

# Lake Zaysan, possibly the oldest lake in the world, is endangered, Kazakhstan

Sentinel-1 CSAR IW acquired on 21 February 2023 from 12:19:24 to 12:19:49 UTC

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Sentinel-2 MSI acquired on 25 March 2023 at 05:26:49 UTC

Sentinel-2 MSI acquired on 03 June 2023 at 05:26:49 UTC

Sentinel-1 CSAR IW acquired on 04 June 2023 from 12:11:21 to 12:12:11 UTC

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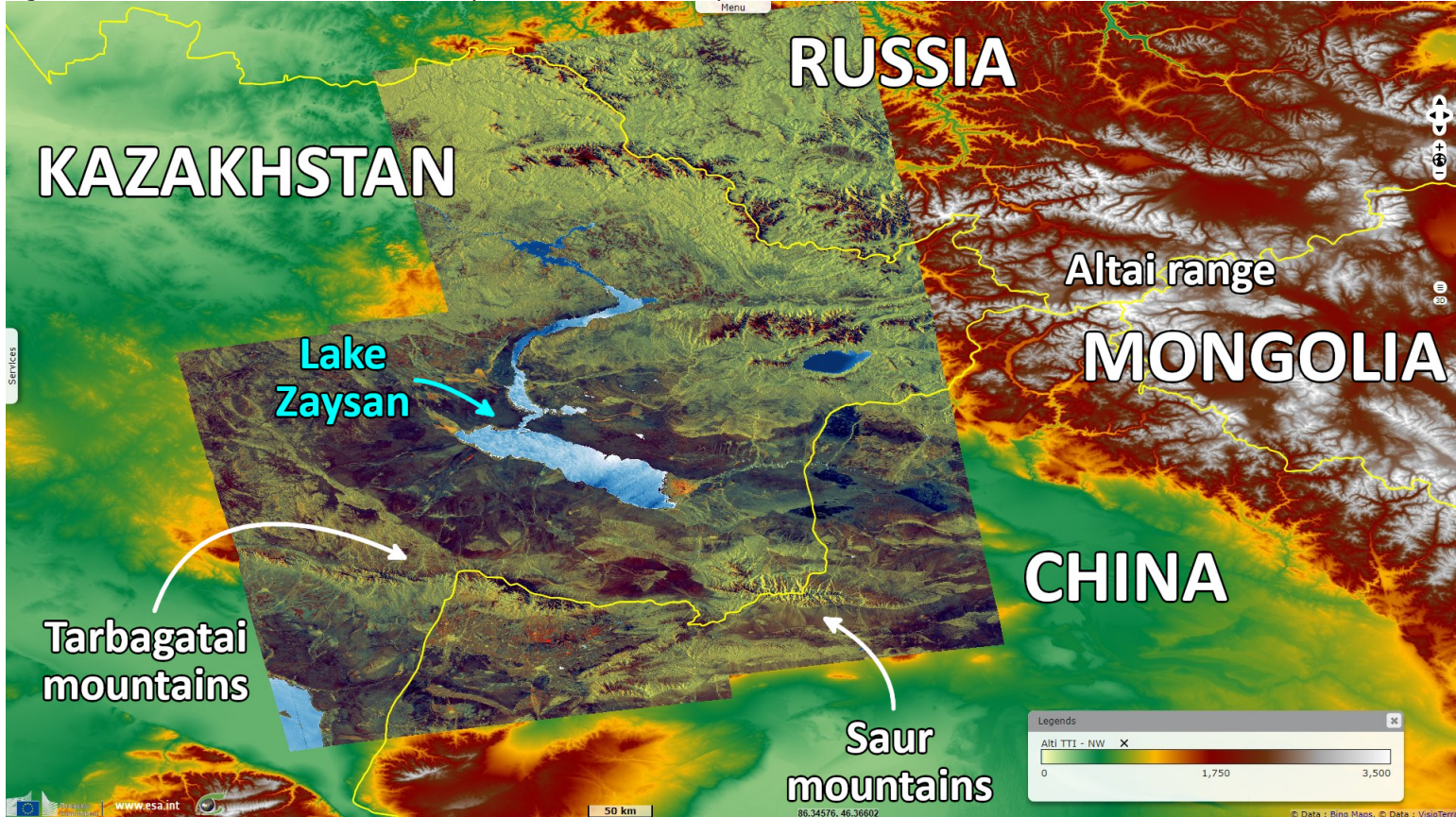
Keyword(s): Lake, river, seasons, hydrology, reservoir, dam, Kazakhstan



