

## Article

# Remote Sensing Estimation of CDOM and DOC with the Environmental Implications for Lake Khanka

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## Other datasets:

The dataset of natural meteorological factors such as temperature, precipitation, wind speed, and atmospheric pressure we obtained comes from <https://www.ncei.noaa.gov/maps/daily/> in jixi Meteorological Station.

NDVI comes from MODIS/Terra Vegetation Indices Monthly L3 Global1km SIN Grid V061. The water volume data of Lake Khanka comes from <https://hydroweb.theia-land.fr/>. The population data of China and Russia comes from the WorldPop dataset in GEE, and the socio-economic data comes from <https://d.qianzhan.com/>.

The Modified Normalized Differential Water Index (MNDWI) is computed and adjusted using a specific formula. This calculation is performed after the OLCI image data has been preprocessed and cloud-free images have been selected from the non-glacial period (May to October). The extraction of these images is achieved by constructing a decision tree using ENVI5.3.

$$\text{MNDWI} = (\text{GREEN} - \text{SWIR}) / (\text{GREEN} + \text{SWIR}) \quad (\text{S1})$$

In Eq. (S1), the term "GREEN" refers to the green band, while "SWIR" represents the short-wave near-infrared band. Based on previous knowledge, the MNDWI threshold is established at 0.3. Subsequently, the decision tree is employed to exclude the portion with an NDWI value below 0.3. As a result, the water extents for the years 2016–2022 are derived using this methodology.

Table S1. Sentinel-3 Ocean and Land Color Instrument (S3-OLCI) spectral and spatial specifications.

Band Number	Central length(nm)	Wave-	Bandwidth(nm)
Oa1	400		15
Oa2	412.5		10
Oa3	442.5		10
Oa4	490		10
Oa5	510		10
Oa6	560		10
Oa7	620		10
Oa8	665		10
Oa9	673.75		7.5
Oa10	681.25		7.5
Oa11	708.75		10
Oa12	753.75		7.5
Oa13	761.25		2.5
Oa14	764.375		3.75
Oa15	767.5		2.5
Oa16	778.75		15
Oa17	865		20

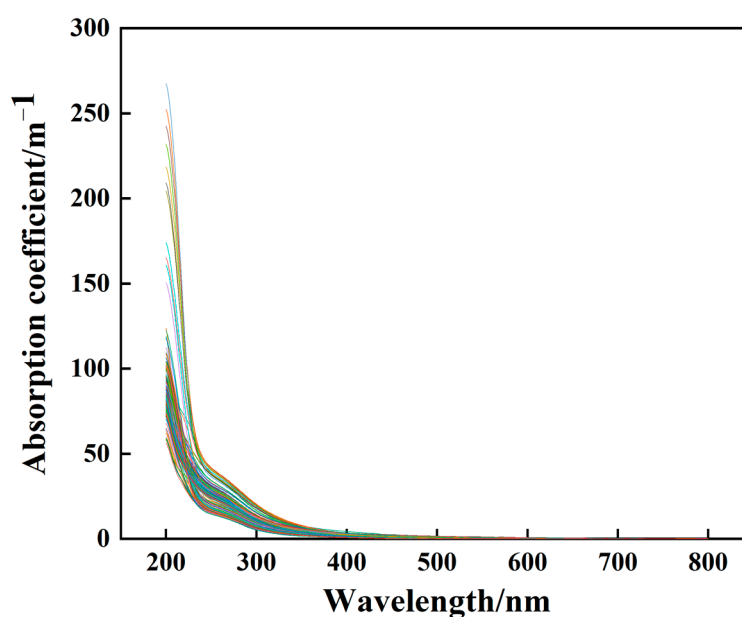


Fig S1. CDOM absorption coefficient curve of samples from 200 to 800 nm

Table S2. Descriptive statistics of water quality parameters

Parameters of Water Quality	Number	Mean	Maximum	Minimum
a(350)	159	4.08±1.44	7.99	1.52
DOC	159	5.11±1.41	9.04	1.30
COD <sub>Mn</sub>	62	20.87±27.45	78.00	1.07
TN	157	0.46±0.29	1.37	0.04
TP	157	0.24±0.19	0.76	0.01
SDD	97	21.50±5.89	37.00	10.00

