Review

A review of remote sensing applications for determining lake water quality - Supplement

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Abstract: Remote sensing methods have the potential to improve lake water quality monitoring and decision-making in water management. This reviews introduces novel findings in the field of optically active water quality parameters using remote sensing. It summarizes existing retrieval methods (analytical, semi-analytical, empirical, semi-empirical, and artificial intelligence/machine learning (AI/ML)), examines measurement methods used to determine concentration of specific water quality parameters, summarizes satellite systems that enable temporal data for understanding the state of the lake with focus on water quality parameters, and proposes enhancements for future research of lake water quality using remote sensing. As part of this review, eight optically active biological and physical water quality parameters were analyzed, including chlorophyll-α (chl-α), transparency (Secchi disk depth (SDD)), colored dissolved organic matters (CDOM), turbidity (TUR), electrical conductivity (EC), surface salinity (SS), total suspended matter (TSM), and water temperature (WT). The research proposes a shift from point-based data representation to a more reliable raster representation and encourages optimizing grid selection for in situ measurements by combining hydrodynamic model with remote sensing methods. This review presents a comprehensive summary of the bands, band combinations, and band equations per sensor for eight optically active water quality parameters as listed in Tables A1-A8. The review's findings indicate that use of remotely sensed data is an effective method for estimating water quality parameters in lakes, with a significant increase in global utilization. The review highlights potential solutions and limitations to the challenges of remote sensing water quality determination in lakes.

Keywords: remote sensing; lake; water quality; water quality parameters; spaceborne sensors; inland waters

Appendix A

Selected remote measurements of selected water quality parameters using different sensors and spectral bands, band ratios and band combinations

Table A1. Selected remotely measurements of chl-α using various sensors and spectral bands, band ratios, and band combinations.

Band Combination	Sensor	Band/Equation	Reference
Ratio between green and red	Landsat-5 TM	B2 (520-600 nm)/B3 (630-690 nm)	[33]
	Landsat-5 TM	B3 (630-690 nm)/B2 (520-600 nm)	[57,58]
	PROBA-CHRIS	R_{706}/R_{561}	[59]
Ratio between NIR and red	HICO	$(1/R_{686}-1/R_{703})*R_{735}$	[60]
	HICO	$R_{708}/avg(R_{662},R_{668})$	[61]
	PROBA-CHRIS	R_{706}/R_{672}	[62]
	MODIS	$R_{743–753}/R_{662–672}$	[63,64]
	MERIS	$(1/R_{660–670}-1/R_{700–730})*R_{740–760}$	[63]
	MERIS	$(1/R_{660–670}-1/R_{703.75–713.75})*R_{750–757.5}$	[64]

