

Space Observation for Water quality monitoring in a Dammed Reservoir

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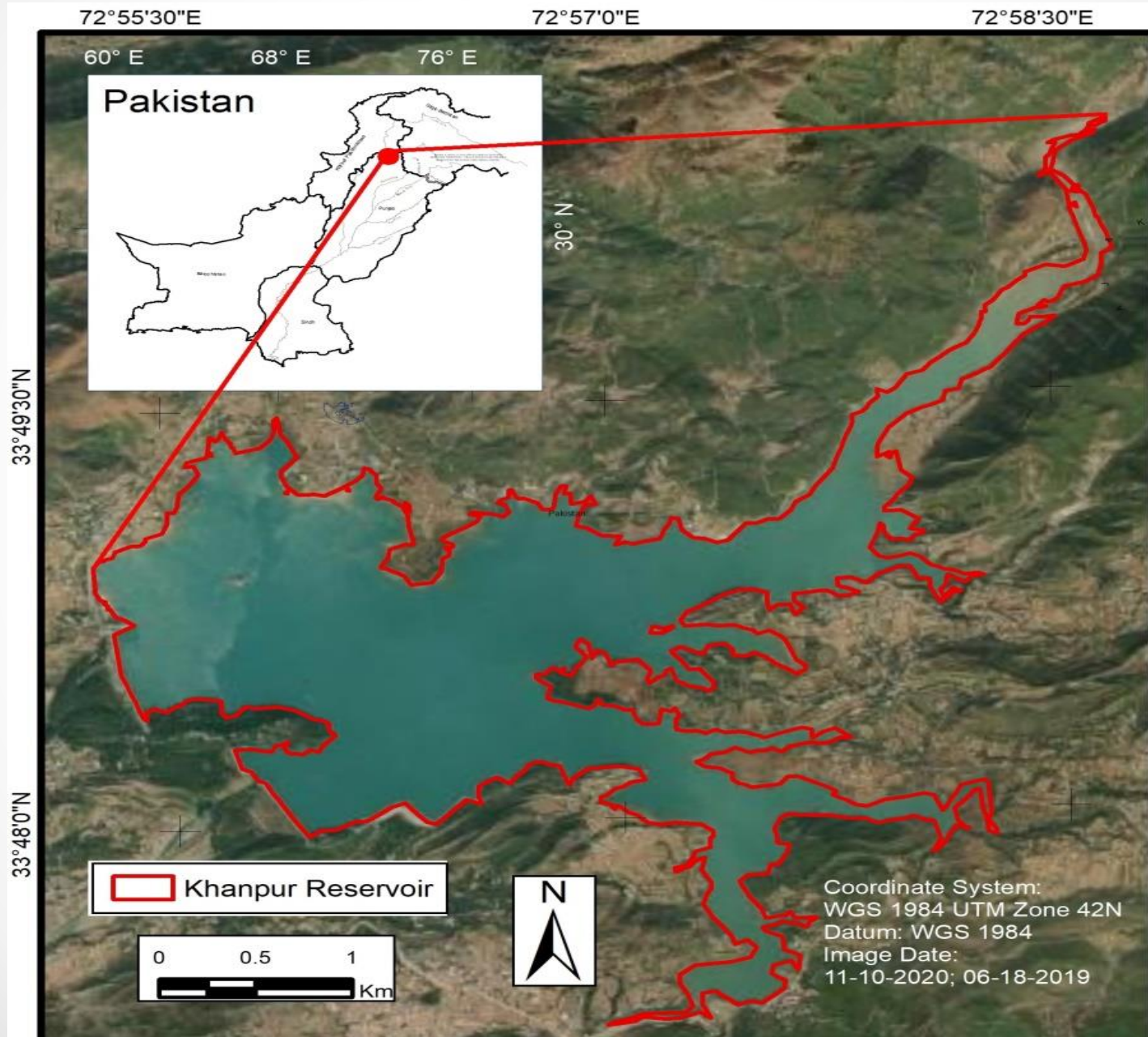
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MOTIVATION AND PERSPECTIVE

