

2020 fuel in Norilsk: defective
construction design, poor maintenance,
or/and climate change?

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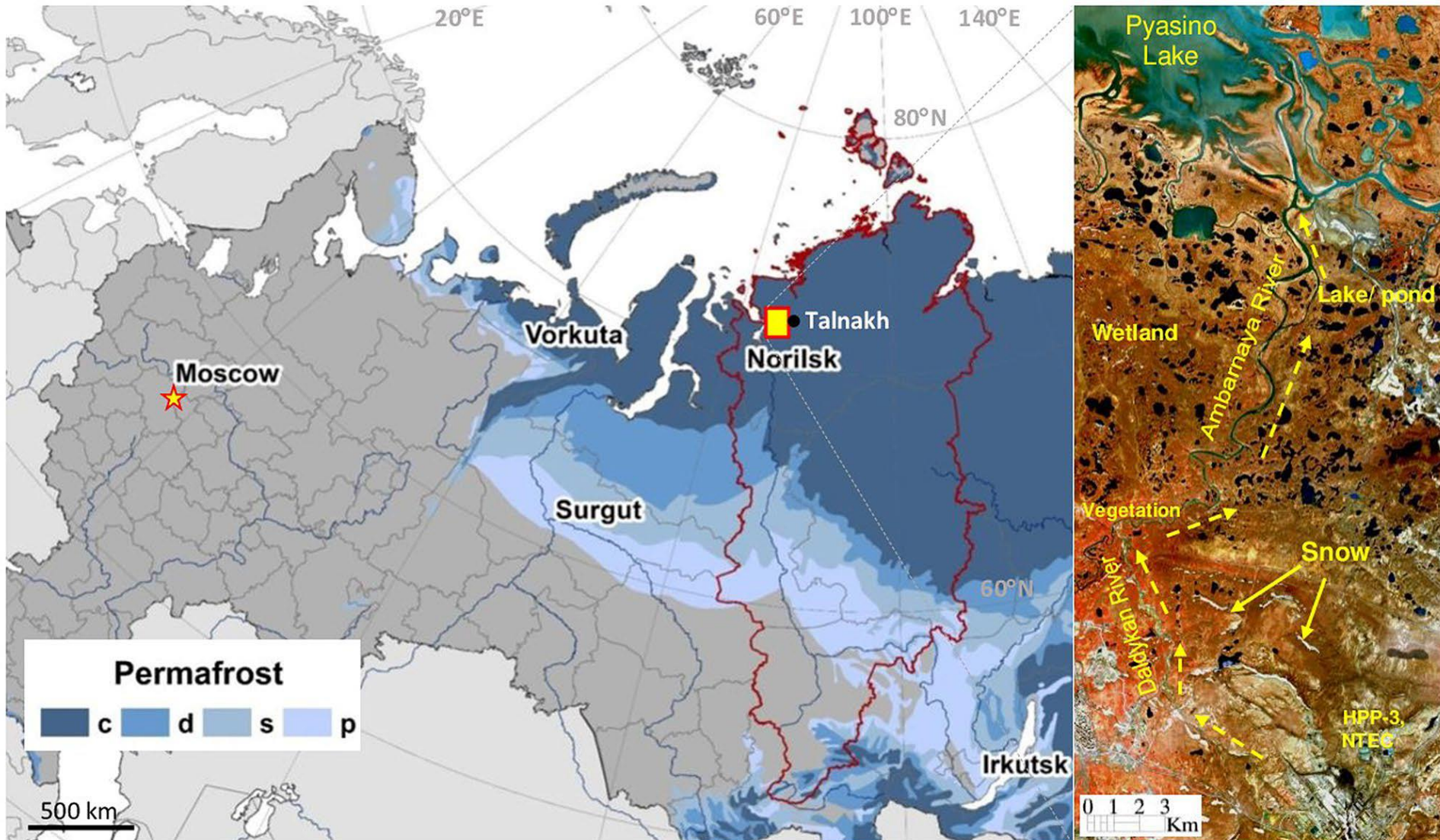
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What happened and when?

