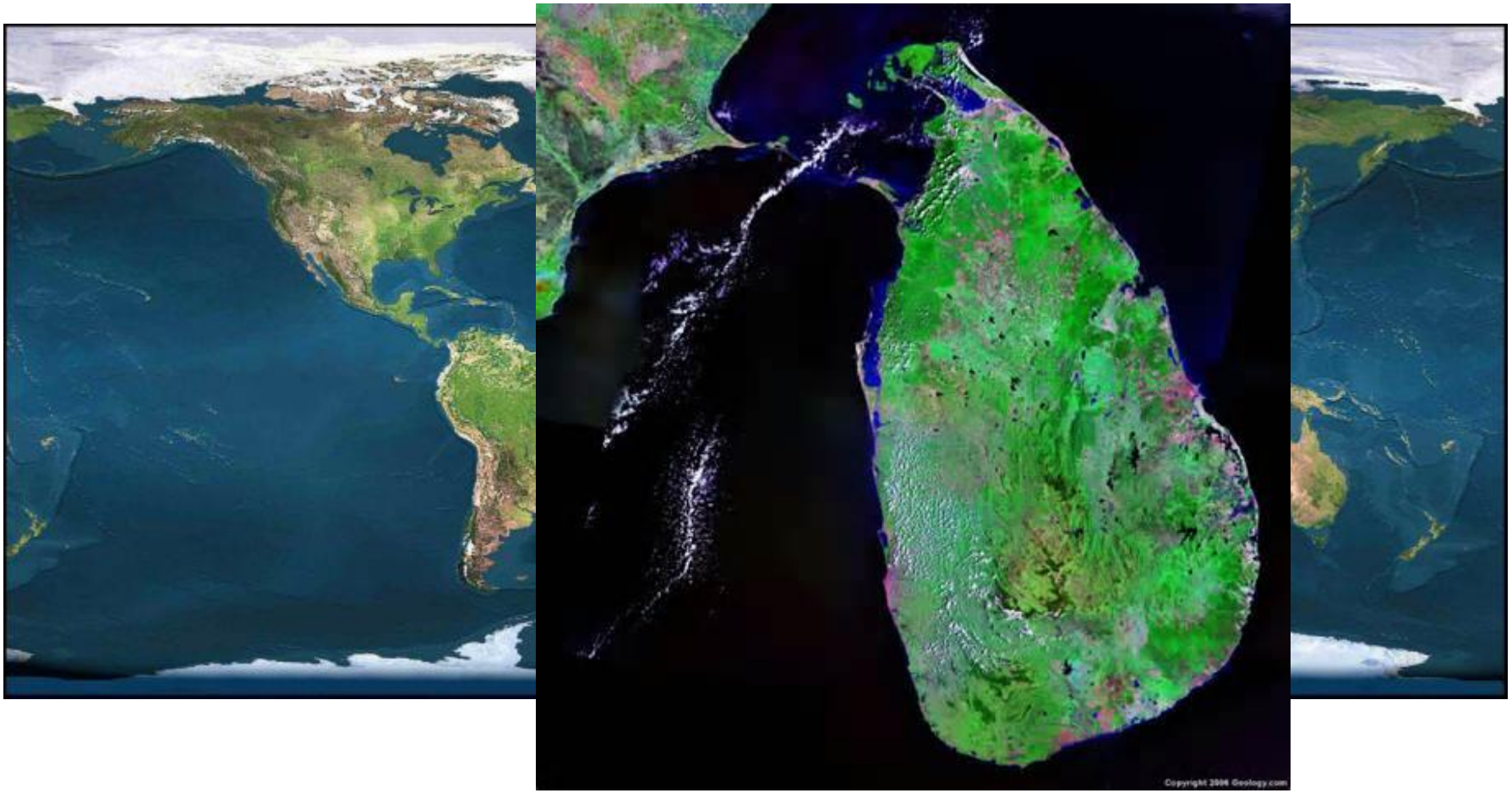
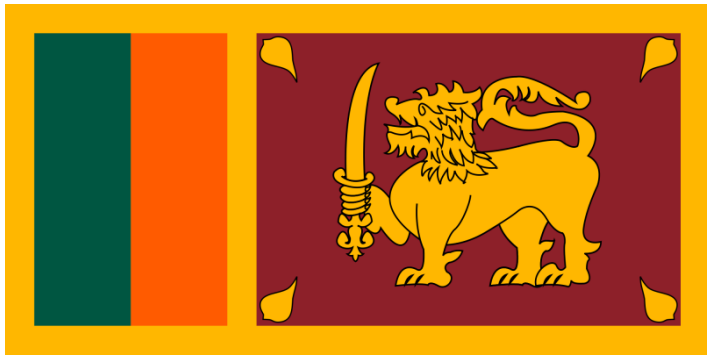
SRI LANKA



DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA



- Area 65610km2
- Water 4.4%
- Population 20,277,597
- Highest biodiversity density in Asia

Arthur C Clarke Institute for Modern Technologies (ACCIMT)

Space Application Division

SPACE TECHNOLOGY BASED NATIONAL CAPACITY DEVELOPMENT ON WORLD HERITAGE

Arthur C Clarke Institute of Modern Technologies

September 2017

Contents

Challenges on World Heritage in Sri Lanka

Solution to reduce the challenges on Heritage in Sri Lanka

Challenges on World Heritage in Sri Lanka

- Implementation on Policy
- Bad behavior and Activities of visitors
- Illegal Deforestation for urbanization
- Forest fire
- Plant Disease
- Destroying Mongrove plant for various purposes
- Costal erosion
- Land slide
- Flood
- No proper mechanism to Save the destroyable plant
- No Spectral Signature Libraries of the plant species to identify the and maintain the forest

Project on to reduce the challenges on heritage site using RS GIS Technologies in Sri Lanka

- Agricultural Drought Assessment in Sri Lanka
- Characterization of Spectral Variations of Seaweed Species Under Different Depth and Turbidity Conditions
- Mangrove Species Mapping in Sri Lanka
- Developing Spectral signature Libraries In Sri Lanka.

UNESCAP initiate for drought monitoring

- Sri Lanka has been selected by the United Nations Economic & Social Commission for Asia and the Pacific (UNESCAP) as the pilot country for space technology based capacity building on drought monitoring and early warning.

- Arthur C. Clarke Institute for Modern Technologies (ACCIMT) is driving as the national focal point of the project.

- Technical guidance provided by,
  - Indian Space Research Organization(ISRO)
  - The Institute of Remote Sensing of Digital Earth(RADI)
  - Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES)

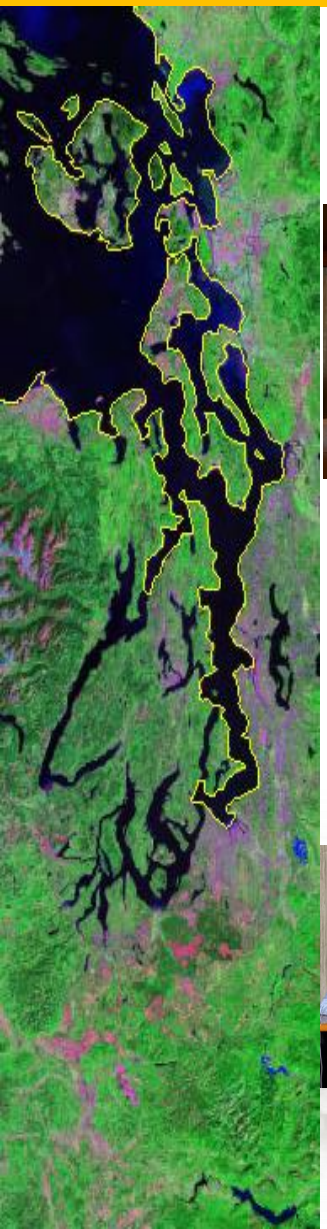
- *Stack holders*
  - *Department of Irrigation*
  - *Department of Agrarian Development*
  - *Department of Agriculture*
  - *Mahaweli Development Authority Sri Lanka*
  - *Department of Meteorology*
  - *Census and Statistics department*

Implementation of the Project

- A team of technical experts visited to Sri Lanka from UN-ESCAP from 18th to 20th of December, 2013

- Organized a capacity building training programme at ACCIMT from 17th to 21st of February 2014.

Implementation of the Project



- Regional Workshop on Space Technology Applications for Drought Monitoring and Early Warning held at Mount Lavinia Hotel, Galkissa , 1st and 2nd July 2014.

- Organized a “Indian capacity building training program”, jointly by the Arthur C Clarke Institute for Modern Technologies (ACCIMT), Indian Space Research Organization (ISRO) with UN-ESCAP, under the UN-ESCAP Regional Cooperative Mechanism for Drought Monitoring and Early Warning in Asia and the Pacific, was successfully held from 28th July to 1st August 2014 at National Remote Sensing Center (NRSC), India.