- Presently, there is no lake water monitoring program conducted by the government environmental protection agencies in Pakistan due to lack of financial support to conduct traditional monitoring surveys.
- As a consequence, no formal in-situ monitoring records of water quality parameters are present for the assessment of ecological status of fresh water lakes and reservoirs.
- To combat situations (COVID-19 emergency or future pandemics) which physically restrict ground based observation and sampling; new data, techniques, and solutions around the planning and management of water resources have to be adopted for **Continuous Monitoring** through satellite observations which provide primary data for analysis of long-term trends.

STUDY AREA



METHODOLOGY

DATA

- Multi-temporal Images from 2020 from Multispectral Instrument (MSI) on board Sentinel-2 satellites (A and B).
- Mean Monthly Rainfall data from Meteorological Station.

ESTIMATED WATER CLARITY INDICATORS:

1. Total Suspended Matter (TSM)
2. Secchi Disk Depth (SDD)

METHODS

QUALITATIVE RETRIEVAL METHOD:

$$NDTI = (B4 - B3)/(B4 + B3)$$

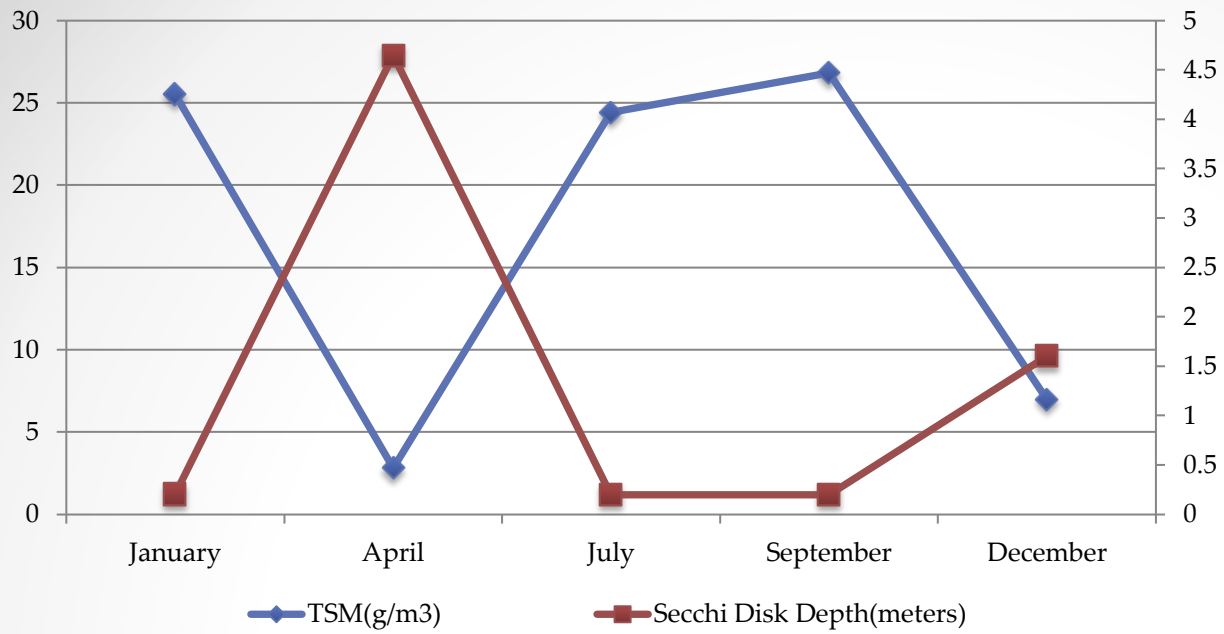
$$Band\ Ratio\ (SDD) = B3/B5$$

QUANTITATIVE RETRIEVAL METHOD:

