

**TECHNICAL CONSIDERATIONS
FOR
OCEAN COLOUR MONITOR- II**

A single sensor cannot satisfy all the application demands. It is essential to identify an optimal configuration in terms of:

- Minimal set of bands (VIS – NIR – Thermal IR)
- Band widths
- Dynamic range
- Noise equivalent spectral radiance (NESR)
- Signal to Noise Ratio (SNR)
- Spatial resolution
- Repeatability
- Global coverage

Experience with IRS P4 – Ocean Colour Monitor

- Development and validation of algorithms for atmos. correction & bio-geophysical retrieval(Chlor., TSM, yellow substance, K_d)
- Application for PFZ identification, fisheries forecast (along with NOAA-SST)
- Detection of algal blooms
- Estimation of primary productivity, CO_2 flux to the Arabian Sea
- Characterisation of atmospheric aerosols
- Study of sediment distribution under tidal action
- Monitoring pre & post monsoon sediment dispersal
- Study of coastal plume dynamics under the action of winds
- Detection of oil pollution

Detection of ocean water constituents

- A minimum of 12 bands essential for the detection of all the important ocean constituents
- Band widths ~ 10 to 20 nm
- SNR ~1000
- PCI (Principal Component Inversion) and analytical neural network based inverse modeling techniques to be tried as alternative approaches

Noise equivalent spectral radiance (NESR)

- An uncertainty of 1% in atmos. path radiance results in $\sim 10\%$ error in L_w
- NESR requirement is more stringent for atmos. correction bands
- An accuracy of $< 20\%$ translates into an NESR of $< 0.025 \text{ Wm}^{-2}\text{sr}^{-1}\mu\text{m}^{-1}$ for VIS bands and $< 0.010 \text{ Wm}^{-2}\text{sr}^{-1}\mu\text{m}^{-1}$ for atmos. correction bands

Dynamic Range

- For bands around 450nm $\sim 35 \text{ Wm}^{-2}\text{sr}^{-1}\mu\text{m}^{-1}$
- For atmos. correction bands $\sim 10 \text{ Wm}^{-2}\text{sr}^{-1}\mu\text{m}^{-1}$

Band no.	Centre Wavelength (nm)	Band width (nm)	NESR ($Wm^{-2}sr^{-1}\mu m^{-1}$)	Applications potential
1	412	10	0.025	Yellow substance absorption
2	443	10	0.025	Suitable for low chlorophyll , yellow substance
3	490	10	0.022	Suitable for moderate chlorophyll, yellow substance, phycoerithrin
4	510	10	0.018	For high chlor., chlor species, TSM, phycoerithrin, algal blooms
5	555	10	0.015	For high chlor., chlor species, TSM, algal blooms
6	620	10	0.014	TSM, algal blooms
7	670	10	0.012	Algal blooms, base line for chlor. fluorescence
8	681	7.5	0.010	Chlor. Fluorescence for high concentrations
9	710	10	0.010	NIR band, extrapolation to VIS bands better, base line for chlor. fluorescence
10	780	10	0.010	Atmos. correction, avoids O ₂ A abs. band in
11	870	<20	0.010	Atmos. correction, good separation from the previous bands, better for coastal waters
12	1010	20	0.020	Atmos. correction, good for coastal waters, useful for aerosol and & foam discrimination

Calibration requirements (contd.)

(i) Internal calibration

- Calibration with internal standard lamps (once in a week)

(ii) Calibration with standard sources

- Calibration with the light sources : Sun and Moon (once in one or two weeks)