Norilsk, 29 May 2020. Fuel spill from the power plant



Alykel Airport

Nadezhda
Metallurgical Plant

Norilsk
Concentrator

Copper Plant

Talnakh
Concentrator

НОРИЛЬСК

НАДЕЖДА

МЕДНЫЙ ЗАВОД

1

2

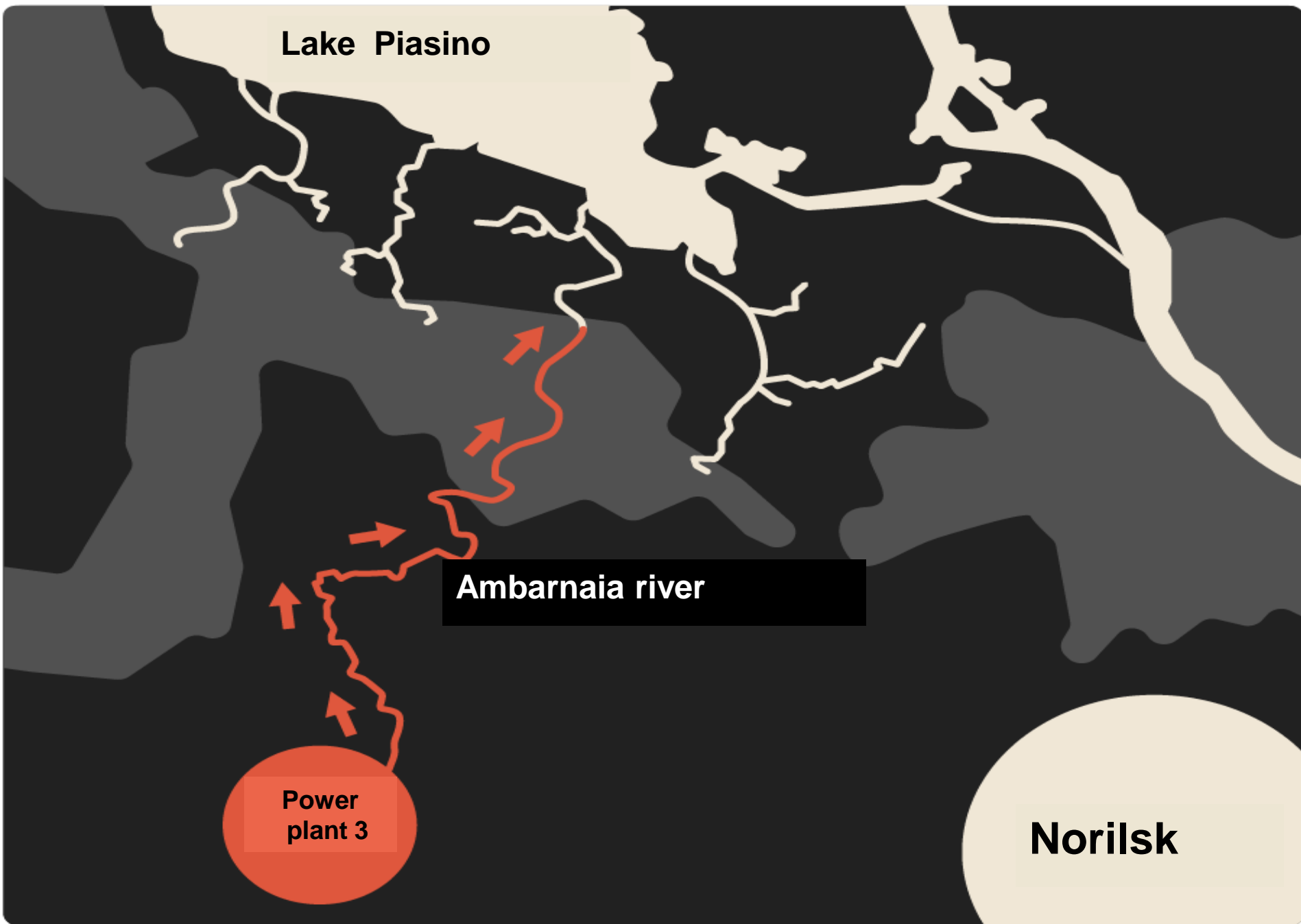
3

4

5



On 29 May 2020, 20k tons of fuel drained into Ambarnaya river



Fuel tanks of the power plant



Fuel tanks of the power plant



Fuel tank №5



Fuel tank №5



Fuel tank №5



Passing car crashed and burned the leaking diesel fuel



Passing car crashed and burned the leaking diesel fuel



Post-fire terrain



Post-fire terrain



Excavation of the contaminated soil



Excavation of the contaminated soil



Excavation of the contaminated soil



Pumping spilled fuel from small ponds



Remediated terrain



Fuel drifted into Dadykan and Ambarnaya rivers
and drifted downstream by 12 km before it was
trapped by floating dams



Floating dam across the river channel



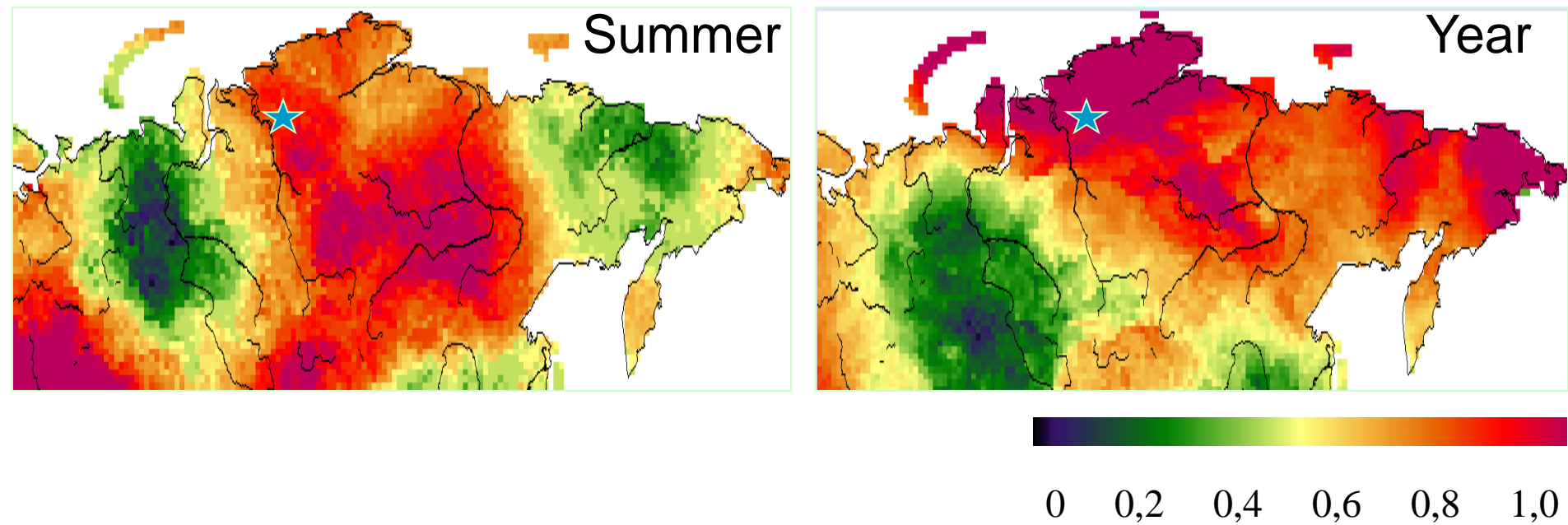
Floating dams, oil traps, pumps, and waste tanks



