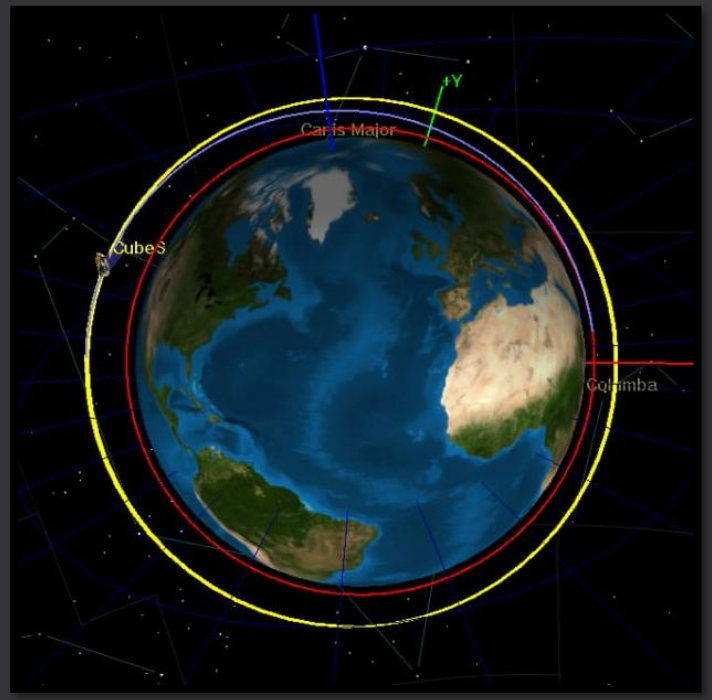
- Structural design

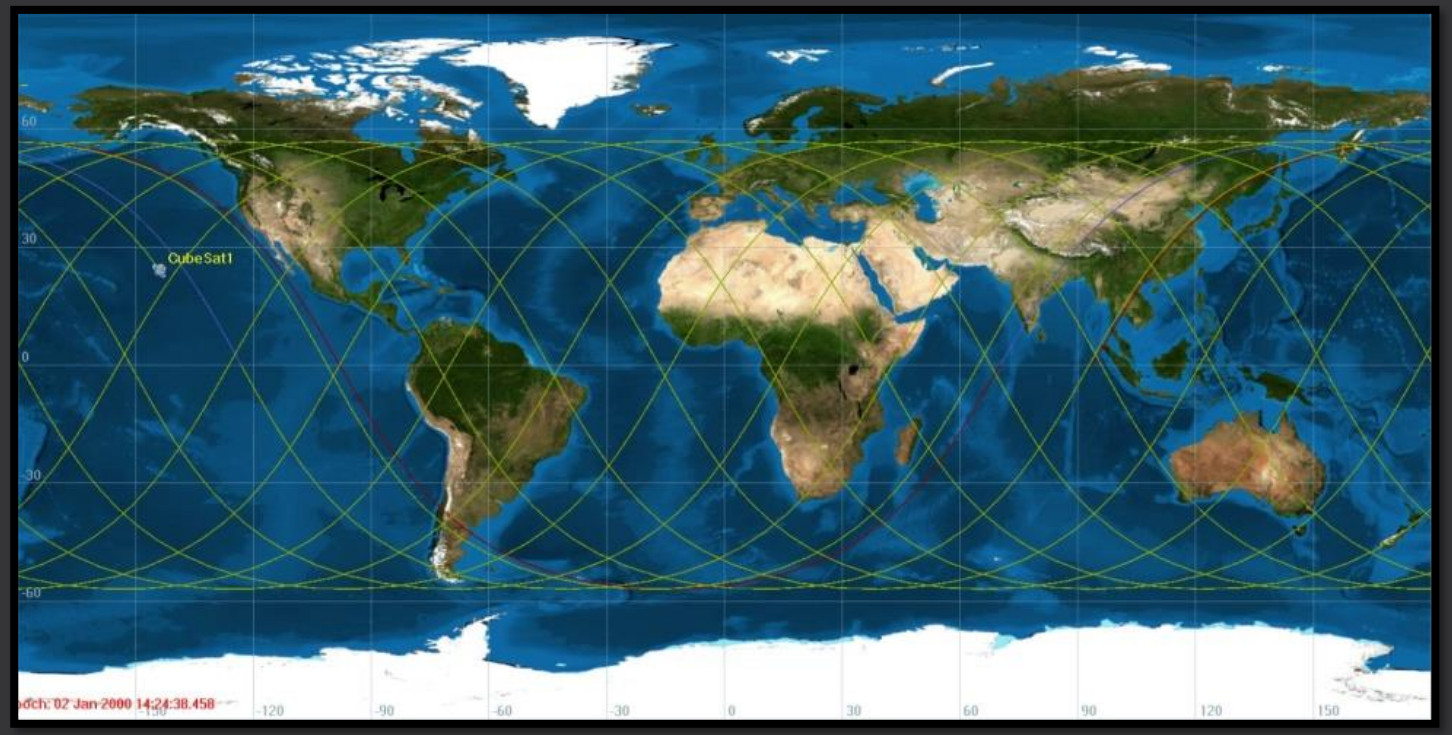


- The 3U CubeSat dimensions are 30×10×10 cm.
- Weights 4 kg .
- Volume of 3000 cm^3.