Agricultural Drought Assessment in Sri Lanka

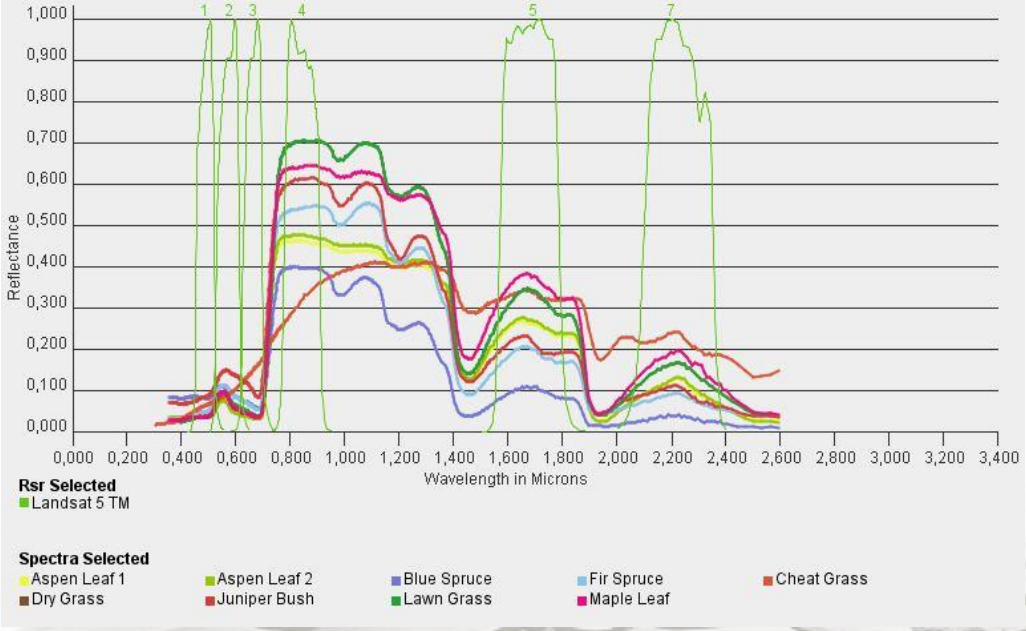
Methodology

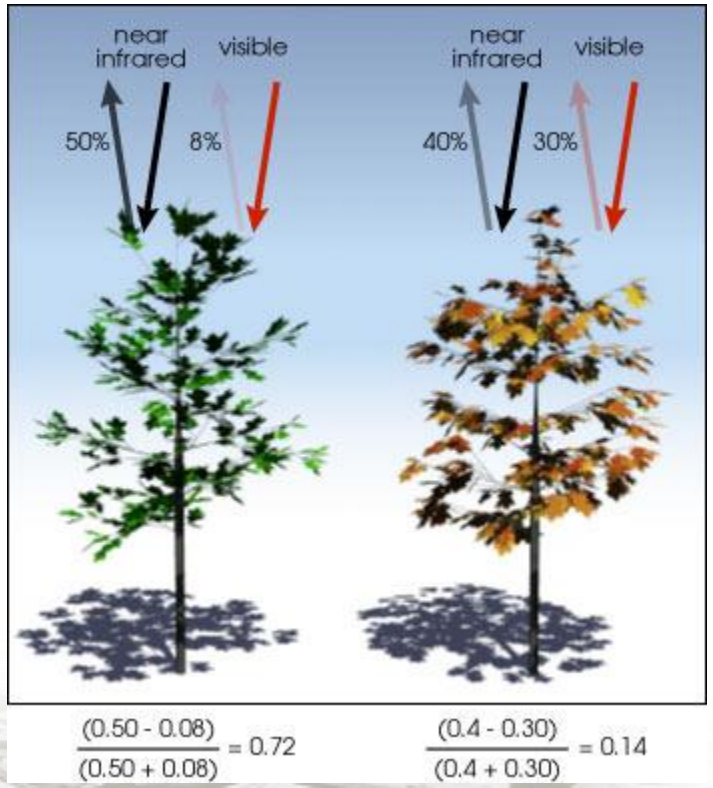
- Agricultural Drought Assessment was initiated for Sri Lanka from March 2014 onwards using Drought Monitoring System(DMS)
- Satellite remote sensing based NDVI, NDVI anomaly, NDWI and SASI analysis
- 2005 was considered as reference normal year as against 2012, being drought year
- District level profiles of current and past years' and NDVI anomalies were computed