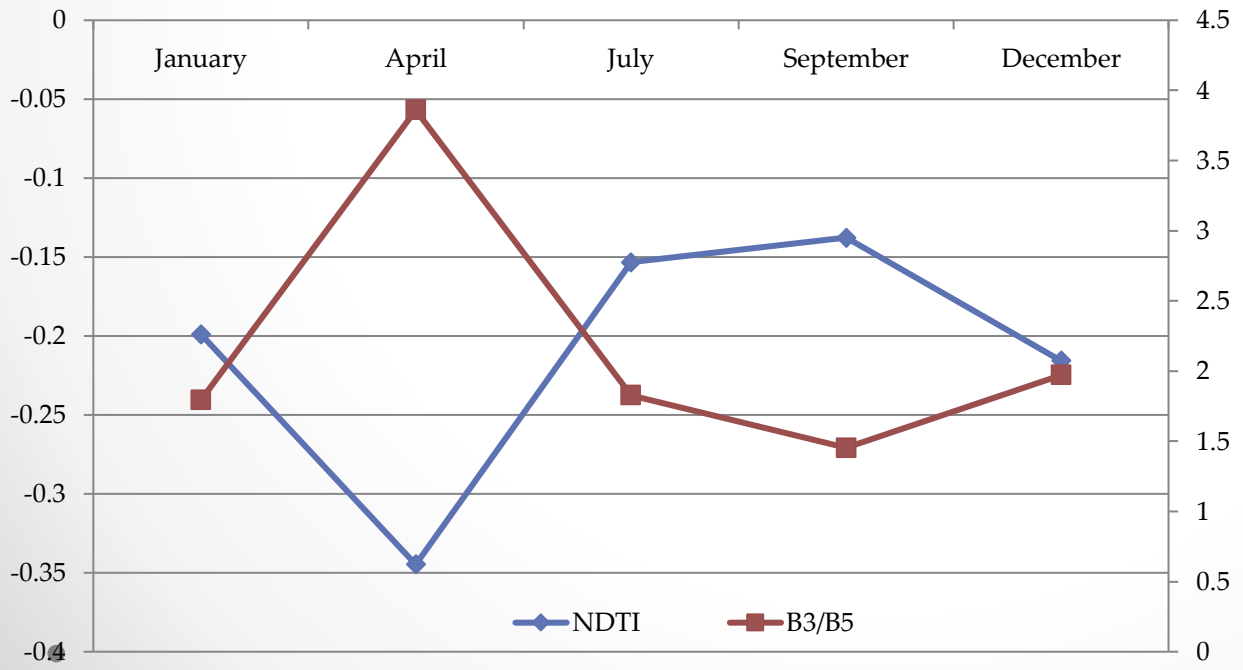
SNAP NATIVE PRODUCTS FROM CASE 2 REGIONAL COAST COLOR (C2RCC) PROCESSOR

- $conc_tsm = (iop_bpart * 0.986) + (iop_bwit * 1.72)$
- $SDD = 0.7 * kd_z90max.$