- Will use a PM200 Propulsion

CubeSat Design: Space Segment

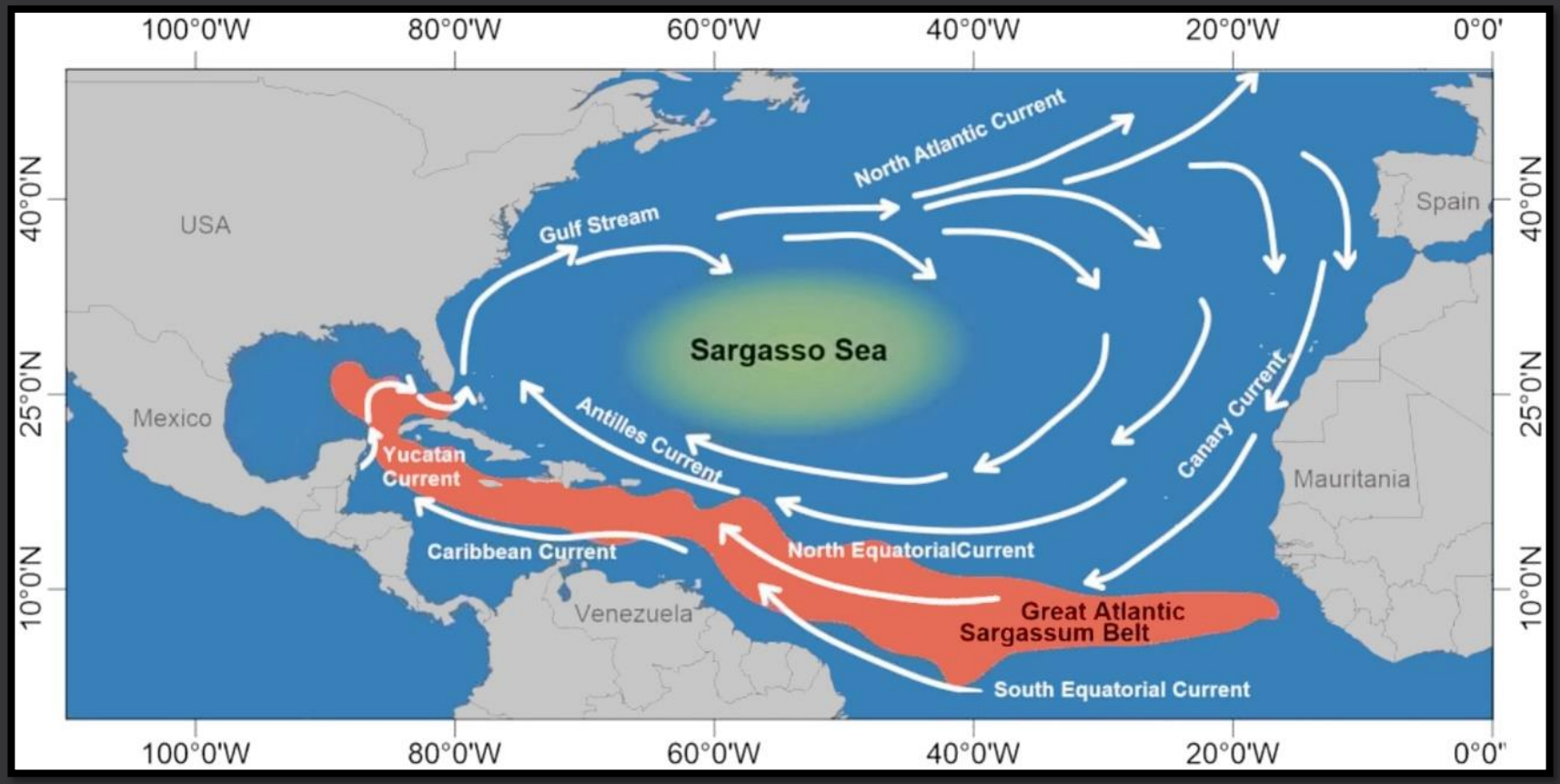
- Required delta V from a 400km orbit to a 750km orbit of 186.1686 m/s.