Agricultural Drought Assessment in Sri Lanka

- NDVI : Normalized Difference Vegetation Index

$$\mathrm{NDVI} = \frac{\rho_{\mathrm{NIR}} - \rho_{\mathrm{red}}}{\rho_{\mathrm{NIR}} + \rho_{\mathrm{red}}}$$





- NDVI Anomaly = $\frac{(\mathrm{NDVI}(i) - \mathrm{NDVI}(i,ry)) * 100\%}{\mathrm{NDVI}(i,ry)}$

Agricultural Drought Assessment in Sri Lanka

- Technical guidance and satellite images provided by,
  - Indian Space Research Organization(ISRO), India
  - The Institute of Remote Sensing of Digital Earth(RADI), China
  - Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES), Thailand

- Types of Satellite data (Commercial)
  - FY-3A – Meteorological Satellite,250m
  - Resourcesat -01, AWiFS(A Wide Field Sensor), 56m

Agricultural Drought Assessment

Characterization of Spectral Variations of Seaweed Species Under Different Depth and Turbidity Conditions

Objective

To characterize the spectral behavior of different seaweed species at different depth and different turbidity conditions.

Seaweed Species

Codium sp.

Padina minor

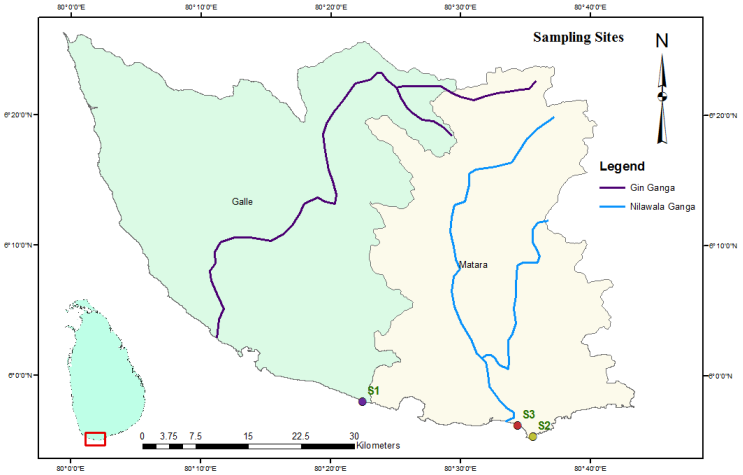
Caularpa racemosa

Eucheuma sp.

Sargassum crassifolium

Characterization of Spectral Variations of Seaweed Species Under Different Depth and Turbidity Conditions

