Monitoring of changes in the water surface and wetland area of the Aral Sea and the Aral Region

SIC ICWC made monitoring of changes in the Aral Sea and the Aral Region by using the Landsat 8 OLI images. The images got on 22 March 2020 allowed having wetland and open water surface areas within the boundaries of the Aral Region and the Aral Sea.

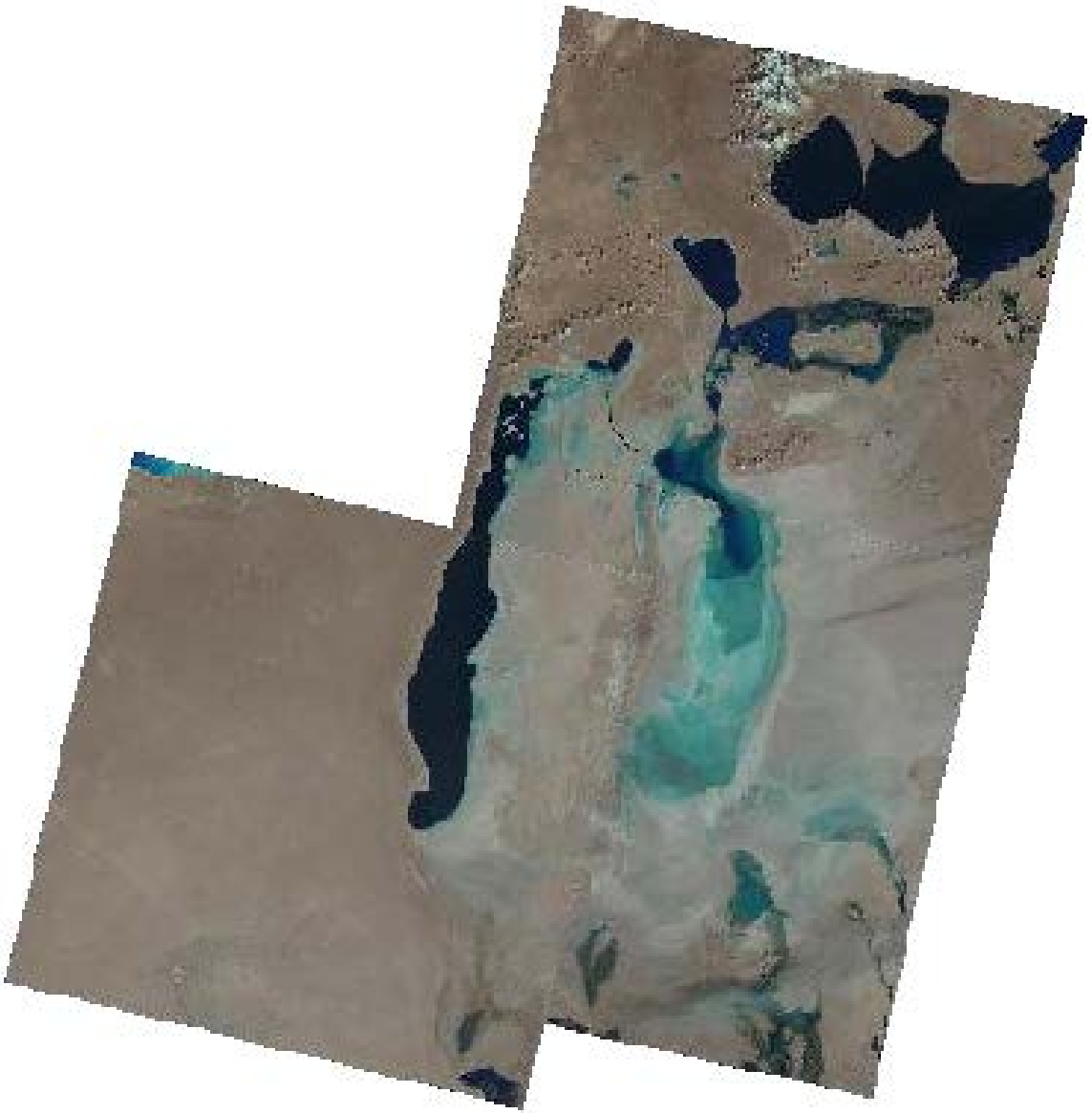

Figure 1. Western and Eastern parts of the Aral Sea.
Landsat 8, 22 March 2020

Table 1

The area of wetlands and open water surfaces in the Western and Eastern parts of the Aral Sea