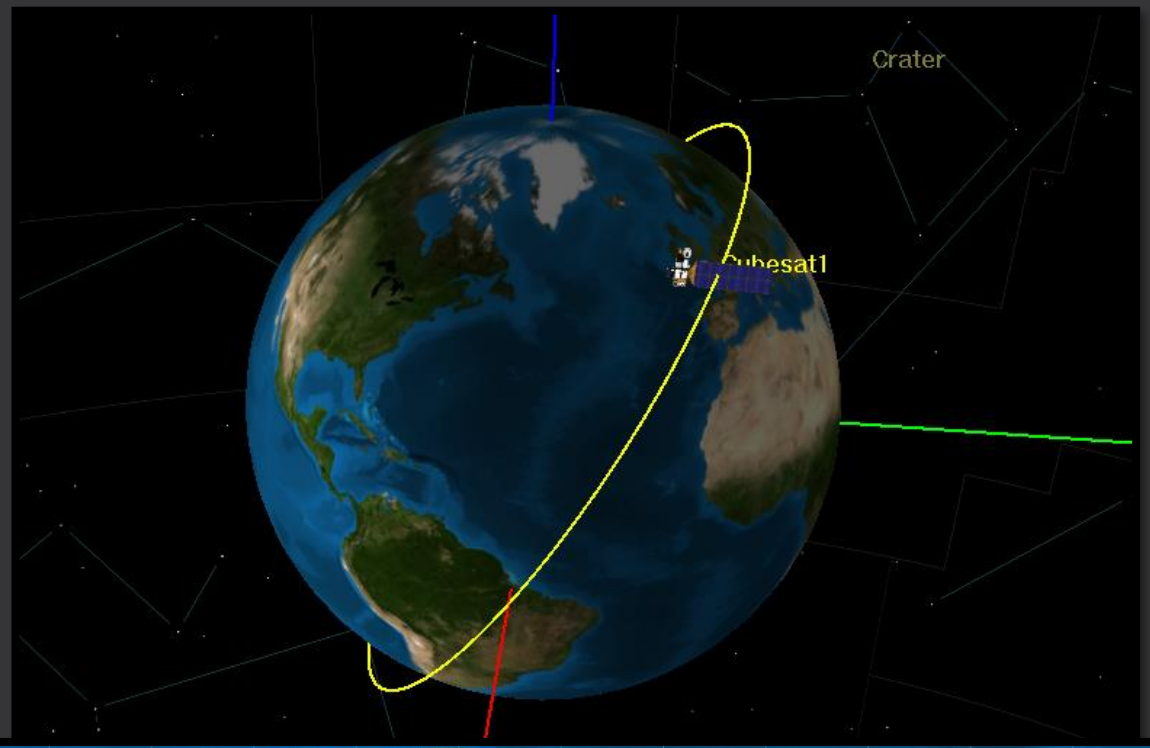
CubeSat Design: Orbit/constellation description

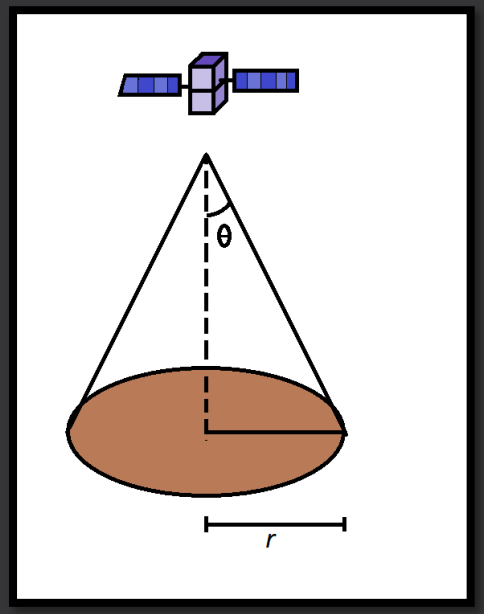
- Sargassum seas covers up to 5.2 million km².

