

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

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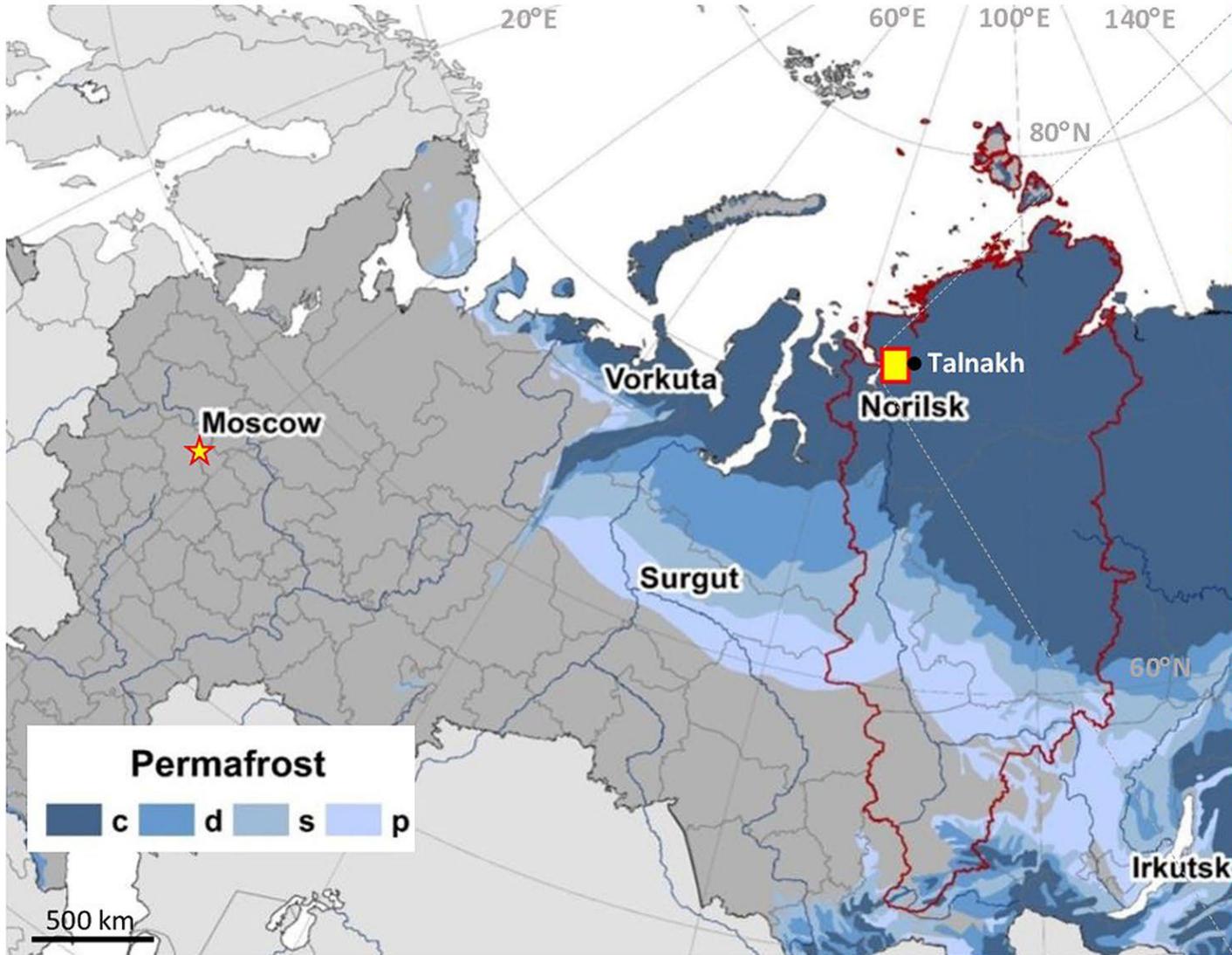
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# What happened and when?