		MERIS	$(1/R_{665}-1/R_{708})*R_{753}$	[65,66]
		MERIS	R_{708}/R_{665}	[65,66]
		AISA	$R_{699-705}/R_{670-677}$	[67]
		AISA	$(R_{700}-R_{781})/(R_{662}-R_{781})$	[35]
		MERIS	$R_{720–740}/R_{660–670}$	[68]
		MERIS	$(1/R_{660–670}-1/R_{700–720})*R_{720–740}$	[68]
		HyperOCR	$(1/R_{672}-1/R_{712})*R_{749}$	[69]
		MERIS	R_{672}/R_{704}	[70]
		MODIS	R_{665}/R_{748}	[70]
		AVIRIS	R_{708}/R_{676}	[71]
		MERIS	$(1/R_{660}-1/R_{692})*R_{740}$	[72]
		MERIS	$(1/R_{622}-1/R_{693})*(1/R_{740}-1/R_{705})$	[72]
		Sentinel-3 OLCI	$(1/R_{665}–1/R_{705}) \times R_{752}$	[73]
		HyMap	R_{705}/R_{678}	[74]
		CASI	R_{705}/R_{678}	[74]
		AISA	R_{700}/R_{670}	[75]
		CASI-2	R_{710}/R_{670}	[76]
		AISA	R_{710}/R_{670}	[76]
		MODIS	R_{700}/R_{670}	[77]
		MERIS	B9 (703.75-713.75 nm)/B7 (660-670 nm)	[78]
		MERIS	R_{709}/R_{665}	[79]
		AISA	$(1/R_{666}-1/R_{704})*R_{723}$	[80]
		AISA	R_{704}/R_{666}	[80]
		MERIS	(B9 (703.75-713.75 nm)-B7 (660-670 nm))*(B9 (703.75-713.75 nm)+B7 (660-670 nm))	[81]
		Sentinel-2 MSI	R_{705}/R_{665}	[82]
		Sentinel-3 OLCI	R_{665}/R_{709}	[82]
Ratio between green and blue		MERIS	(B5 (555-565 nm)-B2 (437.5-447.5 nm))*(B5 (555-565 nm)+B2 (437.5-447.5 nm))	[81]
		EO-1 Hyperion	R_{490}/R_{550}	[83]
		EO-1 Hyperion	R_{467}/R_{559}	[84]
		HICO	R_{444}/R_{553}, R_{490}/R_{553}, R_{507}/R_{553}	[85]
		SeaWiFS	R_{443}/R_{555}, R_{490}/R_{555}, R_{510}/R_{555}	[86]
		Landsat-5 TM	B2 (520-600 nm)/ B1 (450-520 nm)	[87]
		WorldView-2	B1 (400-450 nm)/B3 (510-580 nm)	[30]
Ratio between blue and red		Landsat-7 ETM+	B1 (450-515 nm)/B3 (630-690 nm)	[88,89]
		ALOS-AVNIR-2	B3 (610-690 nm)/B1 (420-500 nm)	[90]
		Landsat-8 OLI	$(R_{630-680}-R_{433-453})/(R_{630-680}+R_{433-453})$	[91]
Single band	Blue	Landsat-5 TM	B1 (450-520 nm)	[32]
		MIVIS	R_{440}	[92]
		MODIS	B8 (405-420 nm)	[93]
	Red	PROBA-CHRIS	$R_{650-690}$	[94]
	Green	Landsat-5 TM	B2 (520-600 nm)	[95]
		Daedalus ATM	B3 (520-600 nm)	[96]
		MODIS	B11 (526-536 nm)	[93]
		MODIS	B4 (545-565 nm)	[93]
	NIR	MODIS	B2 (840-876 nm)	[93]

Multiple bands	IKONOS	B1 (450–530 nm), B2 (520–610 nm), B3 (640–720 nm), B4 (770–880 nm)	[97]
	Landsat-5 TM	B1 (450-520 nm), B2 (520-600 nm), B3 (630-690 nm), B5 (1550-1750 nm), B6 (10400-12500 nm)	[98]
	Landsat-8 OLI	B2 (450-510 nm), B3 (530-590 nm), B4 (630-670 nm), B5 (850-880 nm)	[99]
	Landsat-5 TM	B1 (450-520 nm), B2 (520-600 nm)	[100]
	Landsat-5 TM	B1 (450-520 nm), B3 (630-690 nm)	[101–103]
	Landsat-5 TM	B1 (450-520 nm), B2 (520-600 nm), B3 (630-690 nm)	[102,104]
	Landsat-5 TM	B1 (450-520 nm), B3 (630-690 nm), B4 (760-900 nm)	[102]
	Landsat-5 TM	B1 (450-520 nm), B2 (520-600 nm), B3 (630-690 nm), B4 (760-900 nm)	[100]
	MODIS	B1 (620-670 nm), B4 (545-565 nm)	[93]
	Landsat-8 OLI	B1 (433–453 nm), B2 (450-515 nm), B3 (525-600 nm), B4 (630-680 nm)	[105]
	MERIS	B7 (664 nm), B8 (680.5 nm), B9 (708 nm)	[106]
	CHRIS-PROBA	B8 (581.345-596.935 nm), B9 (613.7-627.1 nm), B10 (641.27-656.25 nm), B11 (661.44-672.12 nm), B12 (672.15-683.21 nm)	[107]
	MODIS	B1 (645 nm), B2 (859 nm), B3 (469 nm), B4 (555 nm)	[108]
	Landsat-5 TM	B1 (450-520 nm), B2 (520-600 nm), B3 (630-690 nm), B4 (760-900 nm), B5 (1550-1750 nm), B7 (2080-2350 nm)	[109]
	PlanetScope	B2 (465-515 nm), B4 (547-583 nm), B6 (650-680 nm), B8 (845-885 nm)	[110]
	Sentinel-2 MSI	B4 (649.6-679.6 nm), B5 (697.1-711.1 nm), B6 (733.5-747.5 nm), B11 (1568.7-1658.7 nm), B12 (2115.4-2289.4)	[110]
	Landsat-8 OLI	B5 (850-880 nm), B6 (1570-1650 nm), B7 (2110-2290 nm)	[110]
	Sentinel-3 OLCI	B1 (392.5-407.5 nm), B4 (485-495 nm), B6 (555-565 nm), B8 (660-670 nm), B9 (670-677.5 nm)	[111]