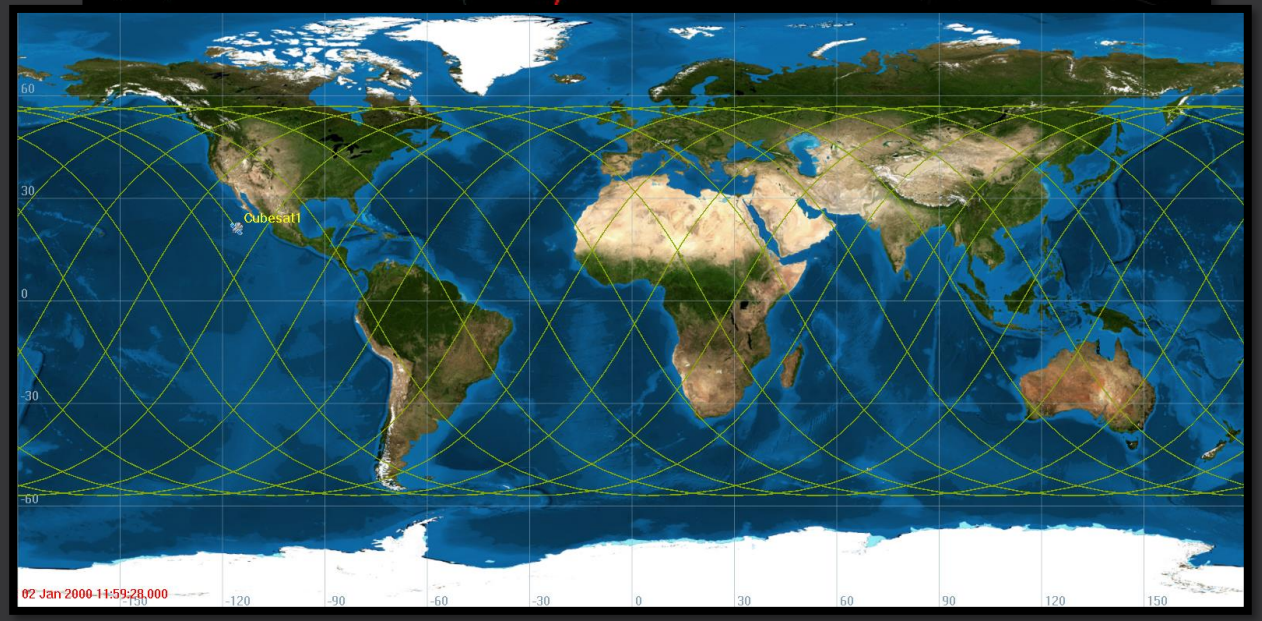


CubeSat Design: Orbit/constellation description

- With LEO Orbit with 57 degrees of inclination. Our satellite covers up to 8,258,605.176 km^2
- $\tau \approx 100$ minutes