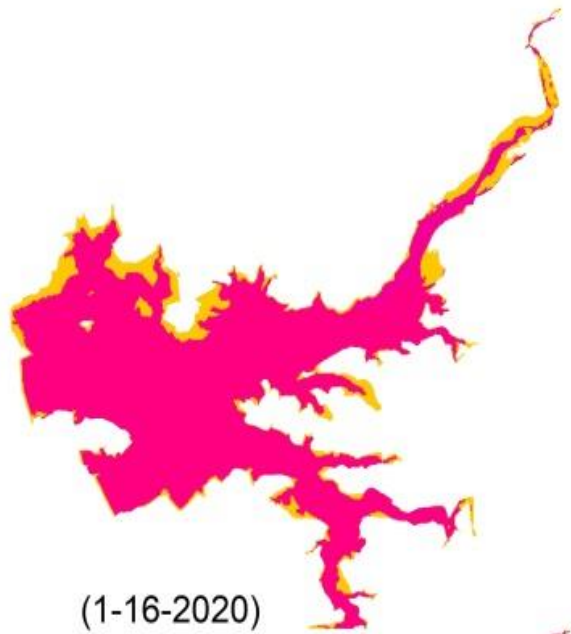
RESULTS



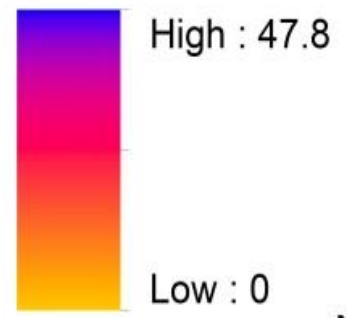
Temporal water clarity patterns from Quantitative method