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

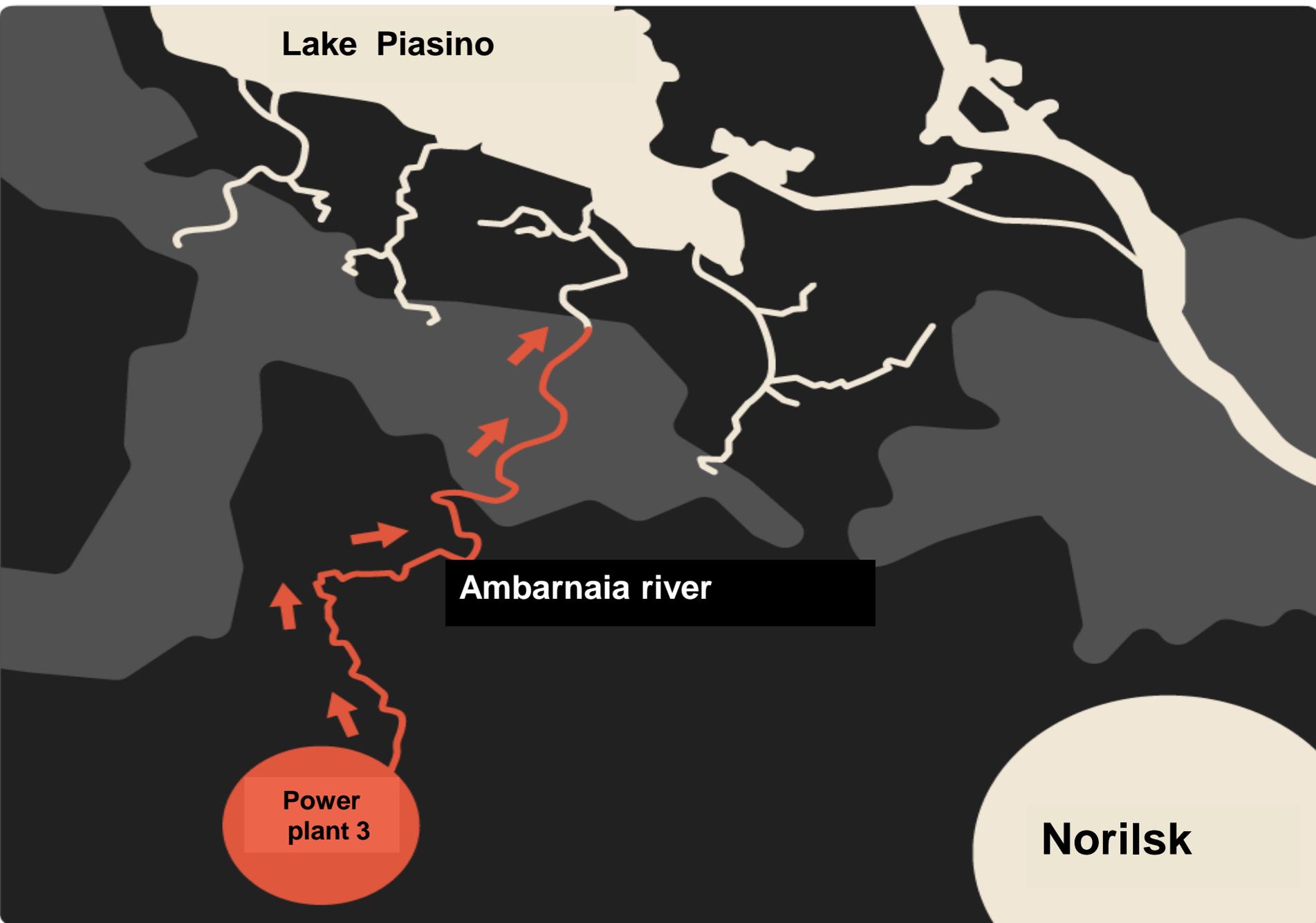
3

4

5



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



# Fuel tanks of the power plant



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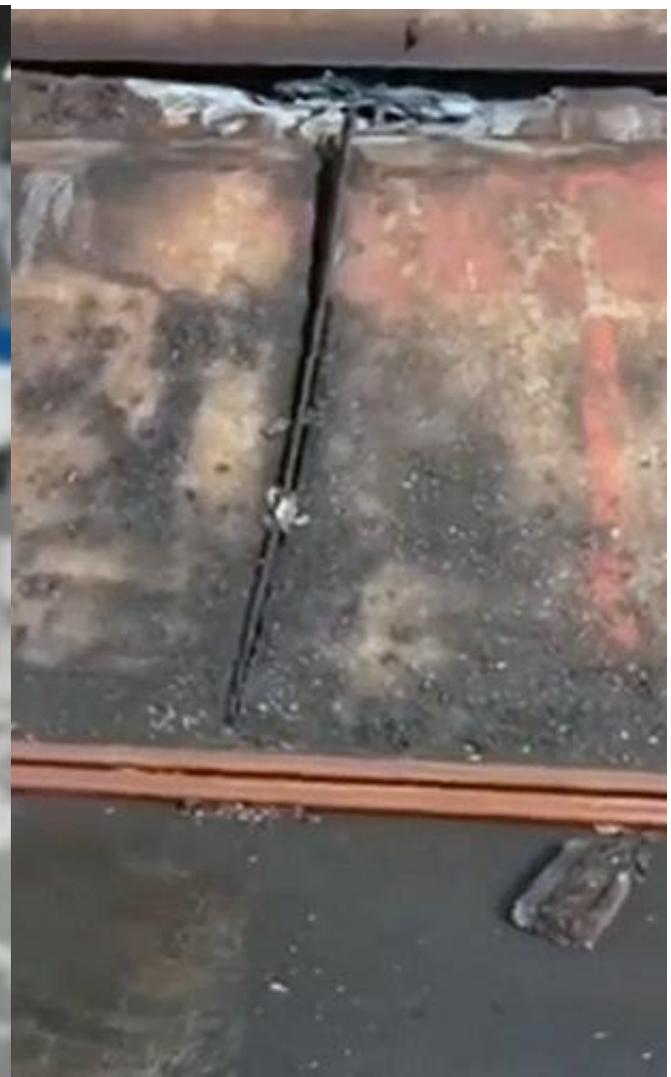
# Fuel tank №5



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Passing car crashed and burned the leaking diesel fuel