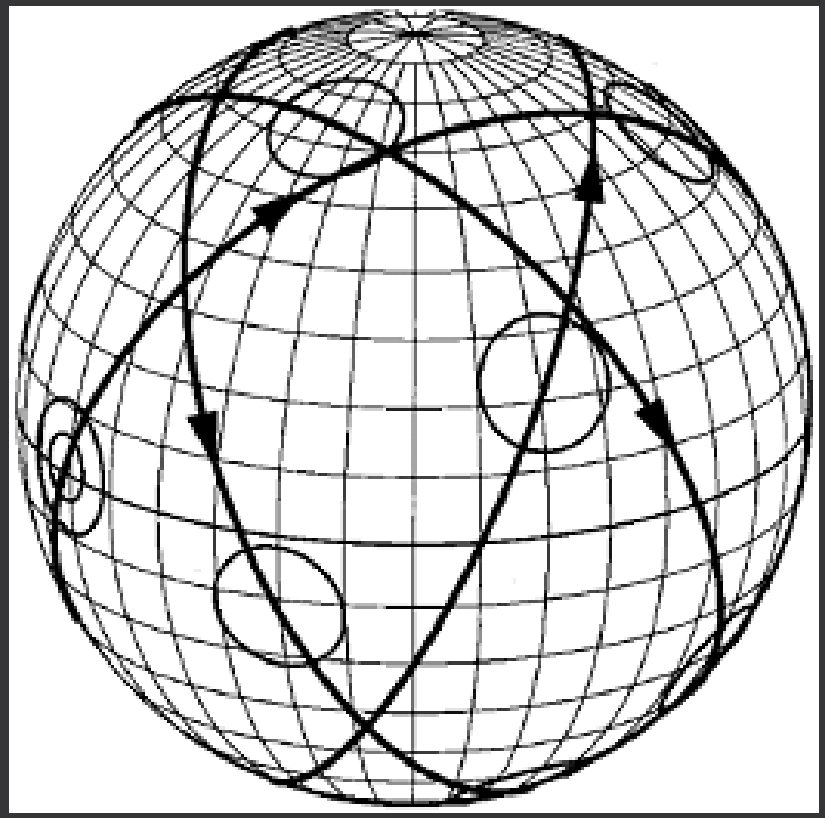


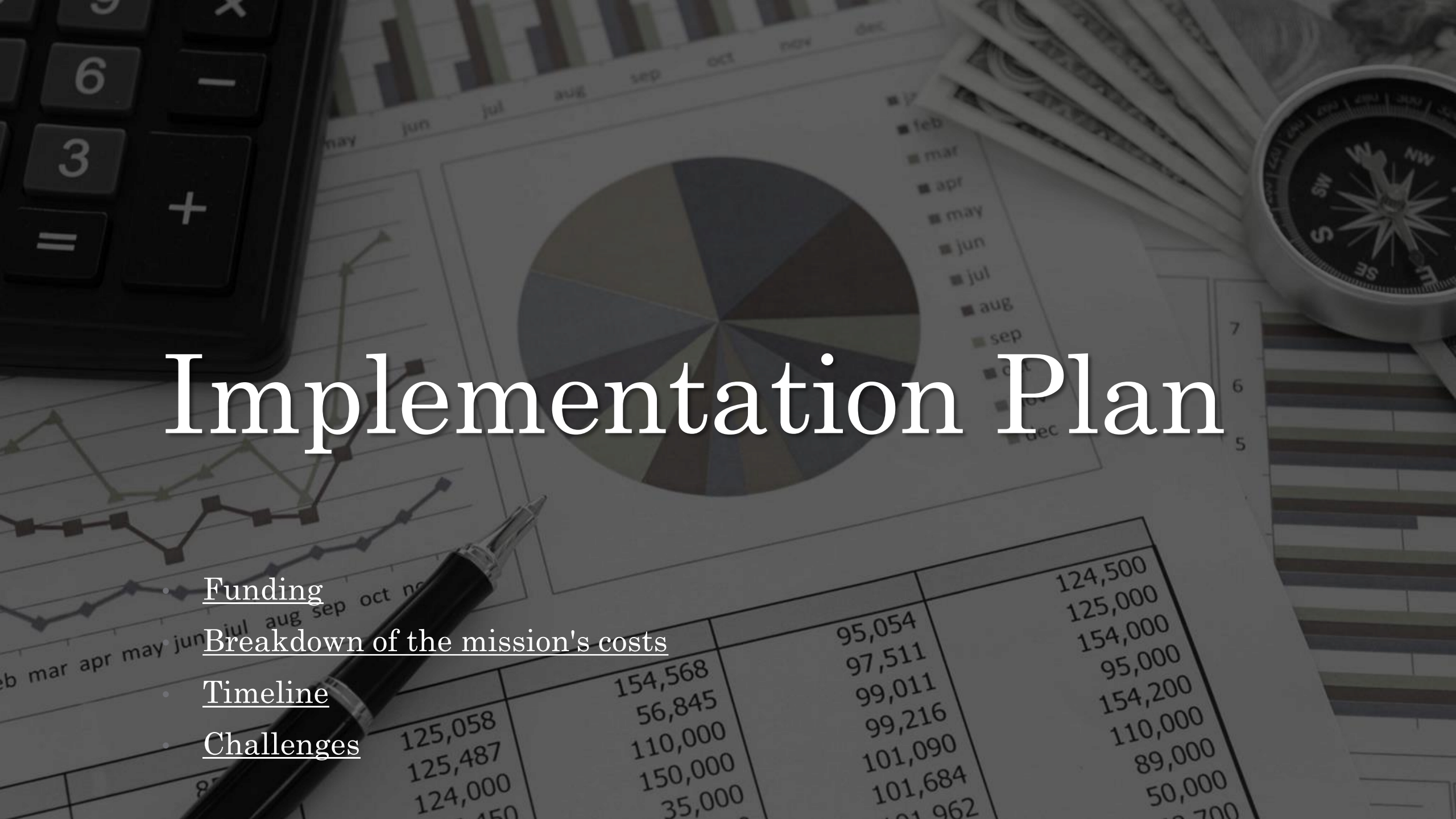




CubeSat Design: Orbit/constellation description

- Walker Delta pattern: (57°:6/3/1)
- Pattern Unit. PU=60°
- Inplane spacing between satellites = 180°
- Node spacing=120°