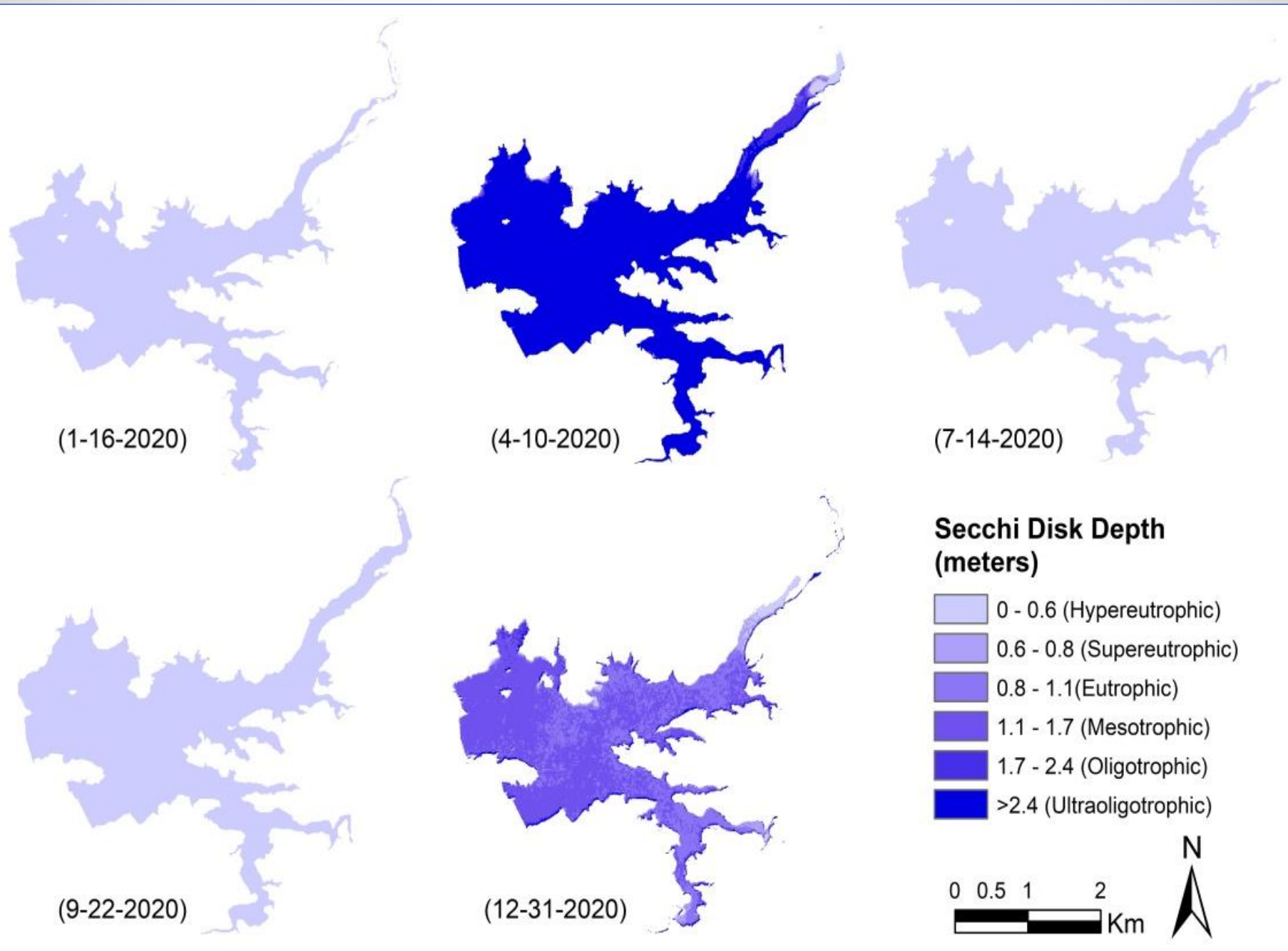


Temporal water clarity patterns from Qualitative method



**Total Suspended Matter
(g/m³)**





(1-16-2020)

(4-10-2020)

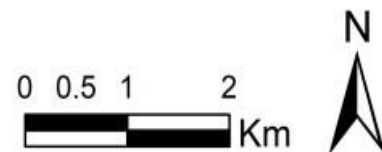
(7-14-2020)

(9-22-2020)

(12-31-2020)

**Secchi Disk Depth
(meters)**

- 0 - 0.6 (Hypereutrophic)
- 0.6 - 0.8 (Supereutrophic)
- 0.8 - 1.1 (Eutrophic)
- 1.1 - 1.7 (Mesotrophic)
- 1.7 - 2.4 (Oligotrophic)
- >2.4 (Ultraoligotrophic)