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# Post-fire terrain



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# Excavation of the contaminated soil



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# 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



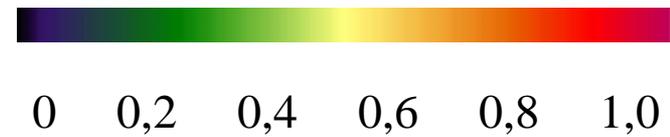
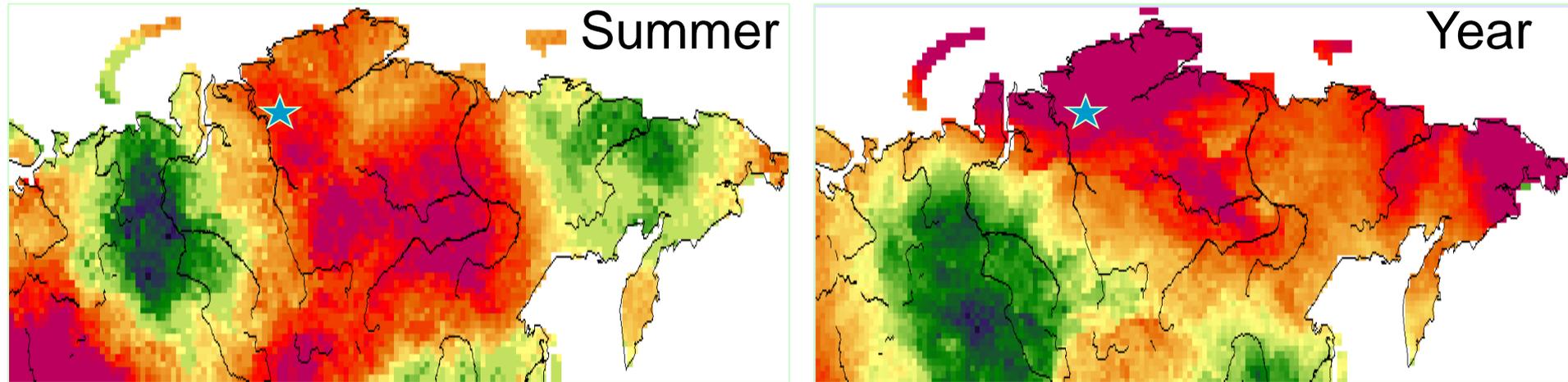
# Floating dams, oil traps, pumps, and waste tanks