- Phase difference between adjacent planes = 60°





Implementation Plan

- Funding
- Breakdown of the mission's costs
- Timeline
- Challenges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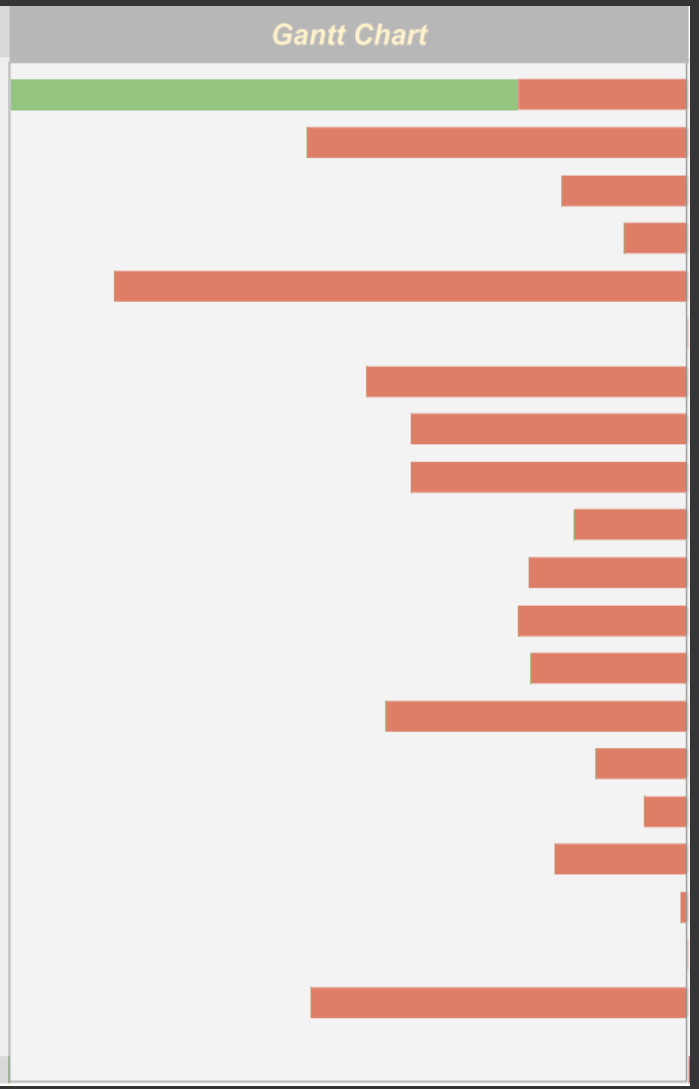
Funding