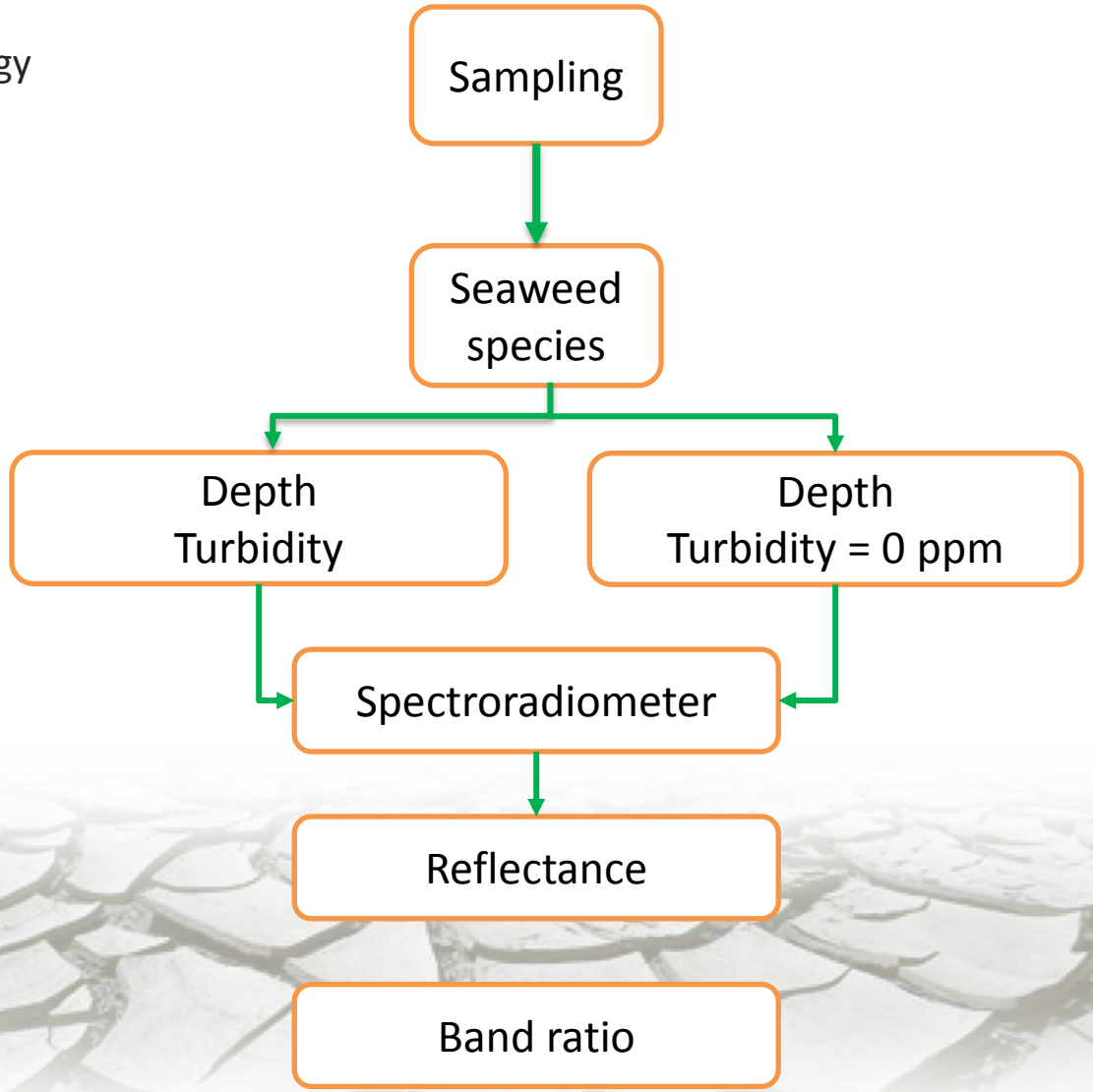
Sampling sites



Seaweed	Locations		
		Latitude	Longitude
Sargassum crassifolium ***Caularpa racemosa*** ***Codium* sp.**	Ahangma (S1)	$5^0\ 57^1\ 59.216^{11}$ N	$80^0\ 22^1\ 30.063^{11}$ E
***Eucheuma* sp.**	Dondra (S2)	$5^0\ 55^1\ 17.384^{11}$ N	$80^0\ 35^1\ 36.954^{11}$ E
Padina minor	Wellamadama (S3)	$5^0\ 56^1\ 7.938^{11}$ N	$80^0\ 34^1\ 26.013^{11}$ E

Characterization of Spectral Variations of Seaweed Species Under Different Depth and Turbidity Conditions

Methodology



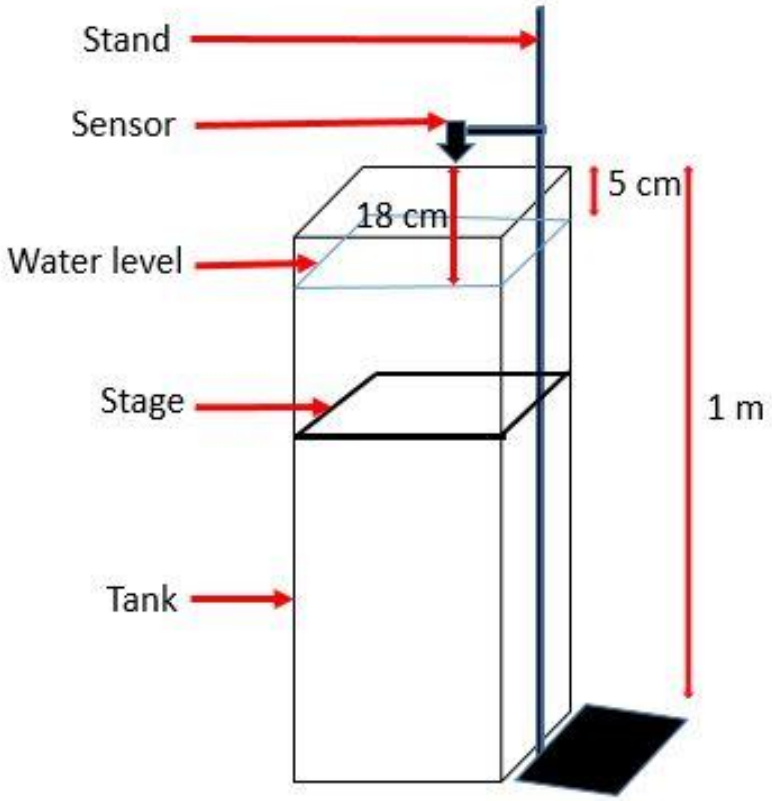
Spectroradiometer with accessory equipment