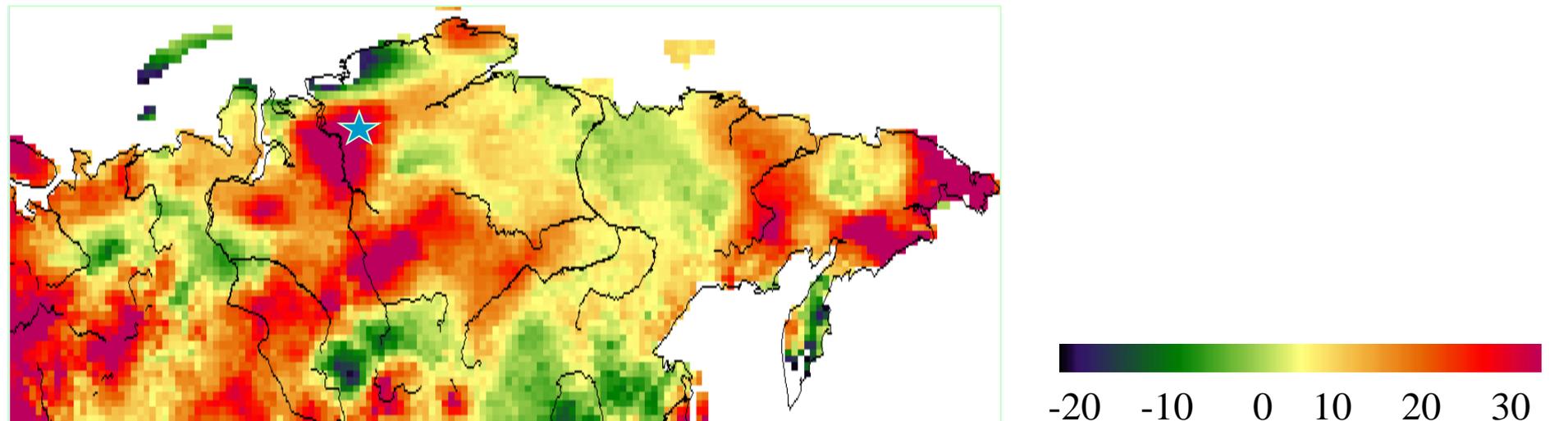
# Pumping water-fuel mix into waste tanks