Part number	Structures	Prices (MSRP $) USD
703-00292	Chassis Walls 13 – skeletonized, 3U	$2,955.00
710-00794	Base Plate Assembly – skeletonized, dual Separation Switches 3	$690.00
	Rod & Spacer Kit, 3U	$330.00
710-00650	Hinge for Deployable Solar Panel 25	$2,500.00
703-00398	Payload Adapter Plate	$360.00
710-00407	Payload Cover Plate Assembly	$495.00
710-00784, 710-00783	Cover Plate Assembly for AntS antenna Base Plate Assembly for AntS antenna	1,085.00 955.00
711-01002	Solar Panel Clips Set for AntS antenna – for 0.031"/0.8 mm side PCBs (set of 4 clips)	$395.00
PM200	PM200 Propulsion Module	$52,459.75
	Microships	
	CubeSat Kit /dsPIC33, skeletonized, 3 U	$11,500.00
	Communication system	
711-01012 /C0 /F1	GPSRM 1 GPS Receiver Module Kit, utilizing NovAtel® OEM615V-series space-grade GPS receiver. GPS L1 + L2.	$17,320.00
710-00837	solar panel for AntS antenna, 2 largearea triple-junction solar cells array, 0.025"/0.6mm thick	$4,730.00
	Power system	
710-00670	Front/Side Panel, 3U, 7 large-area triplejunction solar cells	$5,650.00
632-00413	External Power Supply 6-12Vdc	$80.00
710-01640	Battery Module 2 (BM 2), Intelligent Protected Lithium Battery Module with SoC Reporting with up to eight 18650-size Li-Ion cells.	$10,500.00
711-00338	Linear EPS Module	$980.00
	Telemetry	
36552	HyperScape100 Product	$16,787.12
	CubeSat Deployment	
	3U CubeSat deployment from the International Space Station	$270,000.00
	TOTAL	**$397,731.87**

Mission Costs

$39,7731.87 USD + extra 30% due to taxes and surcharges.

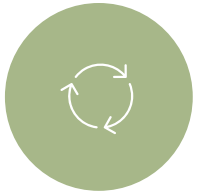
Task	Start Date	End Date	Progress	Asignee
Analysis & Definition of the Project Objective & stakeholders	10/12/2023	11/18/2023	75%	MD, LC, FR
Project Presentation (Identification, Objective, Results, Indicators, Diagnostics, Affected Areas, etc.)	11/19/2023	1/6/2024	0%	MDT
Identify the problems caused by Sargassum and goverment's expediture dedicated to its cleanup	1/7/2024	1/26/2024	0%	MDT
Investigate the companies and institutions involved in the study and coastal cleanup of Sargassum	1/27/2024	2/6/2024	0%	MDT
Survey various launch brokers to determine the most suitable one for launching our CubeSat	2/21/2024	2/26/2026	0%	MDT
Sign a contract with the selected launch broker agency and set the launch date and time	2/27/2026	2/27/2026	0%	MDT, RMT, TTMT
Calculating and defining the orbit, orbital period, number of satellites for the constellation, and delta V.	2/6/2024	5/21/2024	0%	RMT
Define the payload requirements to achieve our project's goals	5/22/2024	10/22/2024	0%	RMT
Design the CubeSats and determine the payload distribution within them	5/22/2024	10/22/2024	0%	RMT
Conduct a market survey to compare prices	10/23/2024	1/6/2025	0%	TTMT
Procurement of the required payload and infrastructure	1/7/2025	5/25/2025	0%	MDT, RMT, TTMT
Designing and constructing the Guidance, Navigation & Control system	1/7/2025	6/7/2025	0%	MDT, RMT, TTMT
Programming telemetry parameters	6/8/2025	12/6/2025	0%	MDT, RMT, TTMT
Development of our Artificial Intelligence and Web Application	1/7/2025	1/6/2026	0%	ST
Testing the functionality of all CubeSat modules	1/7/2026	5/15/2026	0%	ST
Assembling the CubeSats with all their modules	5/16/2026	7/20/2026	0%	ST
Testing of our Artificial Intelligence and Web Application	7/21/2026	3/25/2027	0%	ST
Launch date	9/1/2027	9/15/2027	0%	ST
Orbit Positioning	9/15/2027	9/16/2027	0%	ST
Data acquisition	10/1/2027	10/1/2032	0%	ST
Overall Status	**10/12/2023**	**10/1/2032**	**3.57%**	



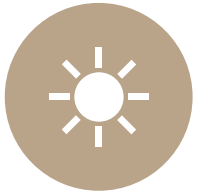
Gantt Diagram

Challenges

Financial limitations



Component lifespan



Solar flares

Transition of the International Space Station

Space debris

Conclusions

In summary, 'Sargassum One' utilizes CubeSats with the Hyperscape 100 spectrometer to monitor and address Sargassum issues in the Caribbean. With a focus on real-time data, health impacts, and economic implications, the project offers an innovative solution. Despite potential risks, the proactive risk management approach underscores its commitment to success. Overall, 'Sargassum One' is a vital initiative in mitigating Sargassum's impact in the region.