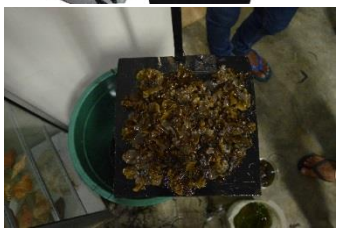
PSR-1100F
Spectral Evolution
Range 320 to 1100 nm

fiber optic cable

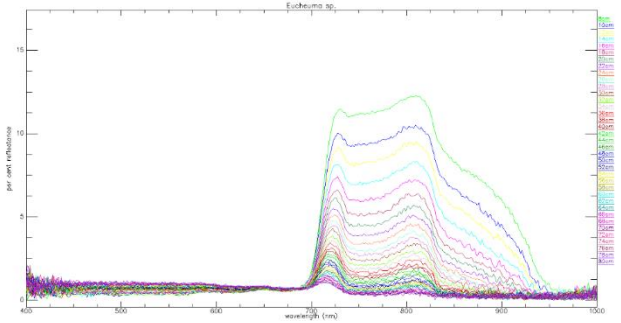
One degree Field Of View optical lens

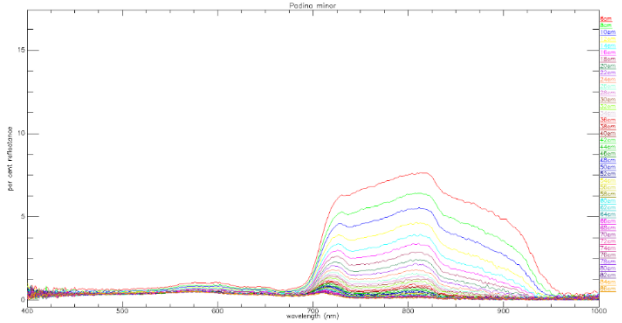
UNESCAP initiate for drought monitoring

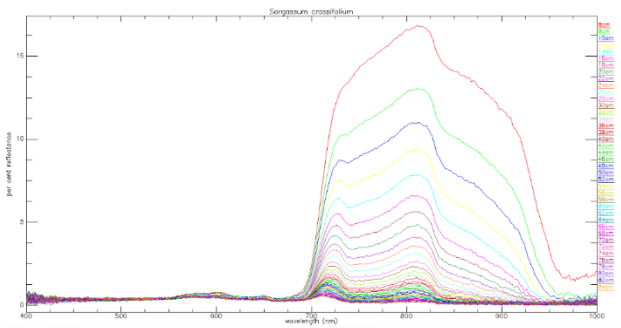


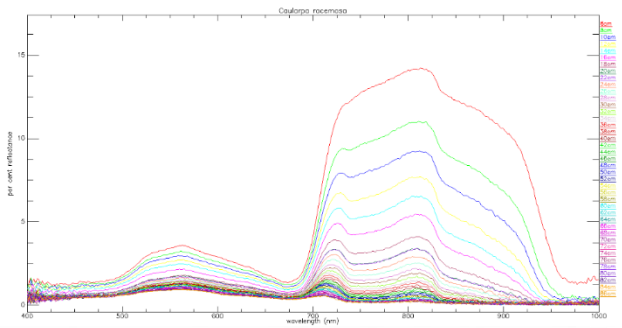


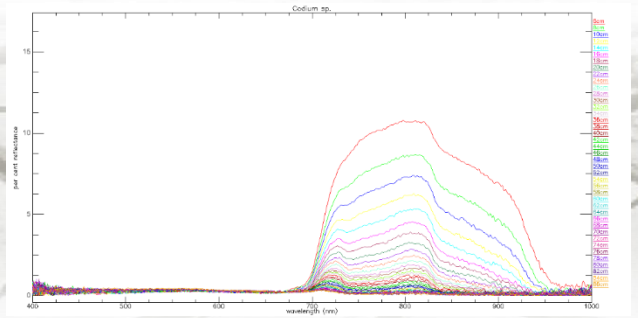
Spectral Variations of Seaweed Species Under Different Depth