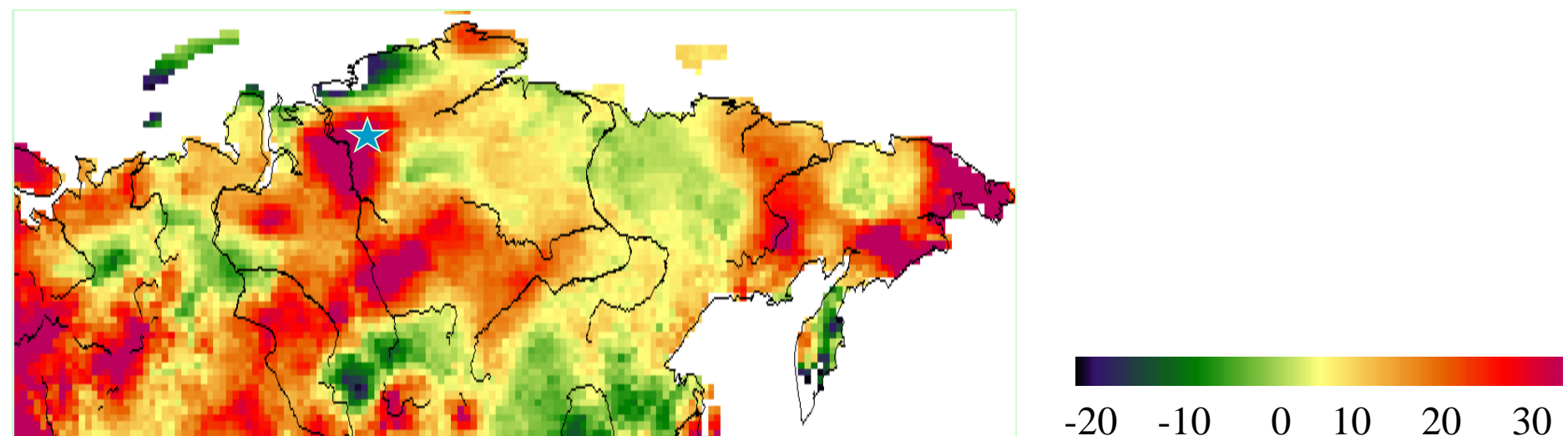
Pumping water-fuel mix into waste tanks



Air temperature trend, 2000-2019, °C/10 y

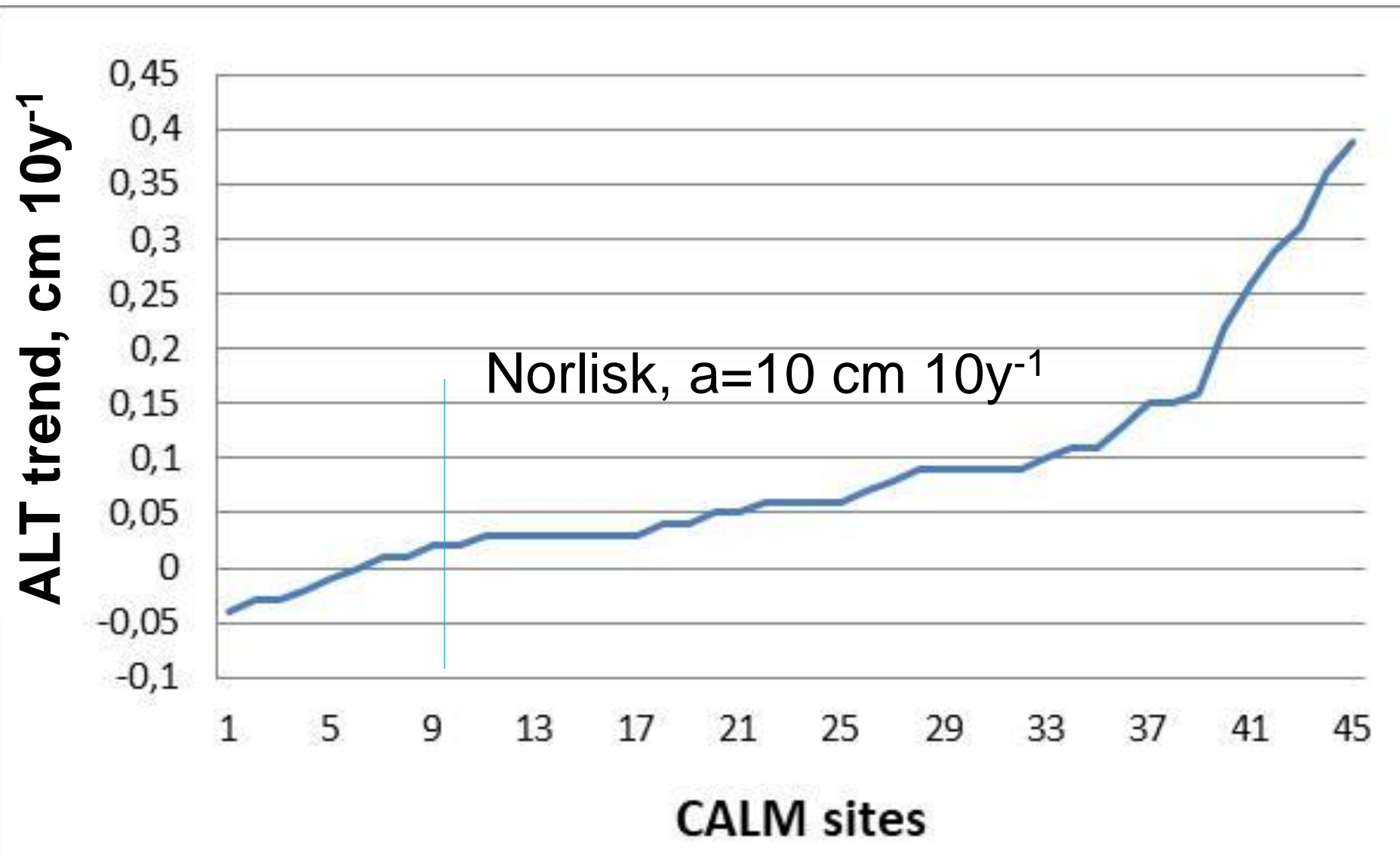


Winter precipitation trend, 2000-2019, mm/10 y