Table A2. Selected remotely measurements of TSM using various sensors and spectral bands, band ratios, and band combinations

Band Combination	Sensor	Band/Equation	Reference
Ratio between green and red	Landsat-5 TM	B3 (630-690 nm)/B2 (520-600 nm)	[58]
	PROBA-CHRIS	R_{680}/R_{530}	[59]
	WorldView-2	B3 (510-580 nm)/B4 (585-625 nm)	[30]
Ratio between NIR and green	SPOT-HRV	R_{850}/R_{550}	[182]
	Landsat ETM+	R_{850}/R_{550}	[182]
	IRS	R_{850}/R_{550}	[182]
	ALOS-AVNIR-2	B4 (760-890 nm)/B2 (520-600 nm)	[90]
	AISA	R_{850}/R_{550}	[75]
	PlanetScope	B1(431-452 nm)/B4 (547-583 nm)	[183]

Ratio between blue and green		PlanetScope	B2 (465-515 nm)/B4 (547-583 nm)	[183]
Single band	NIR	AISA	$R_{705-714}$	[67]
		MODIS	R_{748}	[184]
		DEIMOS-1 (GEOSAT-1)	B3 (755-906 nm)	[185]
		Sentinel-2 MSI	B7 (773-793 nm)	[186]
		Sentinel-2 MSI	R_{705}	[82]
	Red	Landsat-5 TM	B3 (630-690 nm)	[187]
		MODIS	B1 (620-670 nm)	[188]
		MODIS	R_{645}	[189]
		IRS LISS-III	B2 (620-680 nm)	[187]
		Landsat-5 TM	B2 (520-600 nm)	[187]
		IRS-LISS-III	B1 (520-590 nm)	[187]
	Blue	MIVIS	R_{440}	[92]
		MODIS	R_{490}	[190]
	Green	PlanetScope	B3 (513-549 nm)/B4 (547-583 nm)	[183]
		PlanetScope	B4 (547-583 nm)/B3 (513-549 nm)	[183]
		PlanetScope	B3 (513-549 nm)	[113]
Multiple bands		IKONOS	B1 (450-530 nm), B2 (520-610 nm), B3 (640-720 nm), B4 (770-880 nm)	[97]
		Landsat-5 TM	B2 (520-600 nm), B3 (630-690 nm)	[191]
		SPOT-HRV	B1 (500-590 nm), B2 (610-680 nm)	[191]
		Landsat-5 TM	B3 (630-690 nm), B4 (760-900 nm)	[192]
		Landsat-8 OLI	B4 (630-670 nm), B5 (850-880 nm)	[192]
		Landsat-5 TM	B1 (450-520 nm), B2 (520-600 nm), B3 (630-690 nm), B4 (760-900 nm)	[100]
		Landsat-8 OLI	B2 (450-510 nm), B3 (530-590 nm), B5 (850-880 nm)	[99]
		IRS-1A-LISS-I	B1 (450-520 nm), B2 (520-590 nm), B3 (620-680 nm)	[119]
		Landsat-5 TM	B1 (450-520 nm), B2 (520-600 nm), B3 (630-690 nm)	[101]
		Sentinel-3 OLCI	R_{779}, R_{754}, R_{865}	[82]

Table A3. Selected remotely measurements of TUR using various sensors and spectral bands, band ratios, and band combinations

Band Combination		Sensor	Band/Equation	Reference
Ratio between green and red		Landsat-5 TM	B3 (630-690 nm)/B2 (520-600 nm)	[58]
Ratio between NIR and red		AISA	R_{850}/R_{550}	[75]
Single band	NIR	AISA	R_{714}	[35]
		AISA	$R_{705-714}$	[67]
	Red	Landsat-7 ETM+	B3 (630-690 nm)	[32]
		Landsat-5 TM	B3 (630-690 nm)	[32]
		Landsat-5 TM	B3 (630-690 nm)	[33]
		HICO	R_{646}	[60]
		Landsat-7 ETM+	B3 (630-690 nm)	[155]