WATER QUALITY OF RESERVOIR

DRINKING WATER STATUS

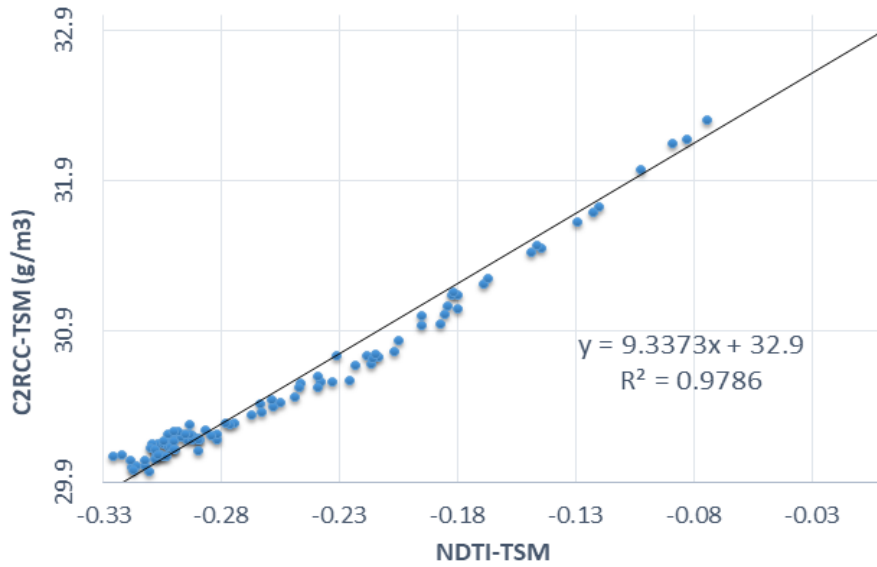
ECOLOGICAL STATUS

Mean TSM and Equivalent NTU

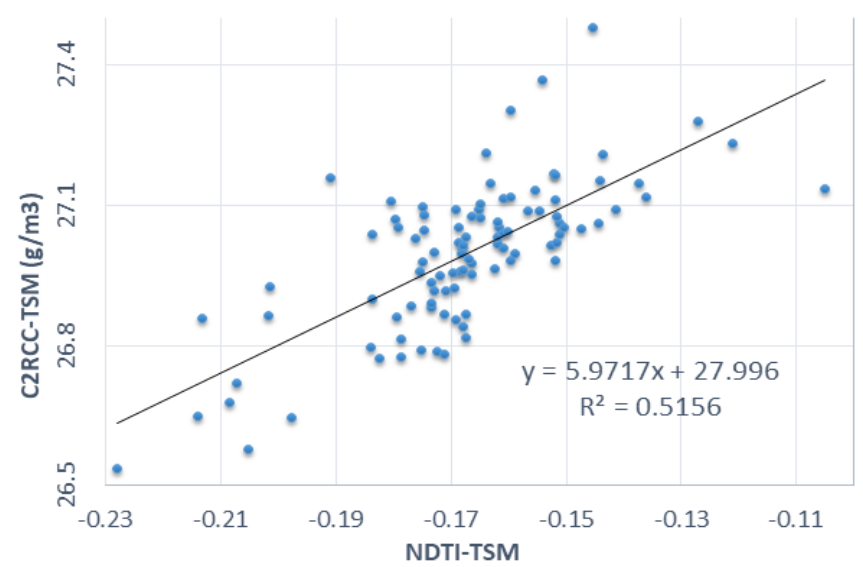
Month	Mean TSM (g/m ³)	Equivalent in NTU
January	25.521	7.460
April	2.796	0.810
July	24.403	7.133
September	26.821	7.838
December	6.955	2.033

The results depict that the months of January, July and September were characterized with high turbidity and poor trophic state (SDD < 1 meter) of the reservoir water as per preliminary estimations of Secchi disk depth and TSM retrievals from C2RCC analytical neural network model.