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

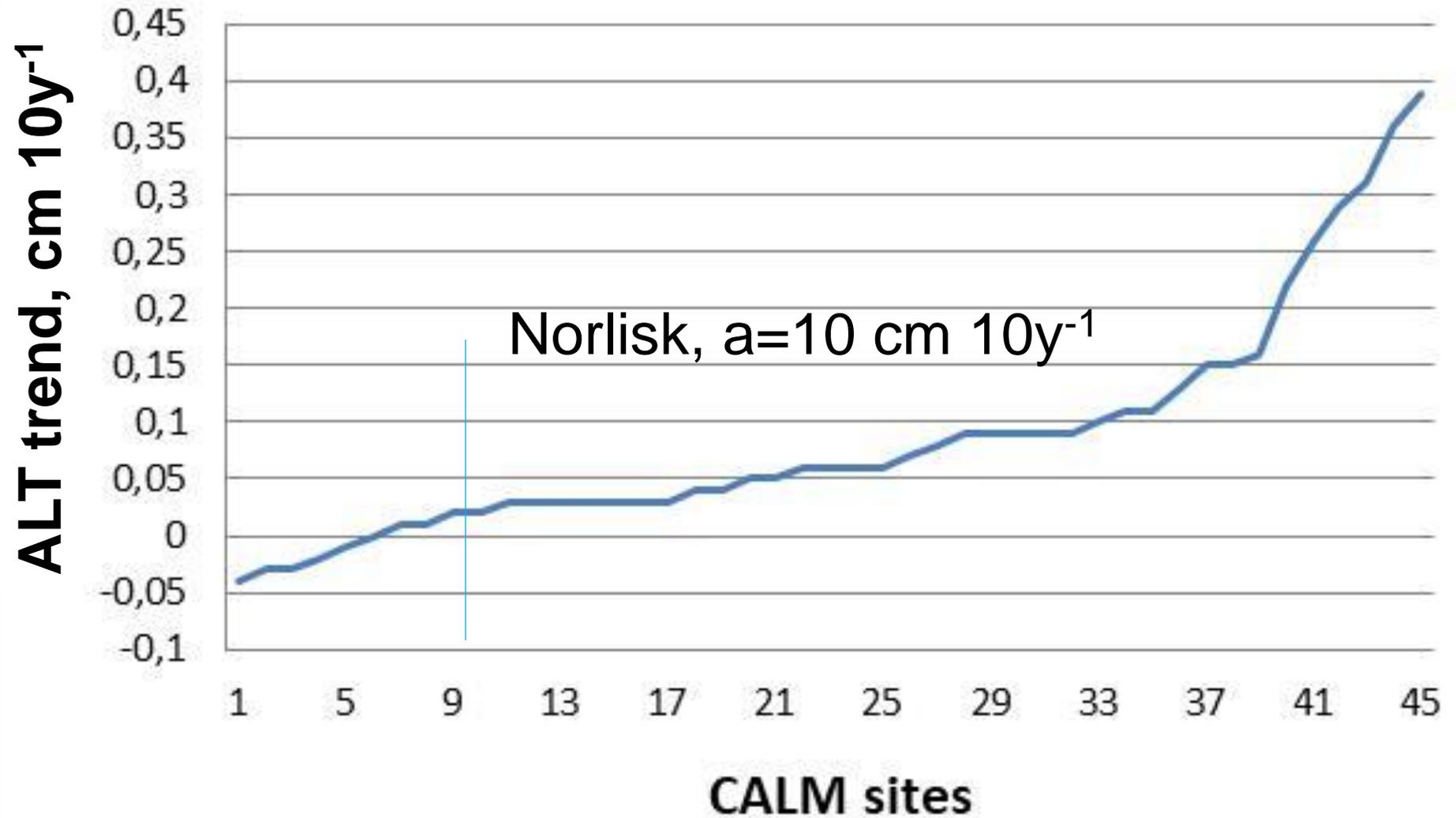


# Winter precipitation