		Landsat-5 TM	B3 (630-690 nm)	[155]
Multiple bands		Landsat-8 OLI	B4 (630-670 nm), B5 (850-880 nm)	[152]
		Landsat-8 OLI	B2 (450-510 nm), B4 (630-670 nm)	[153]
		ASTER Terra	B1 (520-600 nm), B2 (630-690 nm), B3 (780-860 nm)	[150]
		Landsat-5 TM	B2 (520-600 nm), B3 (630-690 nm), B6 (10400-12500 nm), B7 (2080 – 2350 nm)	[98]
		Landsat-5 TM	B1 (450-520 nm), B3 (630-690 nm)	[102]
		Landsat-5 TM	B1 (450-520 nm), B3 (630-690 nm), B4 (760-900 nm)	[102]
		Landsat-5 TM	B2 (520-600 nm), B3 (630-690 nm)	[102]
		Landsat-5 TM	B1 (450-520 nm), B3 (630-690 nm), B4 (760-900 nm)	[104]
		Landsat-5 TM	B1 (450-520 nm), B2 (520-600 nm), B3 (630-690 nm), B4 (760-900 nm), B5 (1550-1750 nm), B7 (2080-2350 nm)	[109]
		PlanetScope	B4 (547-583 nm), B6 (650-680 nm), B8 (845-885 nm)	[110]
		Sentinel-2 MSI	B2 (460.2-525.2 nm), B4 (649.6-679.6 nm), B8 (780.3-885.3 nm), B12 (2115.4-2289.4)	[110]
		Landsat-8 OLI	B3 (525-600 nm), B4 (630-680 nm), B5 (850-880 nm), B7 (2110-2290 nm)	[110]
		ASTER Terra	B1 (520-600 nm), B2 (630-690 nm), B3 (780-860 nm)	[150]
		Sentinel-2 MSI	B3 (542.3-577.3 nm), B4 (649.6-679.6 nm), B5 (697.1-711.1 nm), B12 (2115.4-2289.4)	[156]

Table A4. Selected remotely measurements of CDOM using various sensors and spectral bands, band ratios, and band combinations

Band Combination		Sensor	Band/Equation	Reference
Ratio between green and red		HICO	R_{670}/R_{490}	[60]
		MODIS	R_{670}/R_{571}	[77]
		EO-1 ALI	B2 (525-605 nm)/B3 (630-690 nm)	[127,128]
		EO-1 ALI	B2 (565 nm)/B3 (660 nm)	[129]
		SeaWiFS	R_{670}/R_{490}	[130]
		Sentinel-2 MSI	B3 (560 nm)/B4 (665 nm)	[131]
		VIIRS	R_{551}/R_{671}	[132]
		Landsat-8 OLI	B3 (525-600 nm)/B4 (630-680 nm)	[133]
		Landsat-7 ETM+	B2 (525-605 nm)/B3 (630-690 nm)	[115]
		Landsat-5 TM	B2 (520-600 nm)/B3 (630-690 nm)	[134]
		Sentinel-3 OLCI	R_{665}/R_{550}	[82]
Ratio between red and blue		Sentinel-2 MSI	R_{665}/R_{490}	[82]
Ratio between blue and green		ALOS-AVNIR-2	B1 (420-500 nm)/B2 (520-600 nm)	[90]
		AISA	R_{440}/R_{575}	[75]
		MODIS	R_{488}/R_{555}	[142]
		SeaWiFS	R_{412}/R_{555}	[135,136]
Single band	Green	MERIS	R_{510}/R_{560}	[142]
		SeaWiFS	R_{510}/R_{555}	[142]
	Blue	MIVIS	R_{440}	[92]

		EO-1 Hyperion	R_{440}	[83]
		SeaWiFS + MODIS-Aqua	R_{443}	[137]
		MODIS	R_{380}	[138]
		MODIS	R_{412}	[142]
		MERIS	R_{412}	[142]
		SeaWiFS	R_{400}	[136]
		SeaWiFS	R_{440}	[139]
		SeaWiFS	R_{410}	[140]
		SeaWiFS	R_{412}	[141,142]
		MODIS Aqua	R_{443}	[143,144]
		HICO	R_{440}	[145]
		VIIRS	R_{412}	[132]
		ASTER	R_{440}	[146]
		Sentinel-2A	R_{440}	[147]
Multiple bands		Landsat-5 TM	B1 (450-520 nm), B2 (520-600 nm), B3 (630-690 nm), B4 (760-900 nm)	[102]
		Landsat-7 ETM+	B2 (525-605 nm), B3 (630-690 nm), B4 (775-900 nm)	[115]
		Landsat-7 ETM+	B1 (450-515 nm), B2 (525-605 nm), B3 (630-690 nm)	[115]
		Landsat-8 OLI	B3 (525-600 nm), B4 (630-680 nm), B5 (845-885 nm)	[115]
		Landsat-8 OLI	B1 (433-453 nm), B2 (450-515 nm), B5 (845-885 nm)	[115]