[2D Layerstack](#)

Fig. 1 - S1 (28.05.2023 & 04.06.2023) - Lake Zaysan is located on the Irtysh river in Kazakhstan, between China and Russia.

[2D view](#)

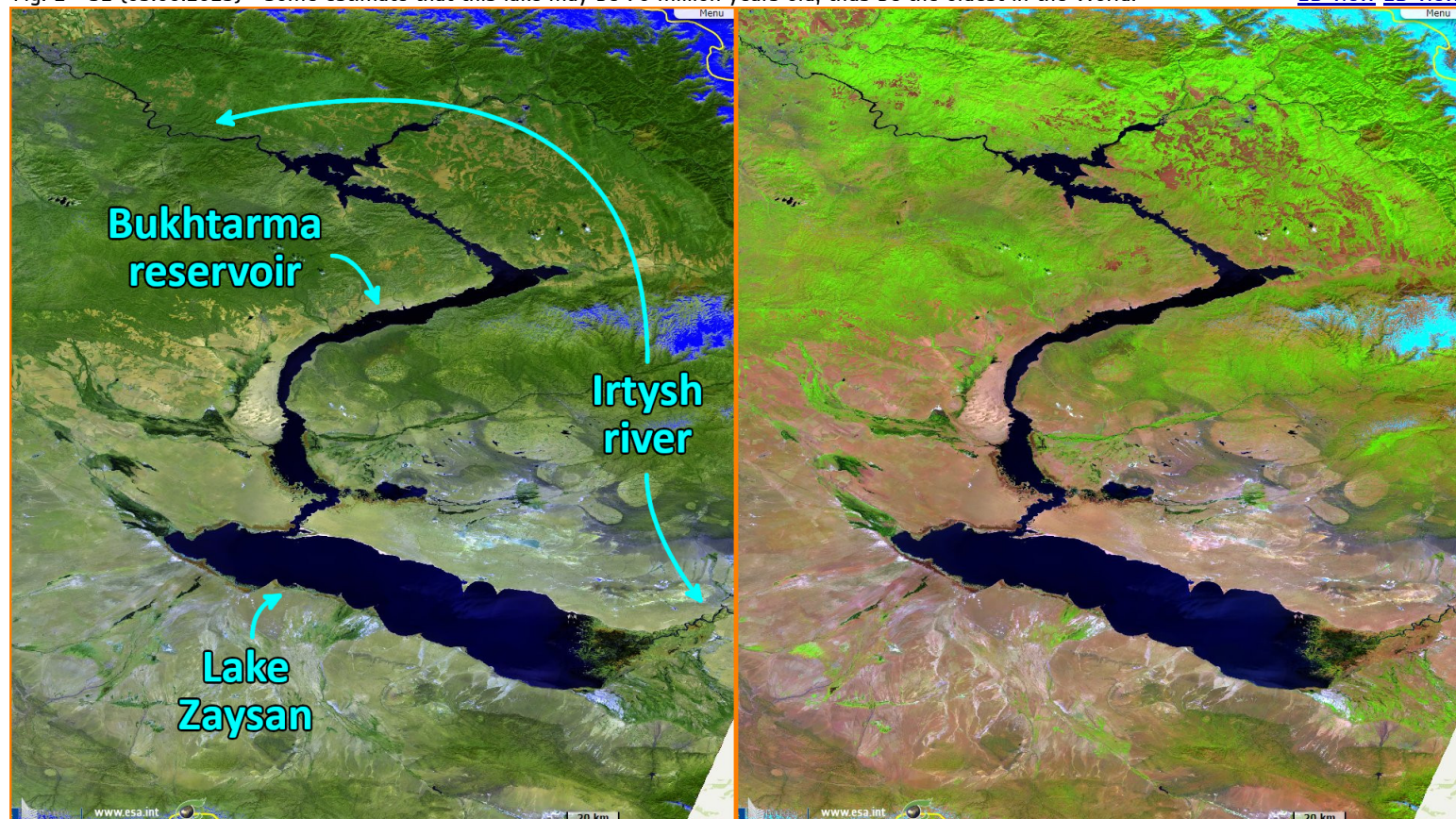


From its origins as the Kara-Irtysh in the Mongolian Altay mountains in Xinjiang, China, the Irtysh flows northwest, merging with the Ob near