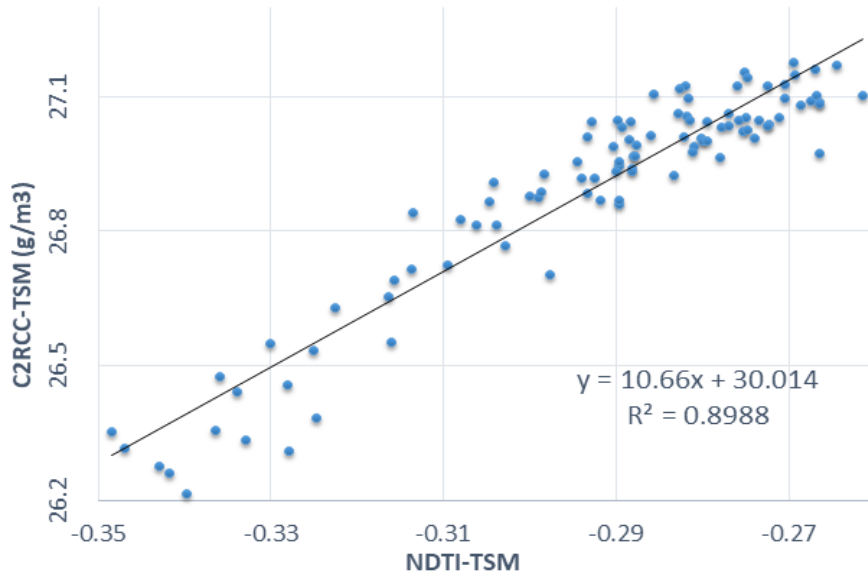
CONFORMITY OF ESTIMATES



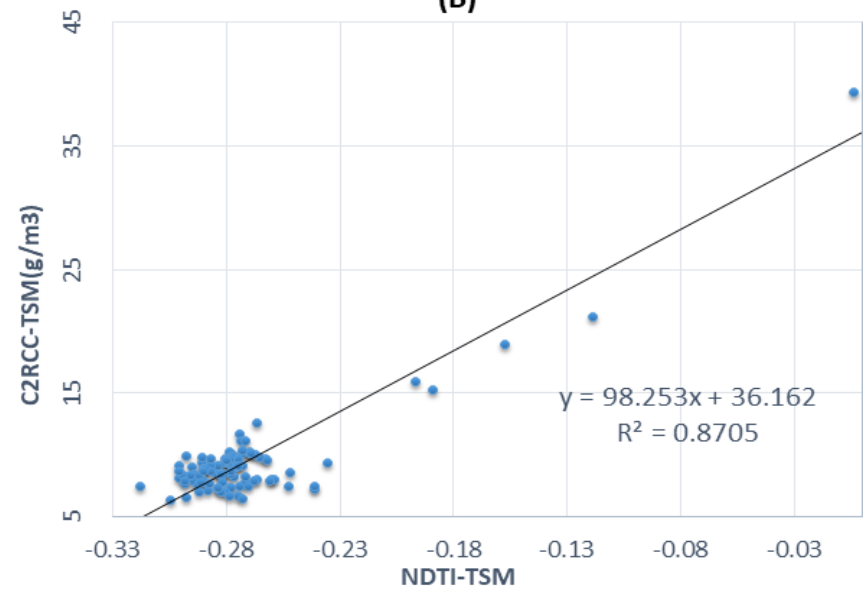
(A)



(B)

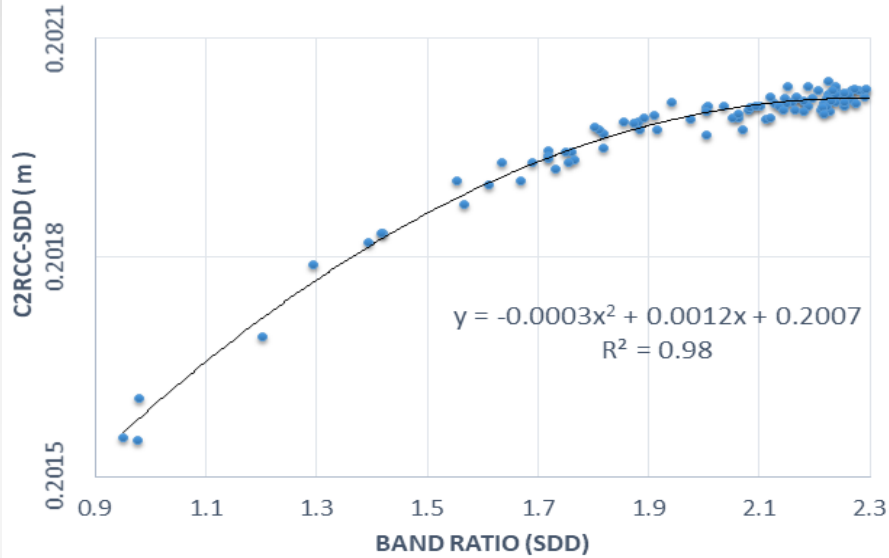


(C)

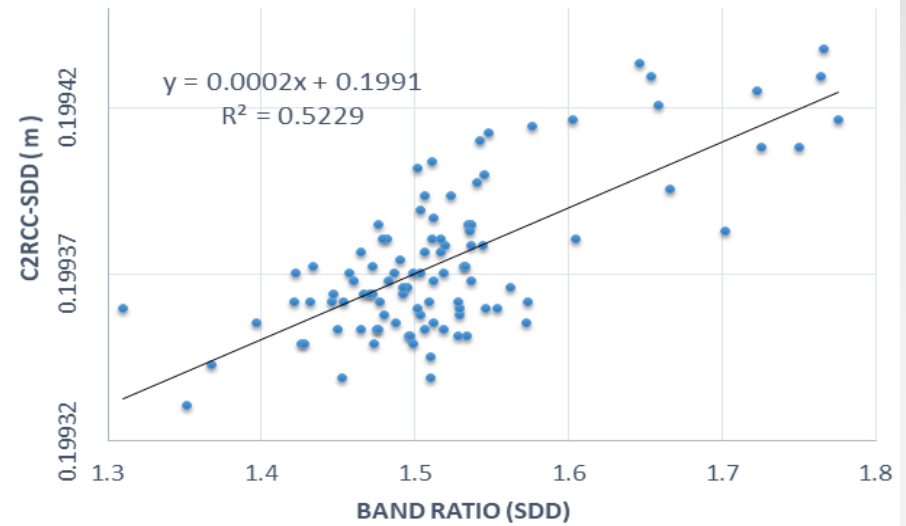


(D)