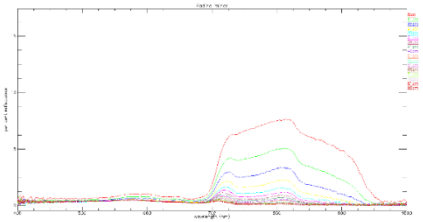


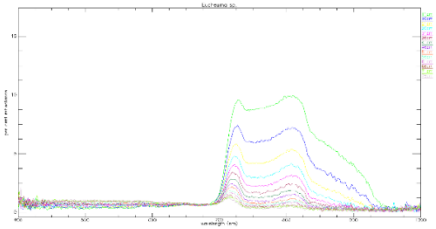




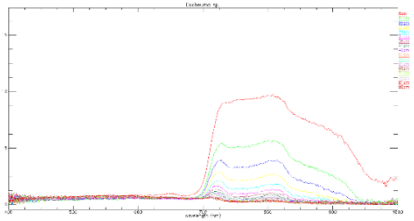
Spectral Variations of Seaweed Species Under Different Depth and Turbidity Conditions

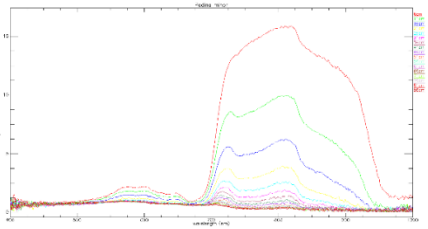
0 ppm



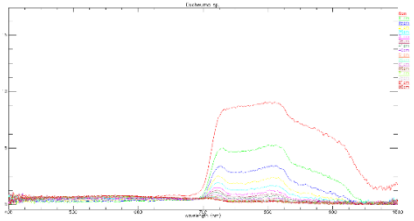


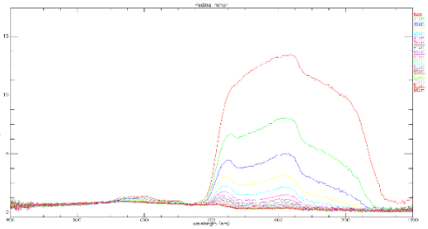
20 ppm



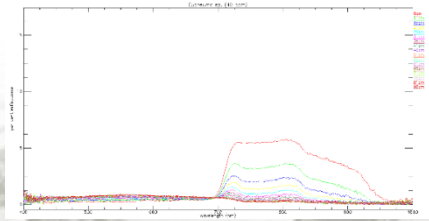


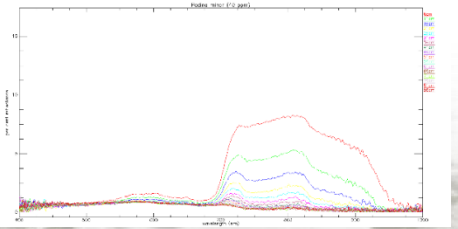
30 ppm



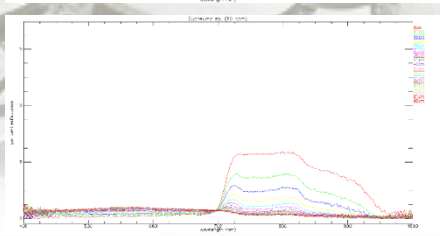


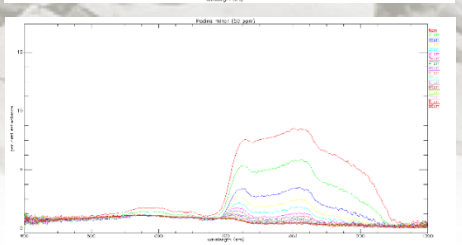
40 ppm





50 ppm





Characterization of Spectral Variations of Seaweed Species Under Different Depth and Turbidity Conditions

Conclusion

- Seaweed species of *Sargassum crassifolium*, *Caularpa racemosa, Codium* sp., *Eucheuma* sp. and *Padina minor* can be identify using their spectral profiles and predict about the depth of the habitat although the turbidity has changed.
- Several band ratios can be used to discriminate and identify them but the most suitable band ratio is 729/686.
- The red edge position of experimented species (*Sargassum crassifolium*, *Caularpa racemosa, Codium* sp., *Eucheuma* sp.) occurred between 716 nm and 726 nm.