Ranked ALT trends over the 2000 – 2020 period

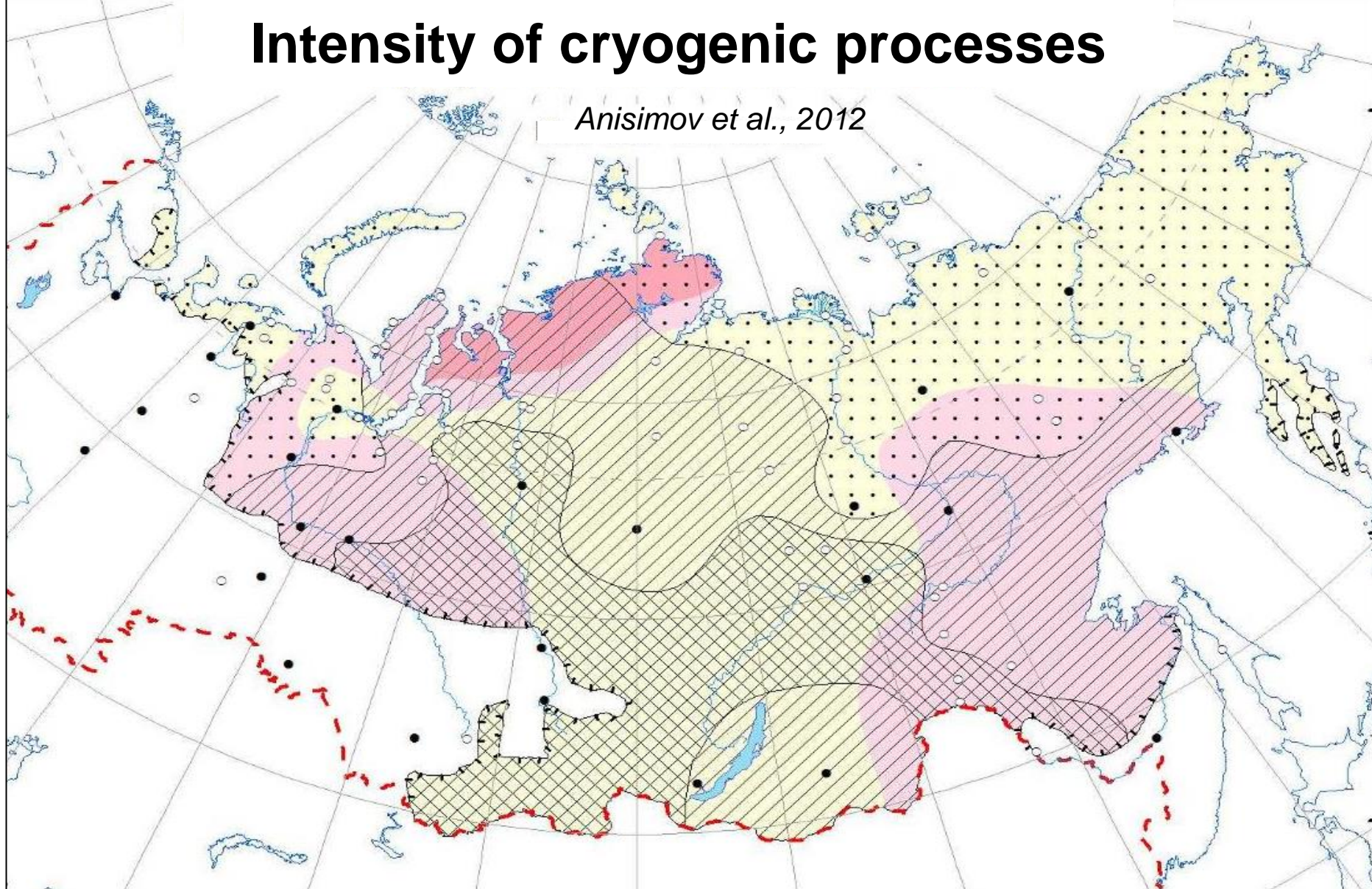
Data from 45 Russian CALM sites



(Anisimov et al., 2020; Anisimov and Zimov, 2020)