Chla	159	10.32±9.33	61.25	1.46
Ph	43	8.20±0.18	8.46	7.92
Turb	126	105.95±67.53	439.60	32.78
Salinity	108	2.52±5.46	29.75	0.07
TSM	139	86.91±46.91	297.50	25.00

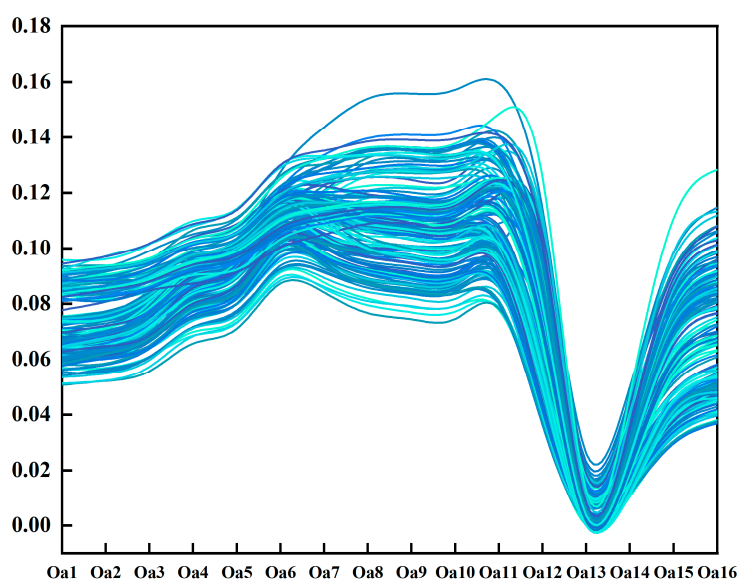


Fig S2. Sentinel 3 OLCI reflectance Rrc after atmospheric correction between Oa1-Oa16

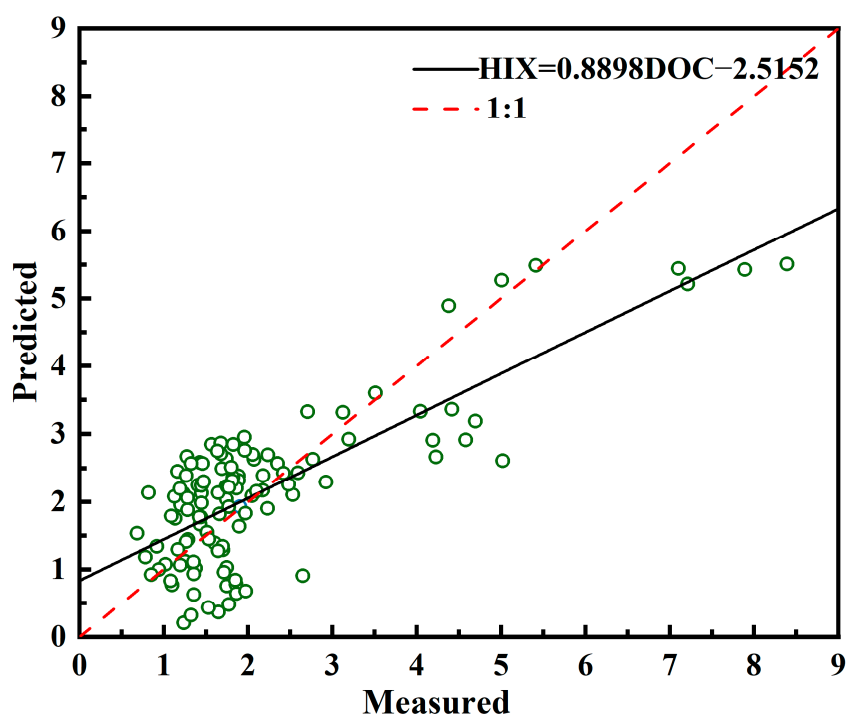


Fig S3. Accuracy Verification of HIX and CDOM Concentration Model