Khanty-Mansiysk in western Siberia, Russia after 4248 kilometres and finally entering the Arctic Ocean. Lake Zaysan is located in the upper course of Irtysh in eastern Kazakhstan.



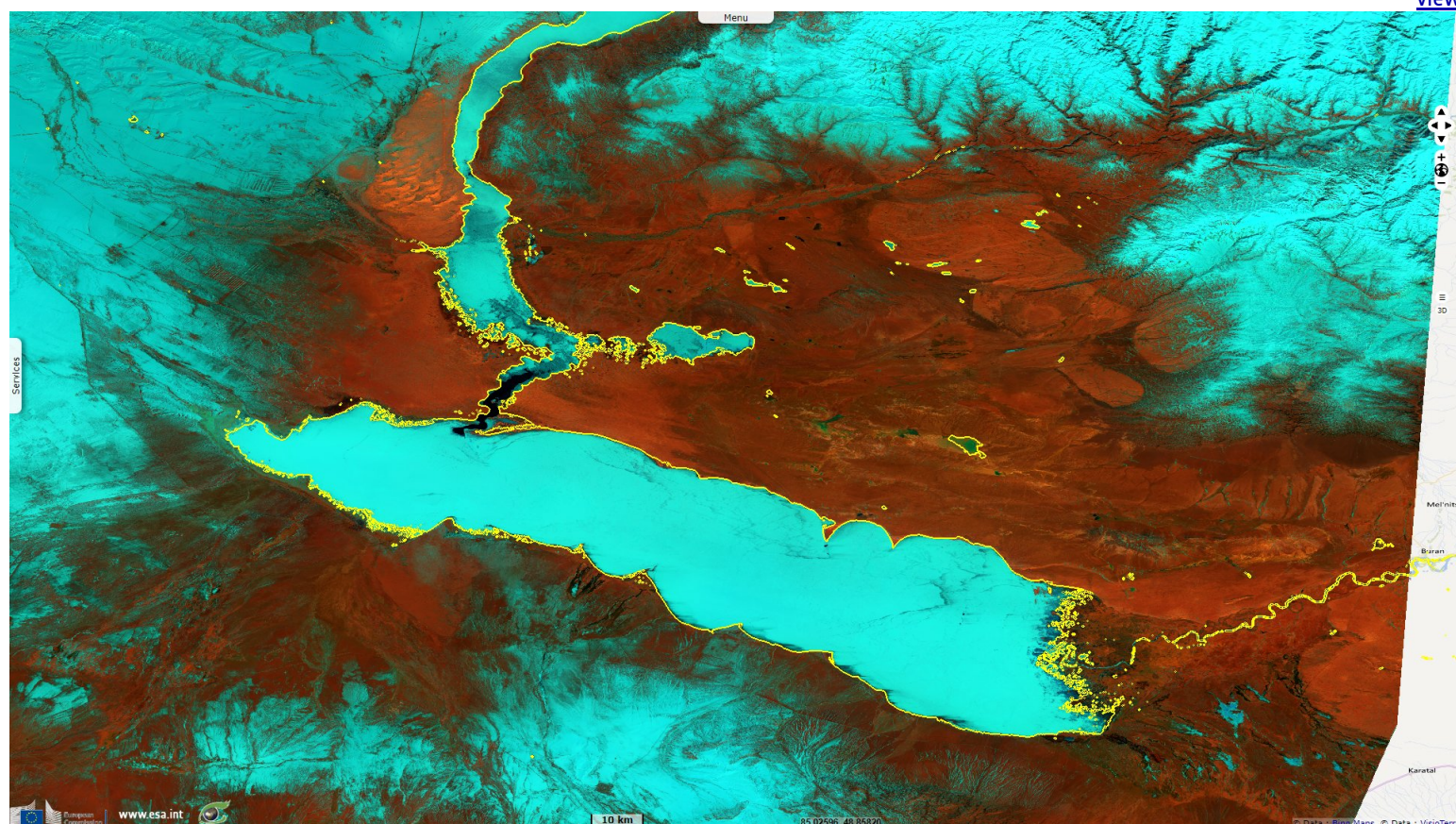
Fig. 2 - S2 (03.06.2023) - Some estimate that this lake may be 70 million years old, thus be the oldest in the World.