Intensity of cryogenic processes

Anisimov et al., 2012



Winter



High



Moderate

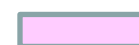


Low

Summer



High

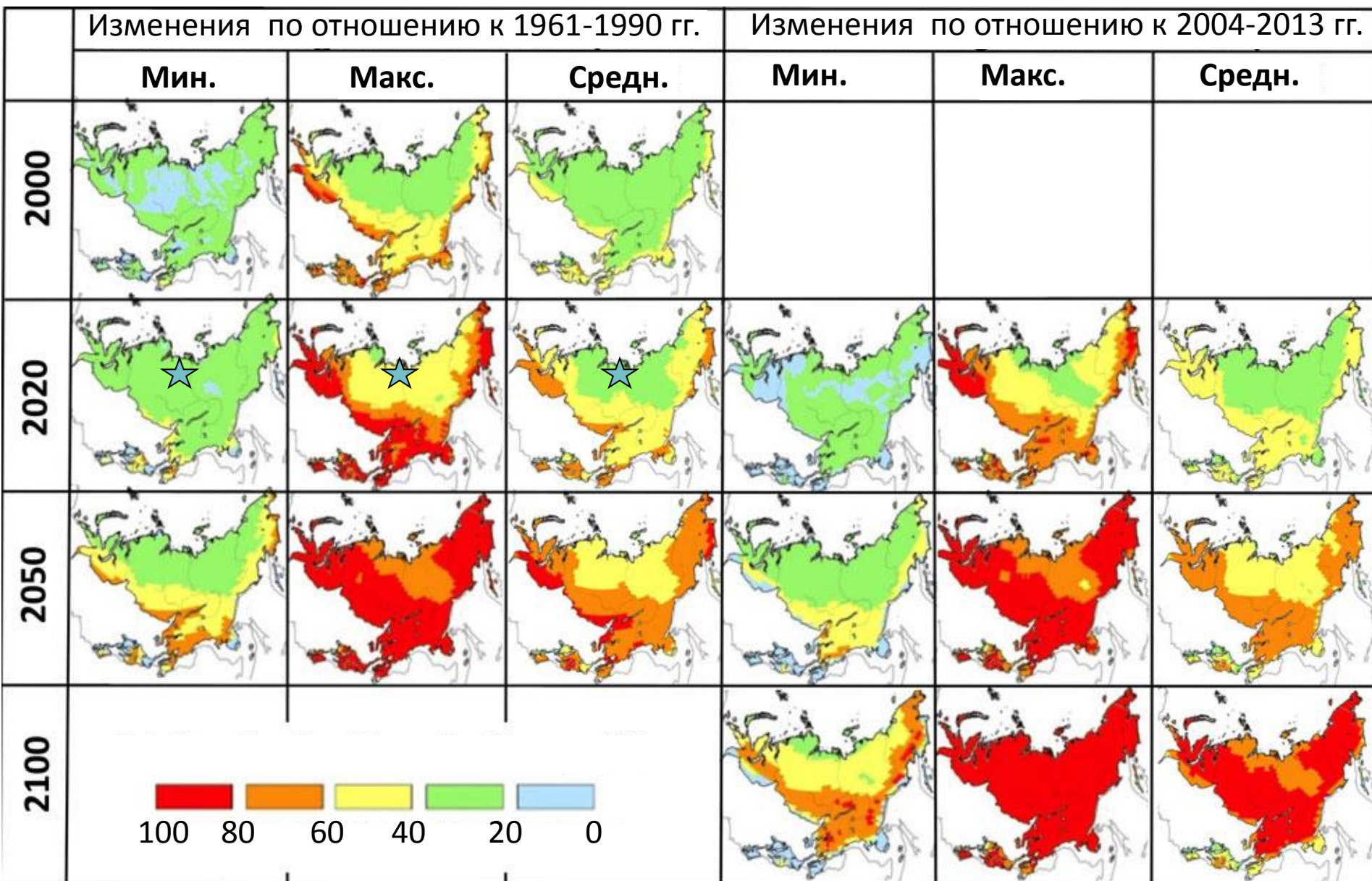


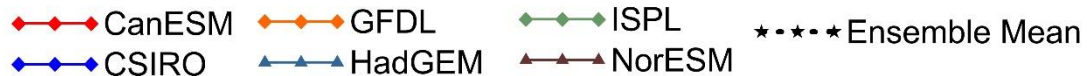
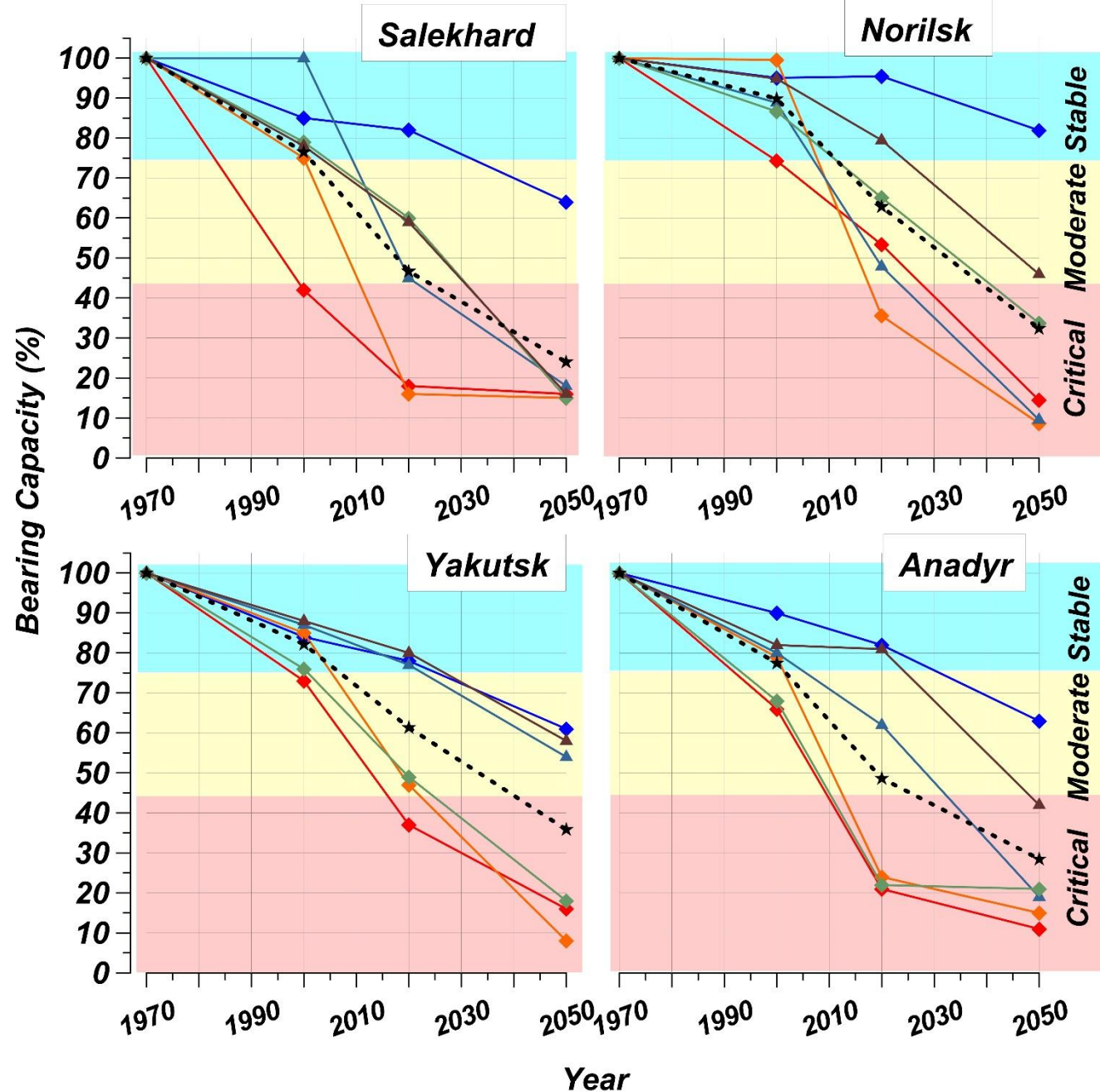
Moderate