trend, 2000-2019, mm/10 y



# Ranked ALT trends over the 2000 – 2020 period

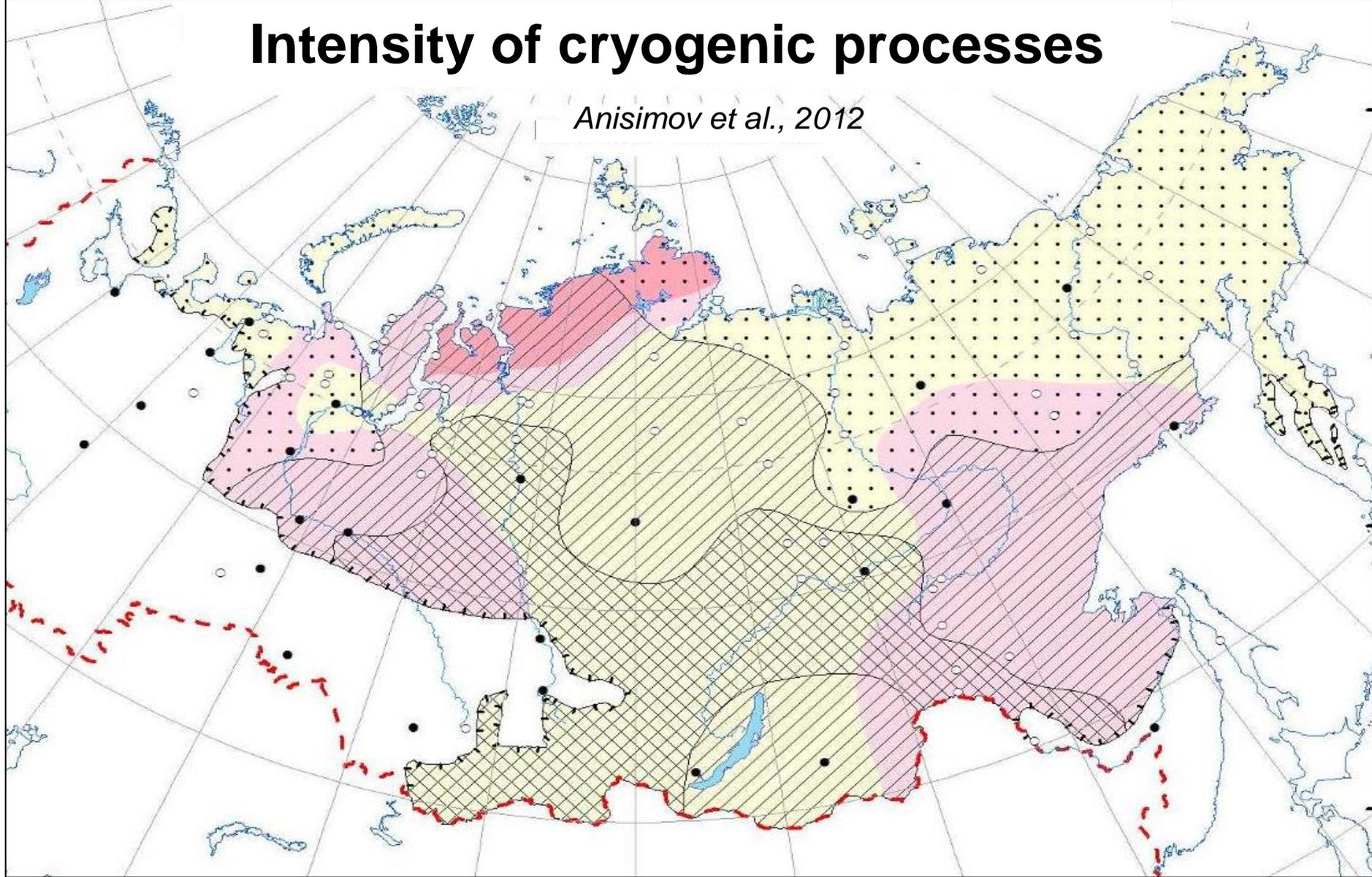