[2D view](#) [2D view](#)



"Paleontological and geological data indicate the origin of Lake Zaysan in Cretaceous period." according to Benjamin Dorfman who [published](#) an article highlighting the long past of Lake Zaysan and its possible demise in the future. "This prompts the conclusion that the lake existed since that period—nearly three times longer than Baikal and at least in order of the magnitude longer than any other existing lake."

Fig. 3 - S2 (25.03.2023) - Lake Zaysan, Bukhtarma reservoir downstream and Irtysh river freeze for several months during the long steppe winter. [2D view](#)

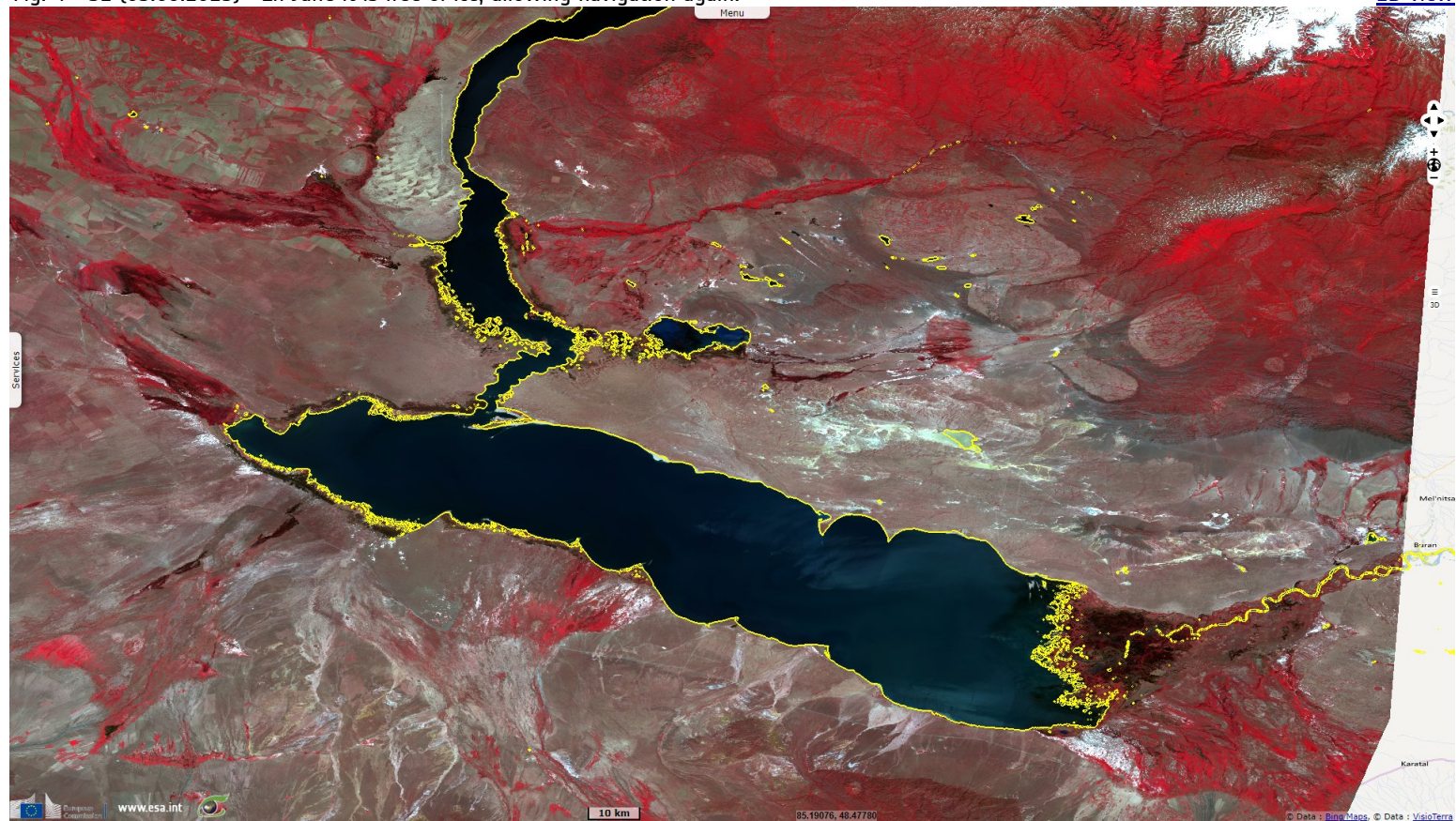


"The Zaysan depression is a tectonic 'focal point' in the terrain of Kazakhstan -Central Asia— the largest in the world with such geological history."  
"The relief of this locality and its position on one of the main water streams of Northern Asia suggests that this basin was never dried. This conclusion is also supported with the established biological history of the region in the entire Cenozoic Era."



Fig. 4 - S2 (03.06.2023) - In June it is free of ice, allowing navigation again.

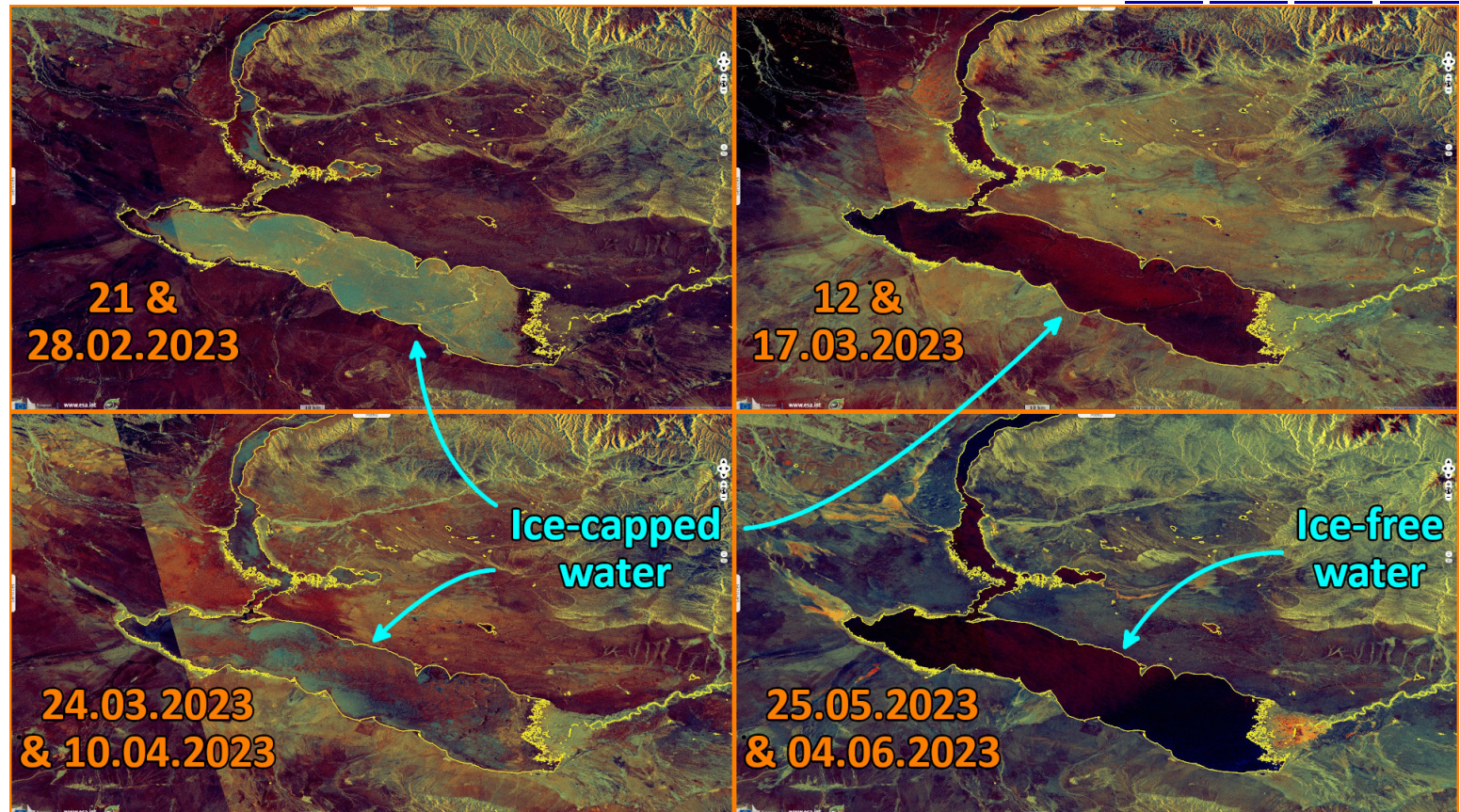
[2D view](#)