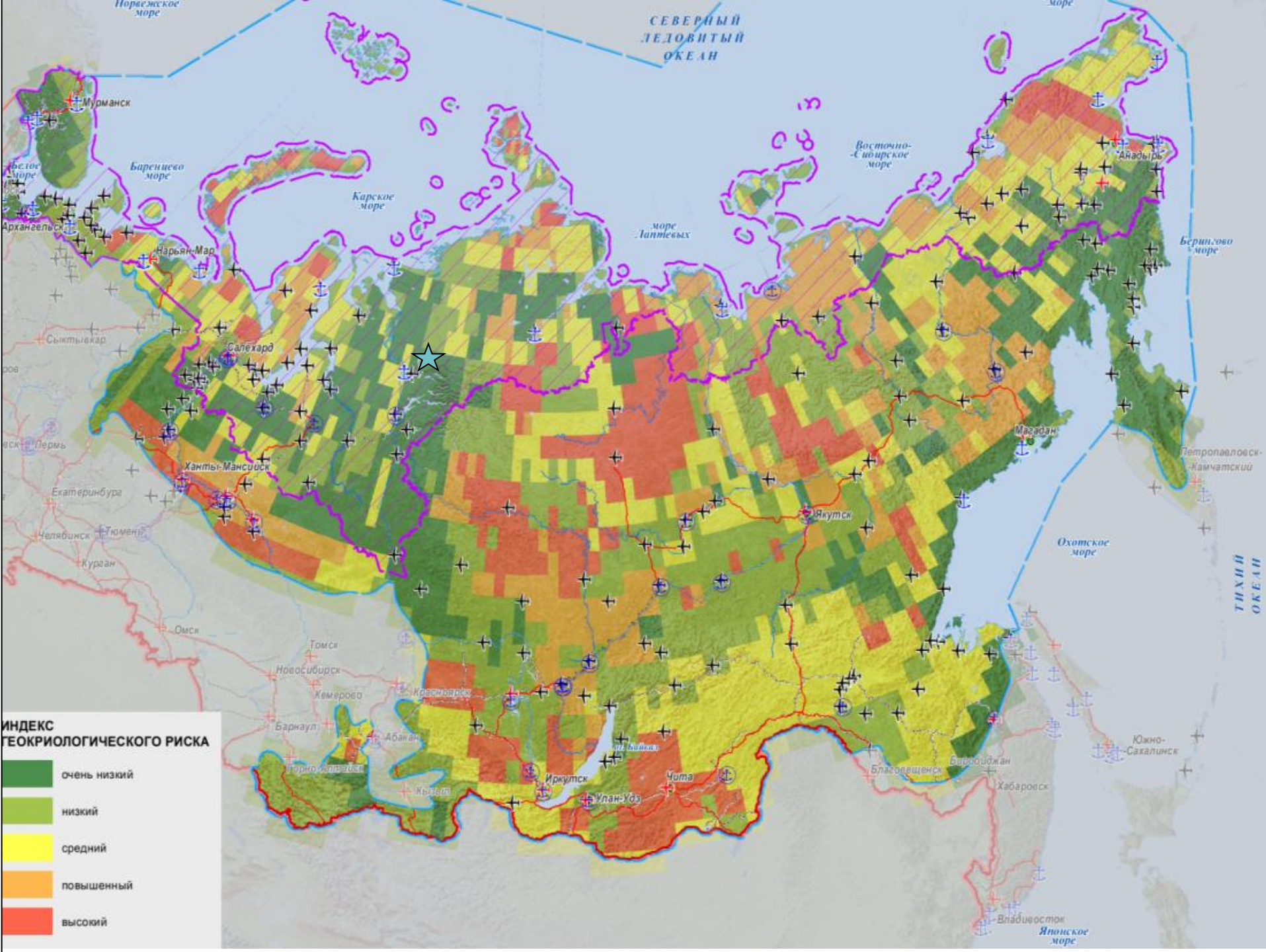


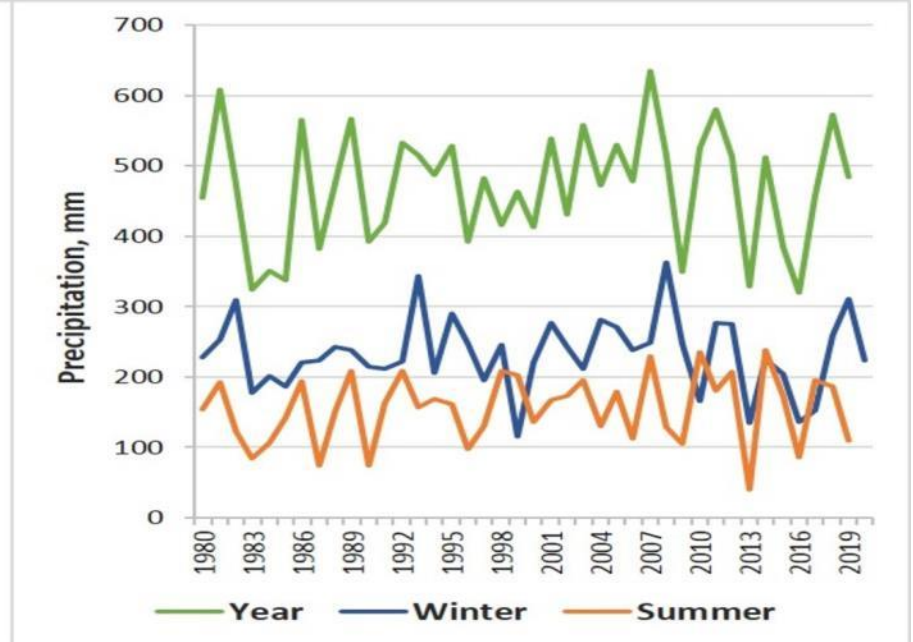
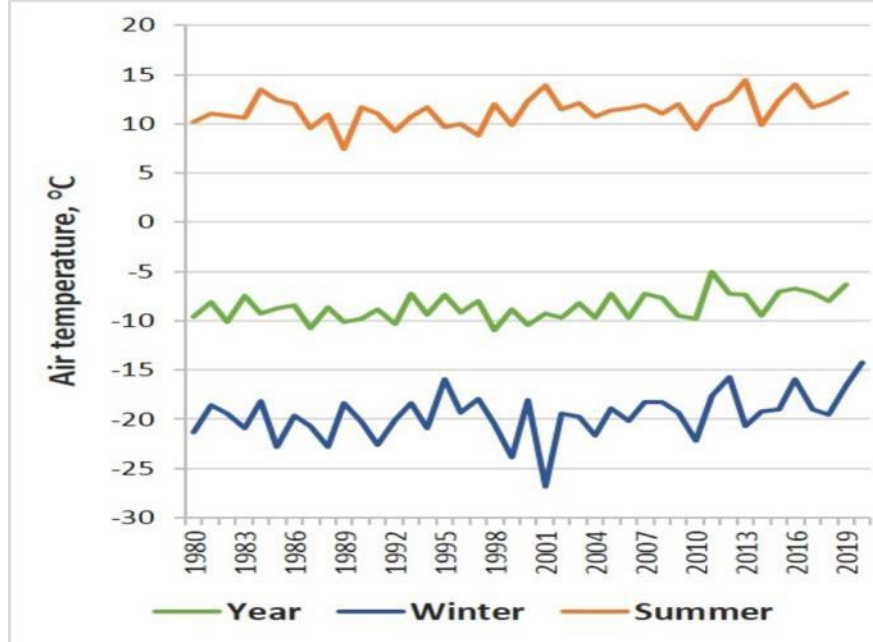
Low