Table A5. Selected remotely measurements of transparency (SDD) using various sensors and spectral bands, band ratios, and band combinations

Band Combination		Sensor	Band/Equation	Reference
Ratio between red and green		Landsat-5 TM	B3 (630-690 nm)/B2 (520-600 nm)	[57,58]
		ALOS-AVNIR-2	B3 (610-690 nm)/B2 (520-600 nm)	[90]
Ratio between NIR and red		AISA	$(R_{670\text{-}677}\text{-}R_{747\text{-}755})/(R_{699\text{-}705}\text{-}R_{747\text{-}755})$	[67]
		MERIS	R_{708}/R_{664}	[112]
Ratio between NIR and green		AISA	$(R_{521}\text{-}R_{781})/(R_{700}\text{-}R_{781})$	[35]
Ratio between blue and red		PROBA-CHRIS	$(R_{410}+R_{651})/R_{680}$	[59]
		Landsat-7 ETM+	B1 (450-515 nm)/B3 (630-690 nm)	[88]
Ratio between blue and green		Landsat-5 TM	B1 (450-520 nm)/B2 (520-600 nm)	[103]
		PlanetScope	B2 (465-515 nm)/B3 (513-549 nm)	[113]
Single band	Red	Landsat-5 TM	B3 (630-690 nm)	[33,95,114]
		MODIS	B1 (620-670 nm)	[93]
	NIR	MODIS	R_{710}	[77]
Multiple bands		IKONOS	B1 (450–530 nm), B2 (520–610 nm), B3 (640–720 nm)	[97]
		Landsat-8 OLI	B1 (433-453 nm), B2 (450-515 nm), B4 (630-680 nm)	[115]
		Landsat-8 OLI	B2 (450-515 nm), B4 (630-680 nm)	[115]
		Landsat-7 ETM+	B1 (450-515 nm), B3 (630-690 nm)	[115,116]
		Landsat-5 TM	B1 (450-520 nm), B2 (520-600 nm), B3 (630-690 nm)	[57,118]

	IRS-1A-LISS-I	B1 (450-520 nm), B2 (520-590 nm), B3 (620-680 nm)	[119]
	Landsat-5 TM	B1 (450-520 nm), B3 (630-690 nm)	[101,102,120–125]
	Landsat-5 TM	B1 (450-520 nm), B4 (760-900 nm)	[102]
	Landsat-5 TM	B1 (450-520 nm), B2 (520-600 nm), B4 (760-900 nm)	[102]
	IKONOS	B1 (445-516 nm), B3 (632-698 nm)	[124]
	Landsat-5 MSS	B1 (500-600 nm), B2 (600-700 nm)	[122,123]
	Landsat-7 ETM+	B3 (630-690 nm), B7 (2090-2350 nm)	[126]
	Landsat-5 TM	B1 (450-520 nm), B2 (520-600 nm)	[87]
	PlanetScope	B2 (465-515 nm), B6 (650-680 nm), B8 (845-885 nm)	[110]
	Sentinel-2 MSI	B3 (542.3-577.3 nm), B4 (649.6-679.6 nm), B7 (773.3-792.3 nm), B12 (2115.4-2289.4)	[110]
	Landsat-8 OLI	B3 (525-600 nm), B4 (630-680 nm), B5 (845-885 nm)	[110]

Table A6. Selected remotely measurements of WT using various sensors and spectral bands, band ratios, and band combinations