*"The conditions minimizing the sedimentary pressure and supporting stability of the lake persisted over the Cenozoic Era until the end of Pleistocene when it was dramatically changed." Nowadays the lake is in the final phase of its geological history and shallow; but it could be exceptionally deep originally. "The human activity, especially the high dam constructed in 1950s, accelerates its vanishing."*

Fig. 5 - S1 (21 & 28.02.2023; 12 & 17.03.2023; 24.03.2023 & 10.04.2023; 25.05.2023 & 04.06.2023) - The lake and its surrounding change quickly on radar images.

[2D view](#) [2D view](#) [2D view](#) [2D view](#)

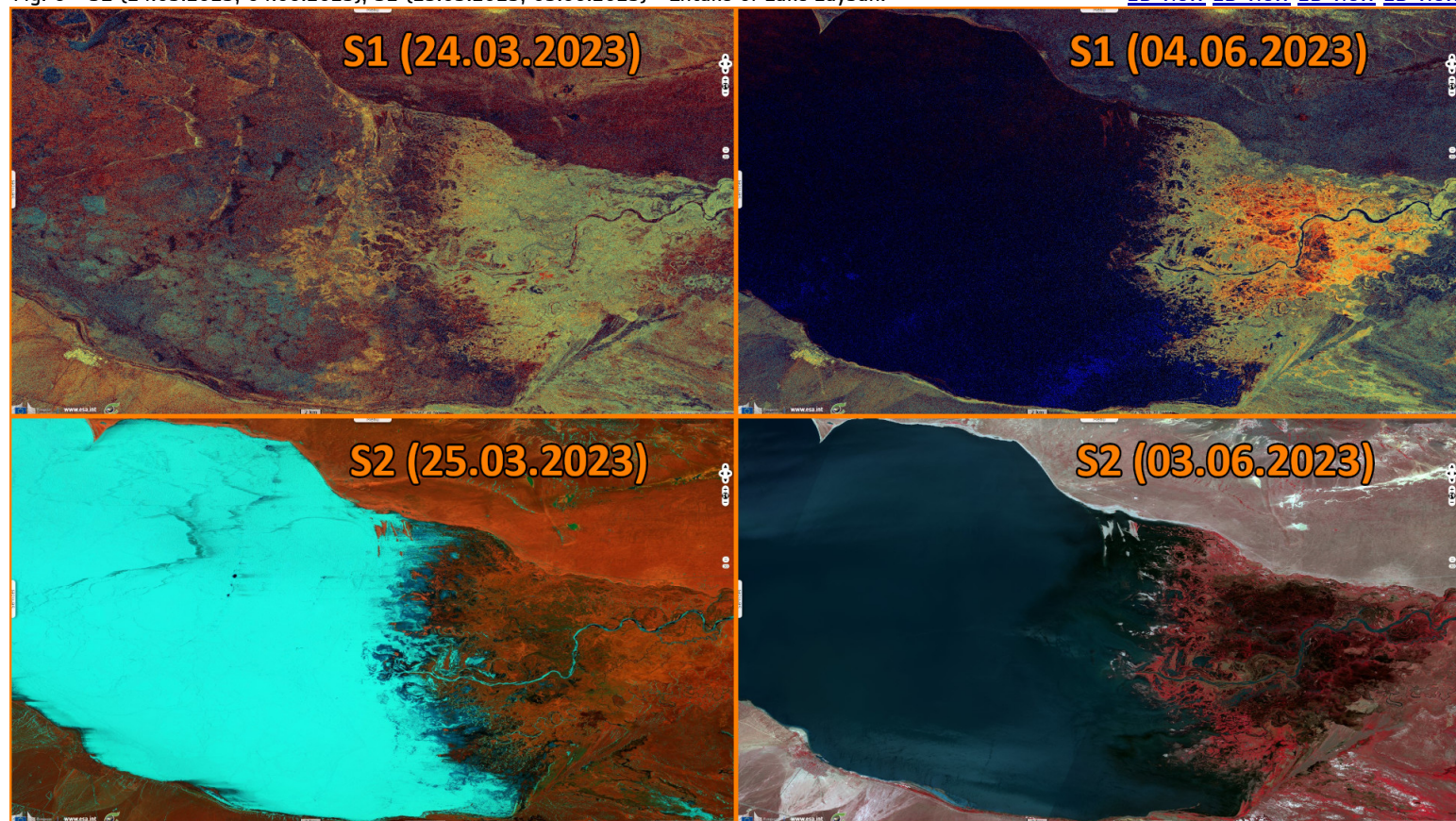


*"for nearly the entire its history, Zaysan received the small sediment input, while the last phase of high sediment input in life of this Cretaceous lake just began about 13 000 years ago. If it is correct, such a scenario should have the important consequences. About 10 000 years ago and possibly even in more recent time, the lake was still deep, and its ancient ecosystem could survive. Besides, the survivability of the lake itself during the last thirteen millennia should be mostly due to the particular sedimentary conditions: its narrow natural basin resulted with relatively fast stream from Black Irtysh to White Irtysh and low sedimentary rate."*



Fig. 6 - S1 (24.03.2023; 04.06.2023); S2 (25.03.2023; 03.06.2023) - Intake of Lake Zaysan.

[2D view](#) [2D view](#) [2D view](#) [2D view](#)



"The conditions had been changed with appearance of the dam about half a century ago. Furthermore, the lake should feel the strongest negative impact from the dam during low rate of hydrologic exchange—in dry seasons. Indeed, "from June to September the rate of hydrologic exchange is decreasing up to one order of magnitude" thus "enhancing the sedimentation over 90%"

Fig. 7 - S2 (25.03.2023; 03.06.2023) - Outtake of Lake Zaysan.