Characterization of Spectral Variations of Seaweed Species Under Different Depth and Turbidity Conditions

Recommendation

- Accuracy assessment should be conducted to check the accuracy.
- Water column correction would be helpful to enhance the spectral signature of seaweeds.
- Sun light intensity and angle may also affect to the reflectance, further analysis should be conducted to overcome those errors.
- All phytoplankton in water bodies contain the photo synthetically active pigment chlorophyll a. this would be affect to the spectral profile of target species. Further analysis should be conducted to overcome this effect.
- Building a Spectral Library of seaweed species would be helpful for future purposes.

Mangrove Mapping in Sri Lanka

Importance of Mangrove Mapping in Sri Lanka

- Mangroves forests are ecologically and socioeconomically important due to many reasons
  - Shoreline stabilization
  - Reduction of coastal erosion
  - Storm protection
  - Flood and flow control
  - Water quality control
  - Sediment and nutrient retention

- Remote Sensing (RS) and Geographic Information System (GIS),
  - Possess the ability to collect information from environments which are hard to explore as well as access
  - Therefore, excellent for mapping and monitoring of mangroves
- Is it possible to generate mangrove species distribution maps using hyperspectral remote sensing integrating with spectroradiometer generated signatures?

Mangrove Mapping in Sri Lanka

Mangroves Map In Sri Lanka

- The largest tracts of mangrove habitats in Sri Lanka are found in..
- Puttlam Lagoon,
- Kala Oya basin and
- Trincomalee.

Mangrove Mapping in Sri Lanka

❖ Site selection

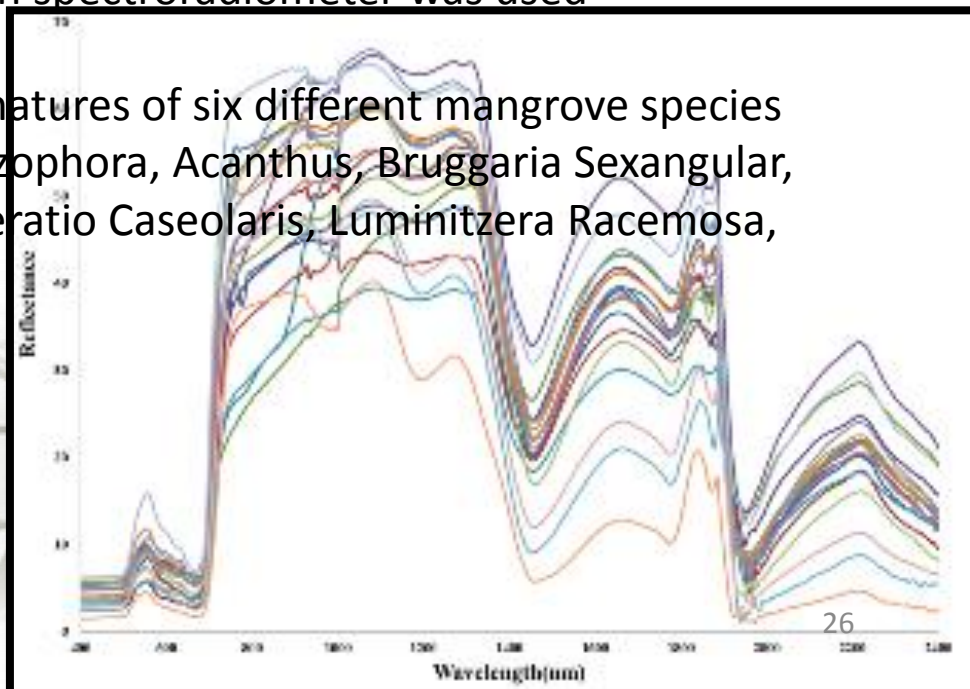
- The Hyperion – EO I covers a small part in the southern part in Sri Lanka

- According to the availability of data, Koggala lagoon area was selected as the study area

❖ Spectral signature collection

- Spectral Evolution spectroradiometer was used

- The spectral signatures of six different mangrove species were collected, namely; Rhizophora, Acanthus, Bruggaria Sexangular, Bruggaria Gimnorisa, Sonneratio Caseolaris, Luminitzera Racemosa,



Mangrove Mapping in Sri Lanka

- Spectral Analysis
  - Calculating different vegetation indices and finding the best indices to differentiating mangrove species with a good accuracy

- Hyperspectral satellite image processing
  - Using ENVI software

- Generation of the mangrove species distribution map

Thanks