



[3D Layerstack](#)

Methane bomb in the thawing permafrost of boiling Esieh Lake, Alaska, USA

Sentinel-2 MSI acquired on 20 June 2020 at 22:55:39 UTC

Sentinel-2 MSI acquired on 23 September 2020 at 22:55:41 UTC

Sentinel-5P TROPOMI CH4 acquired on 15 April 2021 at 21:29:11 UTC

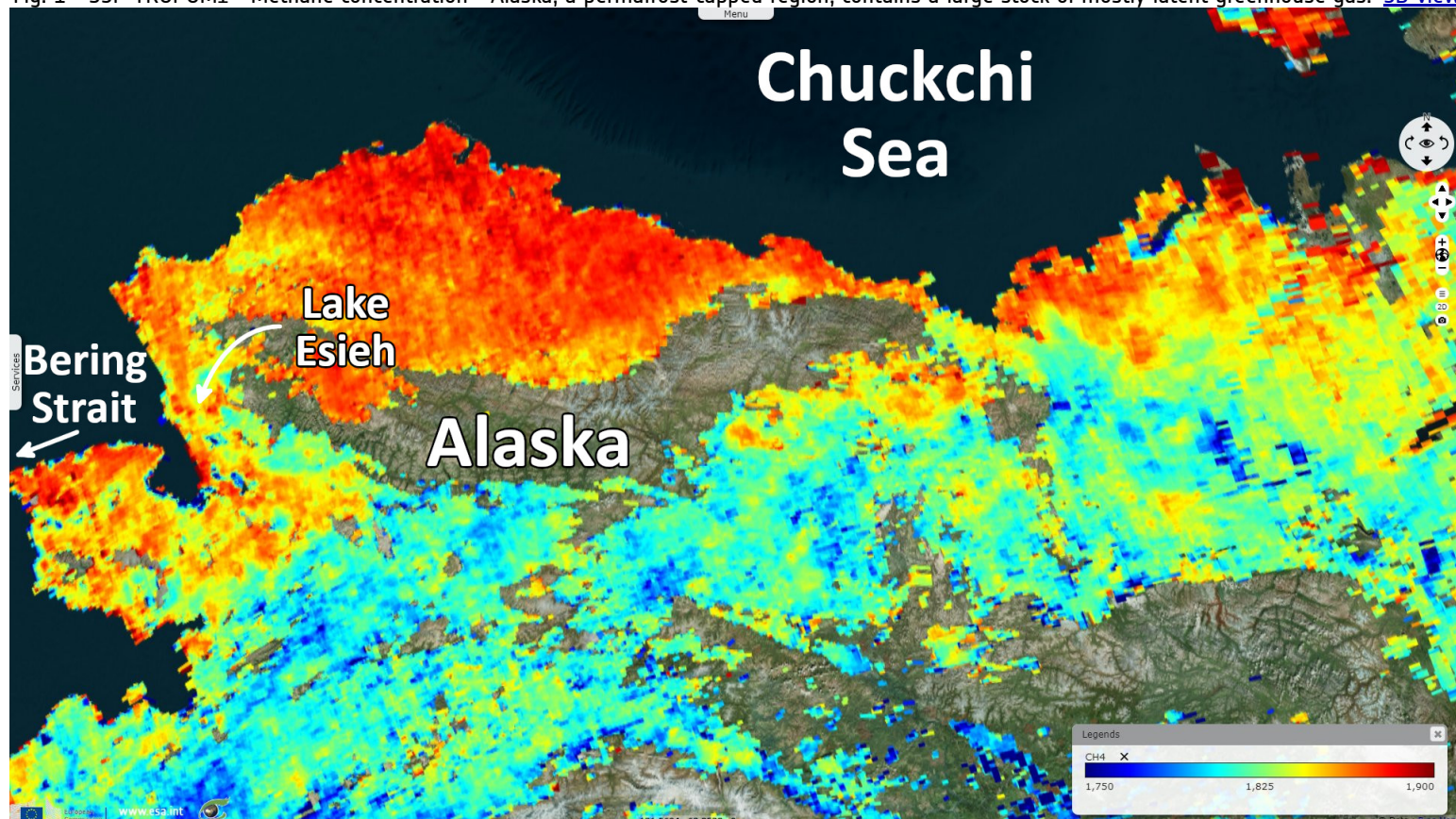
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Sentinel-5P TROPOMI CH4 acquired on 03 August 2022 at 21:25:03 UTC

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Fig. 1 - S5P TROPOMI - Methane concentration - Alaska, a permafrost-capped region, contains a large stock of mostly latent greenhouse gas. [3D view](#)



Permafrost soils can reach depths of nearly 1500m and were laid down over tens of thousands of years or more as generations of plants died and sank beneath the surface. Because of the cold, those carbon-rich remains never fully decomposed, and the soil preserves them in an icy purgatory. Now, though, as the Arctic warms, decomposition is starting up – and it gives off greenhouse gases.

Fig. 2 - S2 (20.06.2020) - Arctic lakes release gas from thawing incompletely decomposed vegetation.

[3D view](#)



Scientists know the permafrost contains enough carbon to catastrophically warm the planet if it were all released into the atmosphere. The total impact from thawing permafrost could be similar to adding a couple of large fossil fuel-emitting economies. Thermokarst lakes could more than double the greenhouse gas emissions coming from the Arctic's soils by 2100 despite the fact that the lakes would cover less than 6 percent of the total Arctic land surface. But those lakes have gas flows that are probably 100 times lower than in Esieh lake.

Fig. 3 - S2 (23.09.2020) - Intense bubbling of Esieh Lake may be caused by a thawing hydrocarbon reservoir.

[3D view](#)



The thawing of permafrost at the lake bed might also have unleashed older fossil gases from a reserve that had been sealed – creating another kind of worrisome lake. Frederic Thalasso, estimated that the lake was producing two tons of methane gas every day – the equivalent of the methane gas emissions from about 6000 dairy cows. There may be many more lakes like this one.

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