Band Combination		Sensor	Band/Equation	Reference
Single band	TIR	MODIS Terra	B29 (8400-8700 nm)	[193]
		Landsat-7 ETM+	B6 (10400-12500 nm)	[193–199]
		Landsat-5 TM	B6 (10400-12500 nm)	[87,103,199,200,204]
		Landsat-8 TIRS	B10 (10600-11190 nm)	[201]
Multiple bands		ASTER	B11 (8475-8825 nm), B13 (10250-10950 nm)	[193]
		ASTER	B10 (8125-8475 nm), B11 (8475-8825 nm), B12 (8925-9275 nm), B13 (10250-10950 nm), B14 (10950-11650 nm)	[197]
		MASTER	B43 (8560-8940 nm), B44 (9010-9410 nm), B46 (10080-10480 nm), B47 (10430-11080 nm), B48 (11060-11760 nm)	[193]
		MASTER	B41 (7740-8140 nm), B42 (8170-8570 nm), B43 (8560-8940 nm), B44 (9010-9410 nm), B45 (9660-10060 nm), B46 (10080-10480 nm), B47 (10430-11080 nm), B48 (11060-11760 nm), B49 (12080-12580 nm), B50 (12800-13300 nm)	[197]
		NOAA-9, -11, -12, -14, -16, -17, -19 AVHRR	B4 (1030-1130 nm), B5 (1150–1250 nm)	[196,202,203]
		NOAA-12 AVHRR	B4 (1030-1130 nm), B5 (1150–1250 nm)	[198]
		MODIS Terra	B31 (10780-11280 nm), B32 (11770-12270 nm)	[204–208,213]
		Landsat-8 TIRS	B10 (10600-11190 nm), B11 (11500-12510 nm)	[209]
		MODIS Terra	B29 (8400-8700 nm), B31 (10780-11280 nm), B32 (11770-12270 nm)	[210]

	ASTER Terra	B8 (2295-2365 nm), B10 (8125-8475 nm), B11 (8475-8825 nm), B13 (10250-10950 nm)	[150]
	NOAA-17/-18 AVHRR	B4 (1030-1130 nm), B5 (1150–1250 nm)	[211]
	NOAA-17/-18 AVHRR	B3B (3550-3930 nm), B4 (1030-1130 nm), B5 (1150–1250 nm)	[211]
	MODIS Terra	B31 (10780-11280 nm), B32 (11770-12270 nm)	[212]

Table A7. Selected remotely measurements of SS using various sensors and spectral bands, band ratios, and band combinations

Band Combination		Sensor	Band/Equation	Reference
Single band	L-band	SMOS MIRAS	L-band (1400–1427 MHz)	[157–163]
		Aquarius/SAC-D	L-band (1.413 GHz)	[164,165]
		STARRS	L-band (1.4 GHz)	[166–169]
		PLMR	L-band (1.413 GHz)	[170]
		SLFMR	L-band (1.4 GHz)	[167,171–173]
		PALS	L-band (1.413 GHz)	[174–176]
		2D-STAR	L-band (1.413 GHz)	[177]
		ESTAR	L-band (1.413 GHz)	[177,178]
		CAROLS	L-band (1.413 GHz)	[179]
Multiple bands		MODIS Aqua	B1 (620-670 nm), B2 (841-876 nm), B3 (459-479 nm), B4 (545-565 nm), B5 (1230-1250 nm), B6 (1628-1652 nm), B7 (2105-2155 nm)	[180]
		EOS Aqua AMSR-E	6.9 and 10.7 GHz	[181]
		ASTER Terra	B3 (780-860 nm), B5 (2145-2185 nm), B7 (2235-2285 nm)	[150]

Table A8. Selected remotely measurements of EC using various sensors and spectral bands, band ratios, and band combinations

Band Combination		Sensor	Band/Equation	Reference
Ration between green and red		Landsat-8 OLI	B3 (525-600 nm)/B4 (630-680 nm)	[148]
Single band	Red	Landsat-8 OLI	B4 (630-680 nm)	[149]
Multiple bands		ASTER Terra	B3 (780-860 nm), B4 (1600-1700 nm), B8 (2295-2365 nm)	[150]
		Landsat-8 OLI	B2 (450-510 nm), B3 (525-600 nm), B4 (630-680 nm)	[151]
		Landsat-5 TM	B1 (450-520 nm), B2 (520-600 nm), B3 (630-690 nm)	[151]
		Landsat-8 OLI	B2 (450-510 nm), B3 (525-600 nm), B4 (630-680 nm), B6 (1570-1650 nm)	[152]
		Landsat-8 OLI	B1 (430-450 nm), B2 (450-510 nm), B3 (525-600 nm), B5 (850-880 nm), B6 (1570-1650 nm)	[153]

	WorldView-2	B2 (450-510 nm), B6 (705-745 nm), B7 (770-895 nm)	[154]