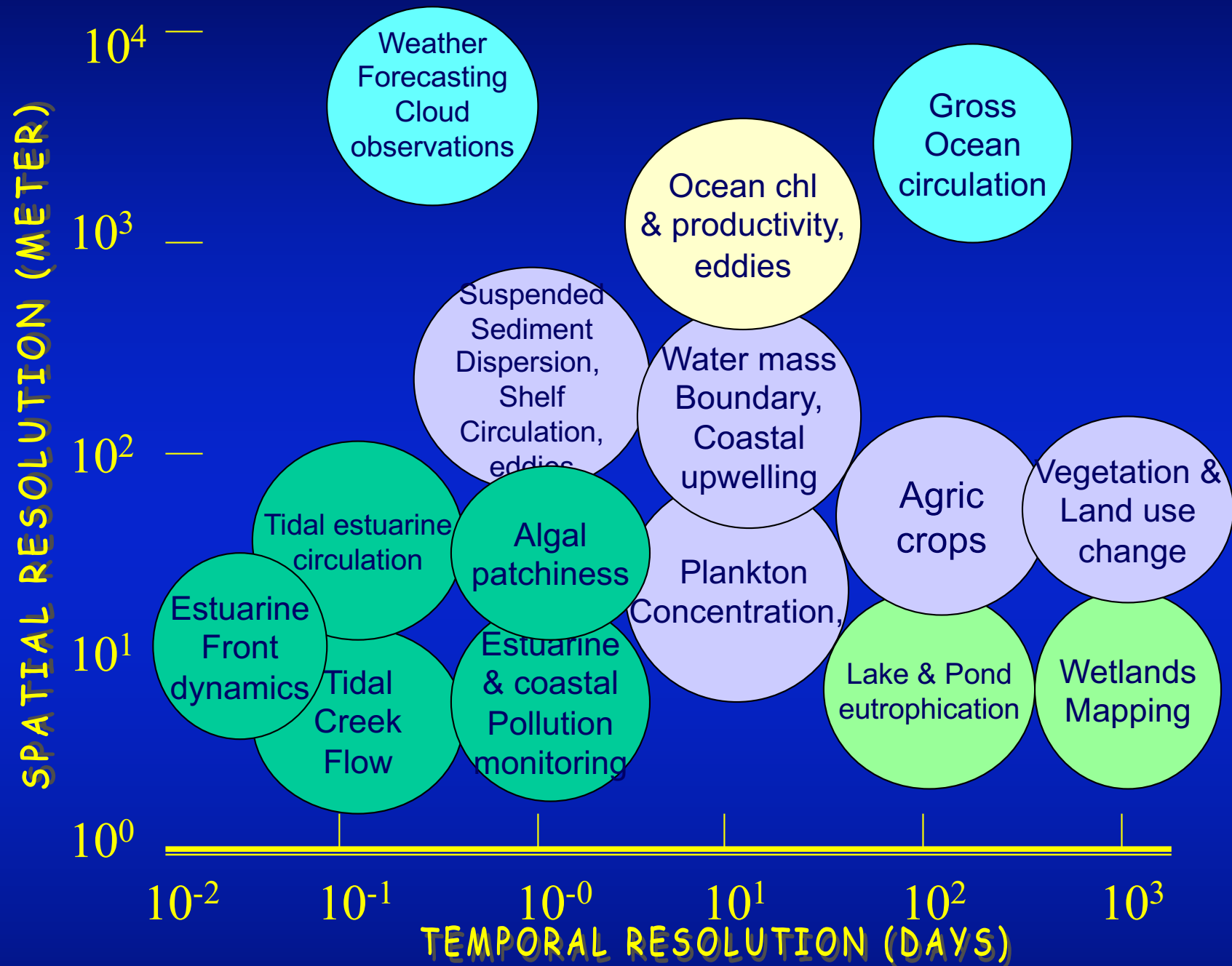
(iii) Vicarious calibration

- Comparison of in-situ normalised L_w measurements with satellite derived values after atmos. correction

Ground and temporal resolution

Governed by the spatial & temporal scales of ocean phenomena

- **Spread, growth decay of phytoplankton modulated by small & large scale eddies**
- **Seasonal occurrence of algal blooms**
- **Frontal dynamics for application to fisheries forecast**
- **Sediment transport & dispersal in coastal regions by currents , tidal actions**
- **Discharges at river mouths**
- **Coastal water quality**



Temporal & Spatial resolution requirements for remote observations of coastal/ocean features

On board recording for global coverage

Ocean colour data on global basis is essential to understand key issues concerning global changes

- **On board recording facility (for ~30min)**
- **Spatial resolution ~ 1- 4 km**