Несущая способность фундаментов

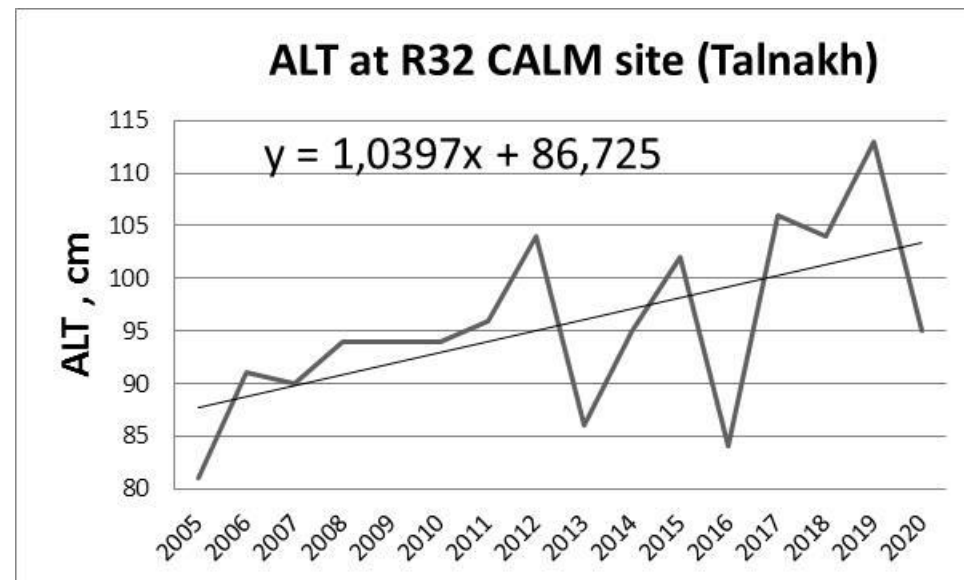
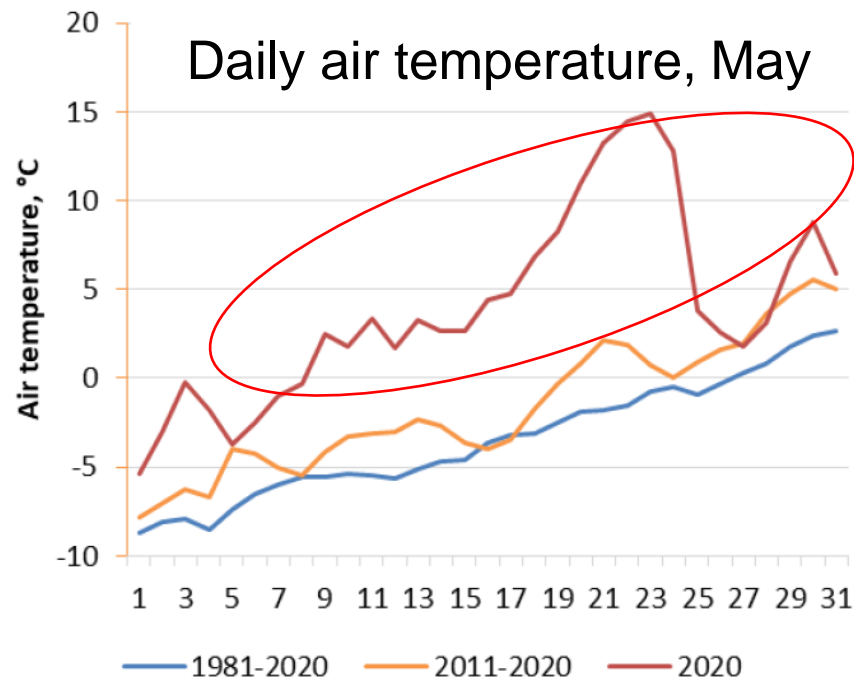