	19.02.2020	**22.03.2020**
Western part of the Aral Sea, ha		
Wetland	clouds	312 527
Water surface	clouds	248 823
Eastern part of the Aral Sea, ha		
Wetland	1 420 530	1 402 136
Water surface	76 294	94 688
	January	February
Inflow to the Aral Region, Mm^3/month	216	210

Figure 2 The Aral Region, Landsat 8, 22 March 2020

Table 2

Areas of wetlands in the Aral Region, ha

Водоем	**19.02.2020**	**22.03.2020**
Sudoche	37 422,31	34 828
Mejdureche	29109,8	28 402
Rybache	6957,36	9 553
Muynak	13292,28	13 251
Djiltyrbas dam-terminated	38971,71	38 644
Djiltyrbas (together with former right and left streams)	87991,34	92 720
Dumalak	15497,13	15 615
Makpalkul	7516,16	7 673
Mashan Karadjar	25727,79	25 973
Water surface southward of Muynak	9509,51	9 555
Water surface along Kazakhdarya river channel	4751,5	4 752
Zakirkol	2379,46	2 252
Total:	**279 126,4**	**283 219**

Table 3

The area of open water surface in the Aral region, ha

Water body	19.02.2020	22.03.2020
Sudoche	35274,6	37868,85
Mejdureche	8674,2	9381,6
Rybache	4535,64	1940,04
Muynak	2871,72	2913
Djiltyrbas dam-terminated	8500,68	8828
Djiltyrbas (together with former right and left streams)	10595,66	6230,7
Dumalak	552,87	435,15
Makpalkul	1167,84	1010,52
Mashan Karadjar	1473,21	1228,5
Water surface southward of Muynak	95,49	49,68
Water surface along Kazakhdarya river channel	0	0
Zakirkol	411,84	539,55
Total	**74 517,84**	**70 425, 9**

Since 2019, SIC ICWC has been using a new methodology for detection of water surfaces and wetlands through the controlled classification (Automated Water Extraction Index, AWEI).

The boundaries of water bodies and wetlands (i.e. Sudoche lake system, Mejdureche reservoir, Makpalkul, Djiltyrbas reservoirs, etc.) digitized manually in 2016 were used as a 'conditional design' boundaries for statistics on the total open water surface and wetland area of these water bodies (i.e. total water body area = open water area + wetland area).

Such a method minimizes erroneous interpretation/digitization of an area under consideration as the water or land surface (e.g. if plants cover the water's surface). However, the problem of detecting wetlands, i.e. the possibility to distinguish them from land (dry, degraded land) remained open. Moreover, the wetland areas within the 2016 boundaries have changed considerably over the last years, mainly, towards shrinkage/drying (dry, degraded land replaced wetlands).

Therefore, in early 2022, we undertook a research to improve the 2019 methodology. To this end, we determined the threshold values of open water surface (water depth of 5-25 cm, depending on the rise or fall of water), wetlands (water depth of up to 5 cm, wet and moist soil), and non-water sites (all other land surfaces, except for open water and wetlands) for 10 spectral indices (including NDVI and AWEI).

Based on the research results, we selected the threshold values for NDVI (< -0.001 for open water, -0.001÷0.05 for wetland, and > 0.05 for other land surfaces) for further classification of water sites.

By present, the information for 2020 and 2021 have been updated on the base of the improved methodology. In this context, differences can be found when making comparison with the data for the past years.

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