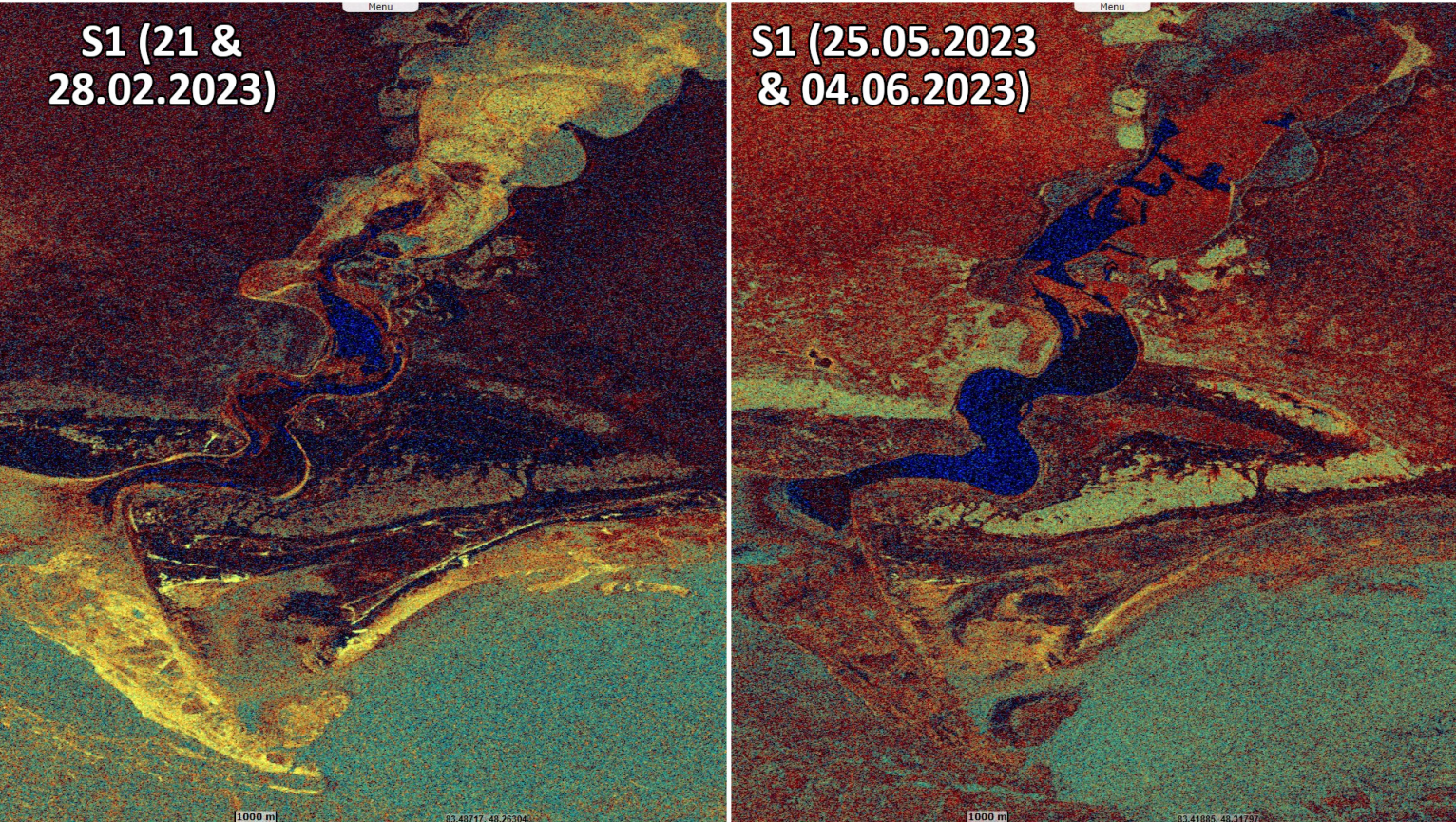
[2D view](#) [2D view](#)



"Nowadays, this unique lake experiences double pressure: decline of the water inflow and increased sedimentation. Both processes are accelerating due to natural and anthropogenic environmental changes. Comparison of factual records and observations from XIX century with modern data and local observations drives to conclusion that lake is losing at least 15% of its linear dimensions per century."















Fig. 8 - S1 (21 & 28.02.2023; 24.03.2023 & 10.04.2023) - It is also the intake of lake Bukhtarma. [2D view](#) [2D view](#)



"The dam built in the middle of XX century produced multiple impacts on the lake: on the positive side, it maintains the water level; on the negative side, it changes the hydrologic dynamics, thus strengthening sedimentation; the quality of water was deteriorated as well. The remnants of the ancient ecosystem of the lake Zaysan experience exceedingly high pressure.", concludes the [article](#).

*The views expressed herein can in no way be taken to reflect the official opinion of the European Space Agency or the European Union.  
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