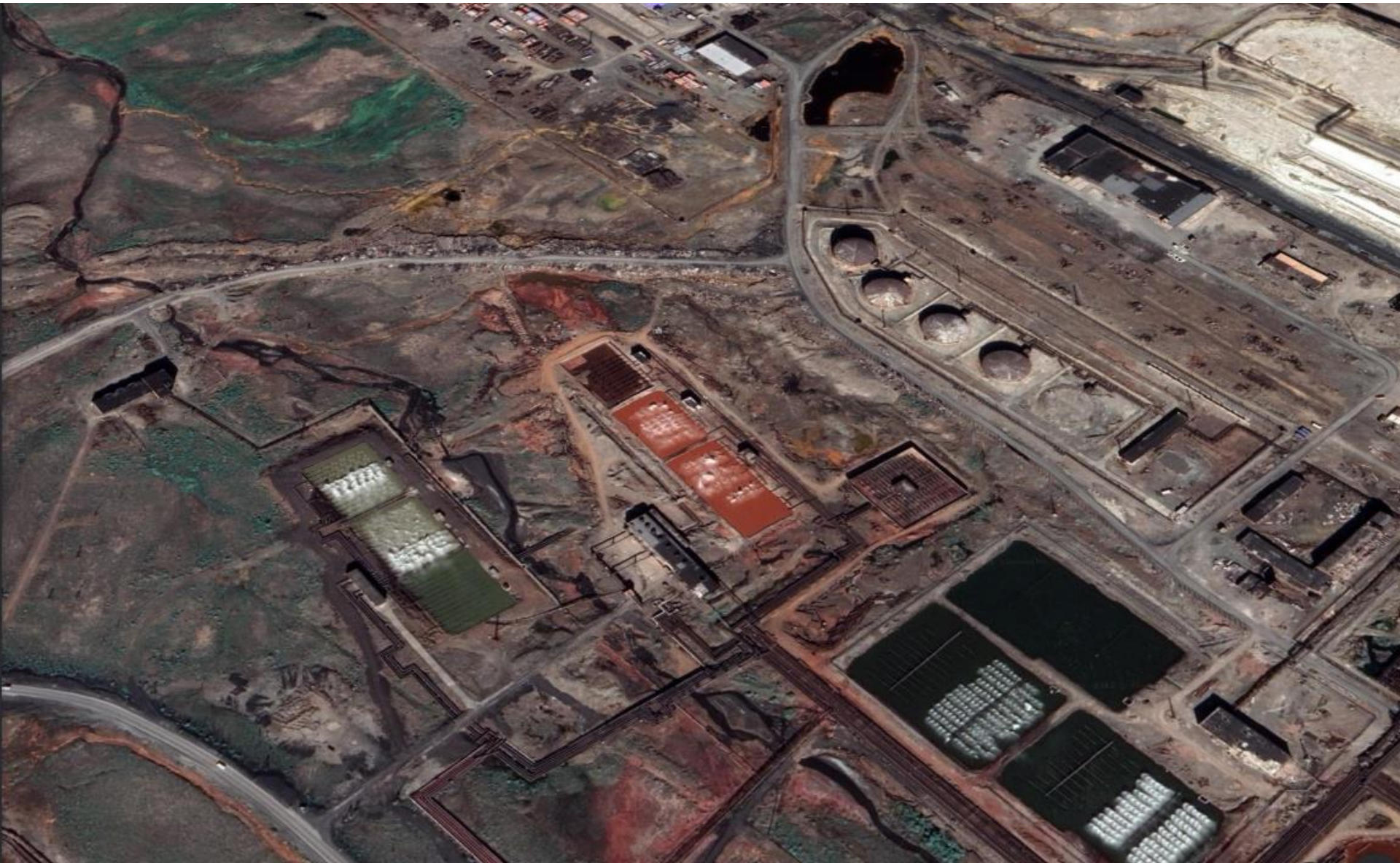
2019/2020 – warmest winter since 1980; In 2019 - maximum ALT.



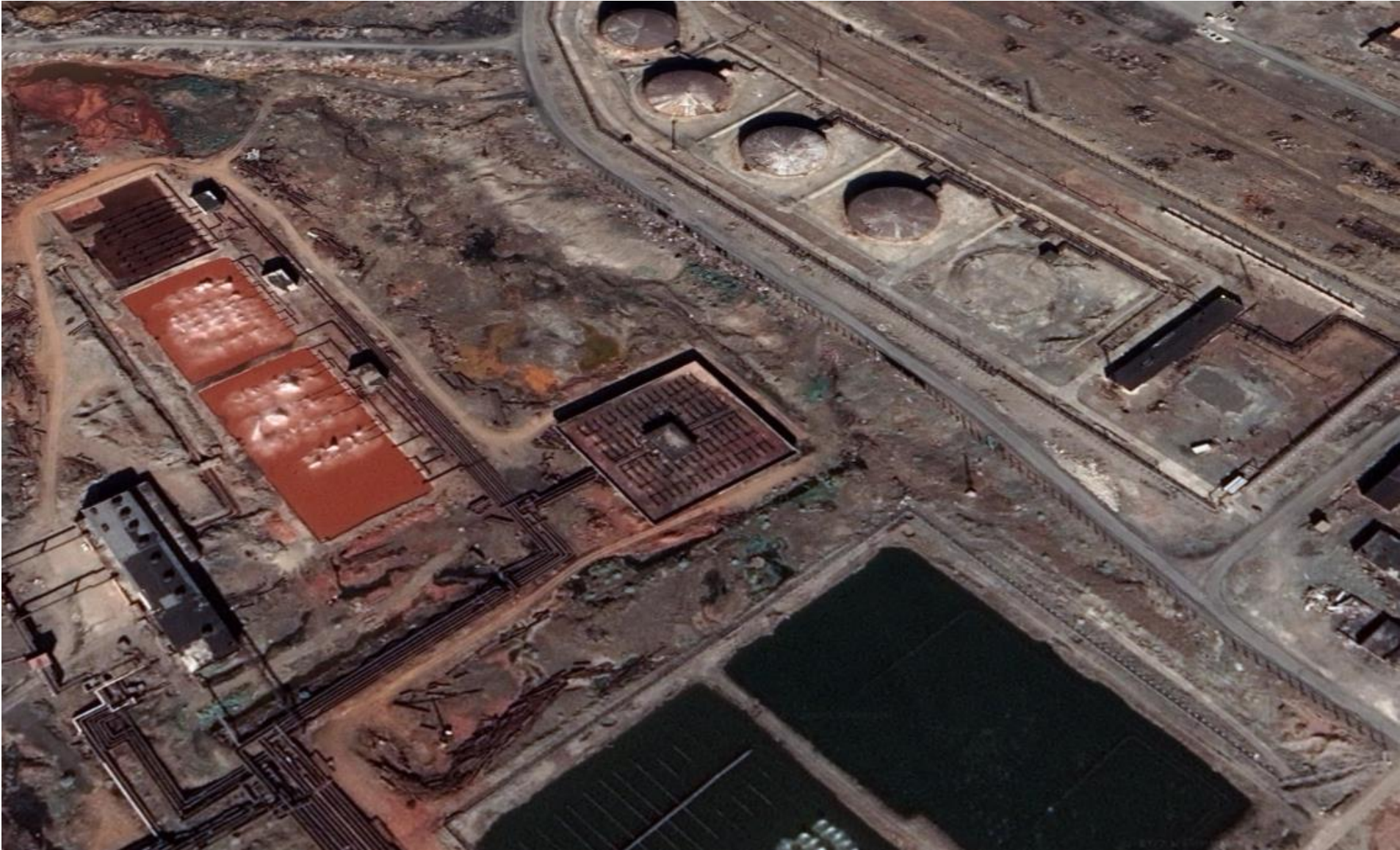
Who's the next, and when?



Who's the next, and when?



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Who's the next, and when?



Who's the next, and when?



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