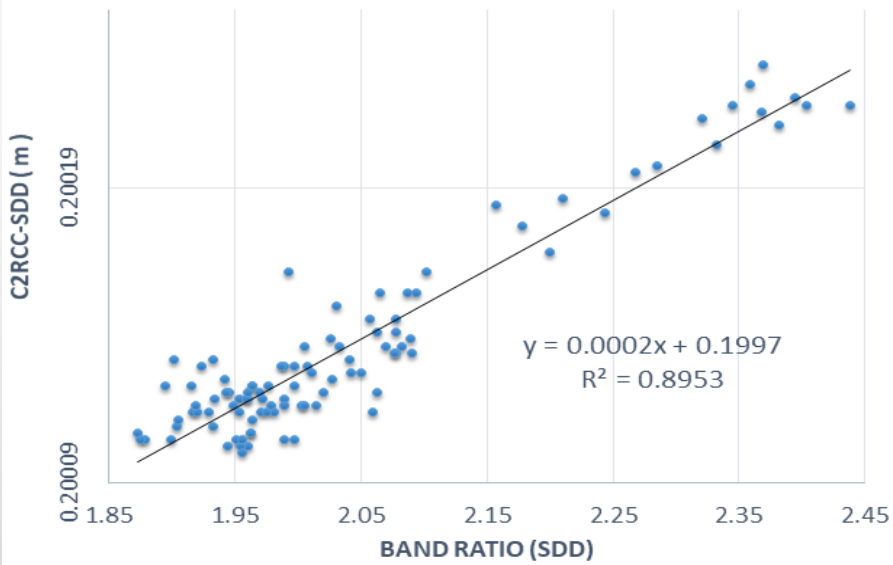
CONFORMITY OF ESTIMATES



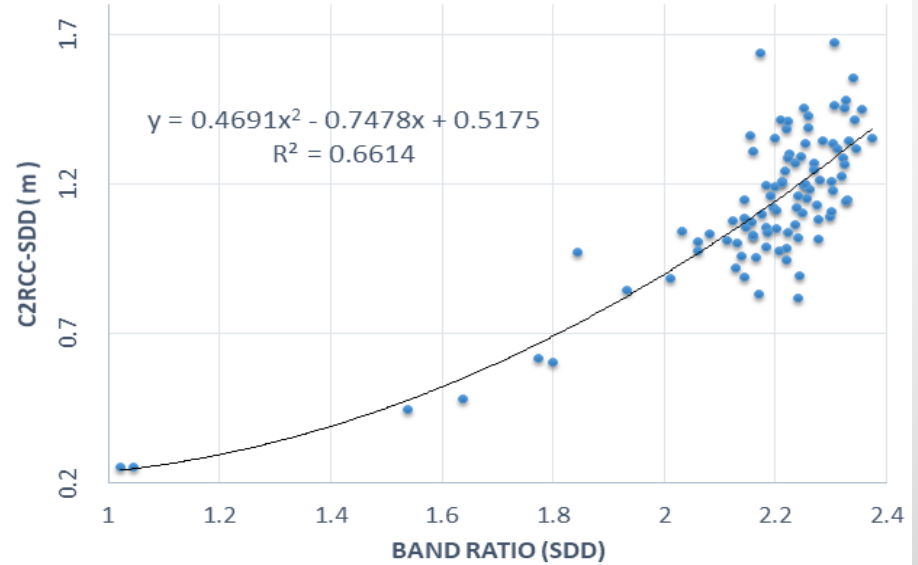
(A)



(B)



(C)



(D)

**THANK YOU FOR YOUR
ATTENTION!**