*Data from 45 Russian CALM sites*



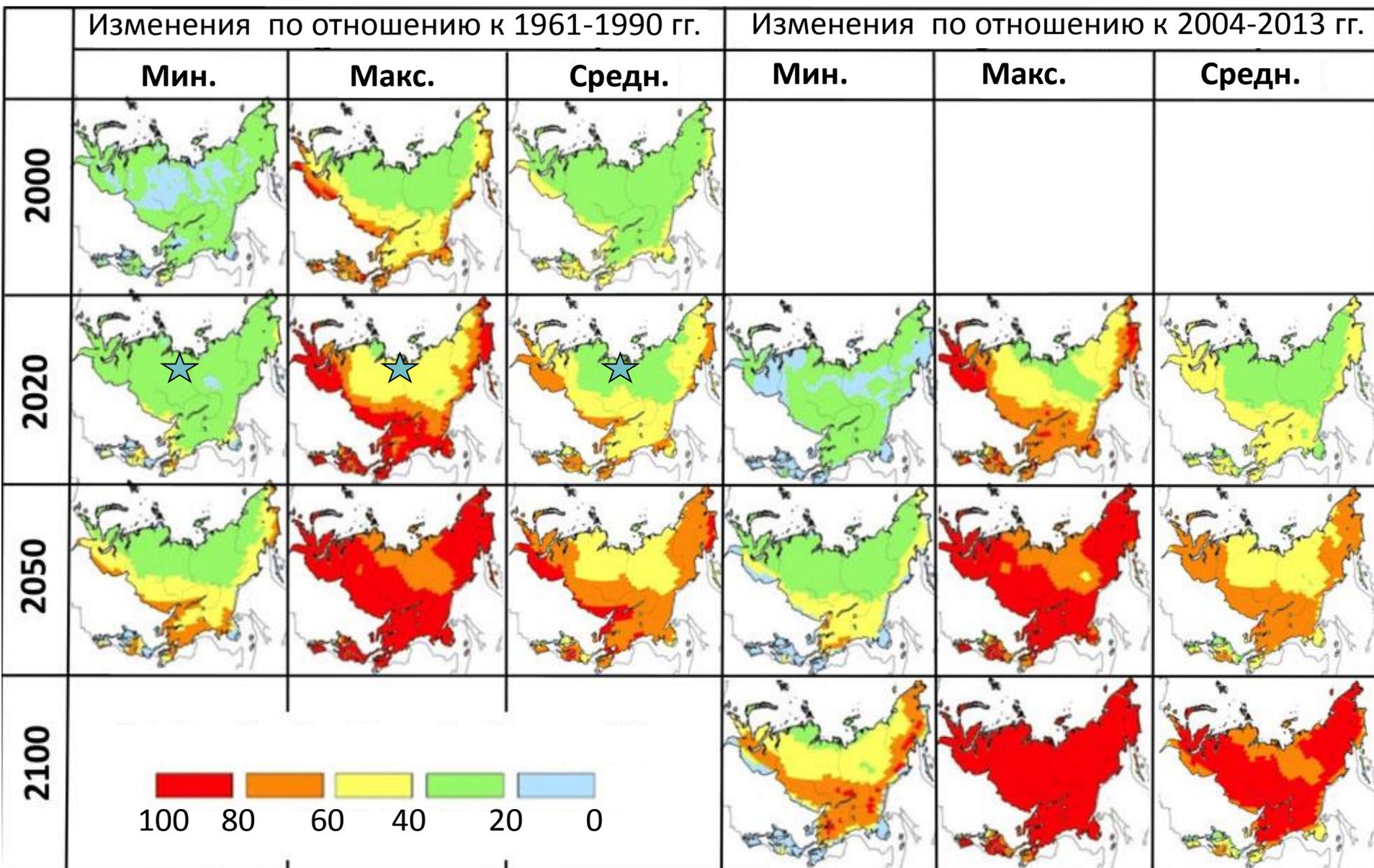
*(Anisimov et al., 2020; Anisimov and Zimov, 2020)*

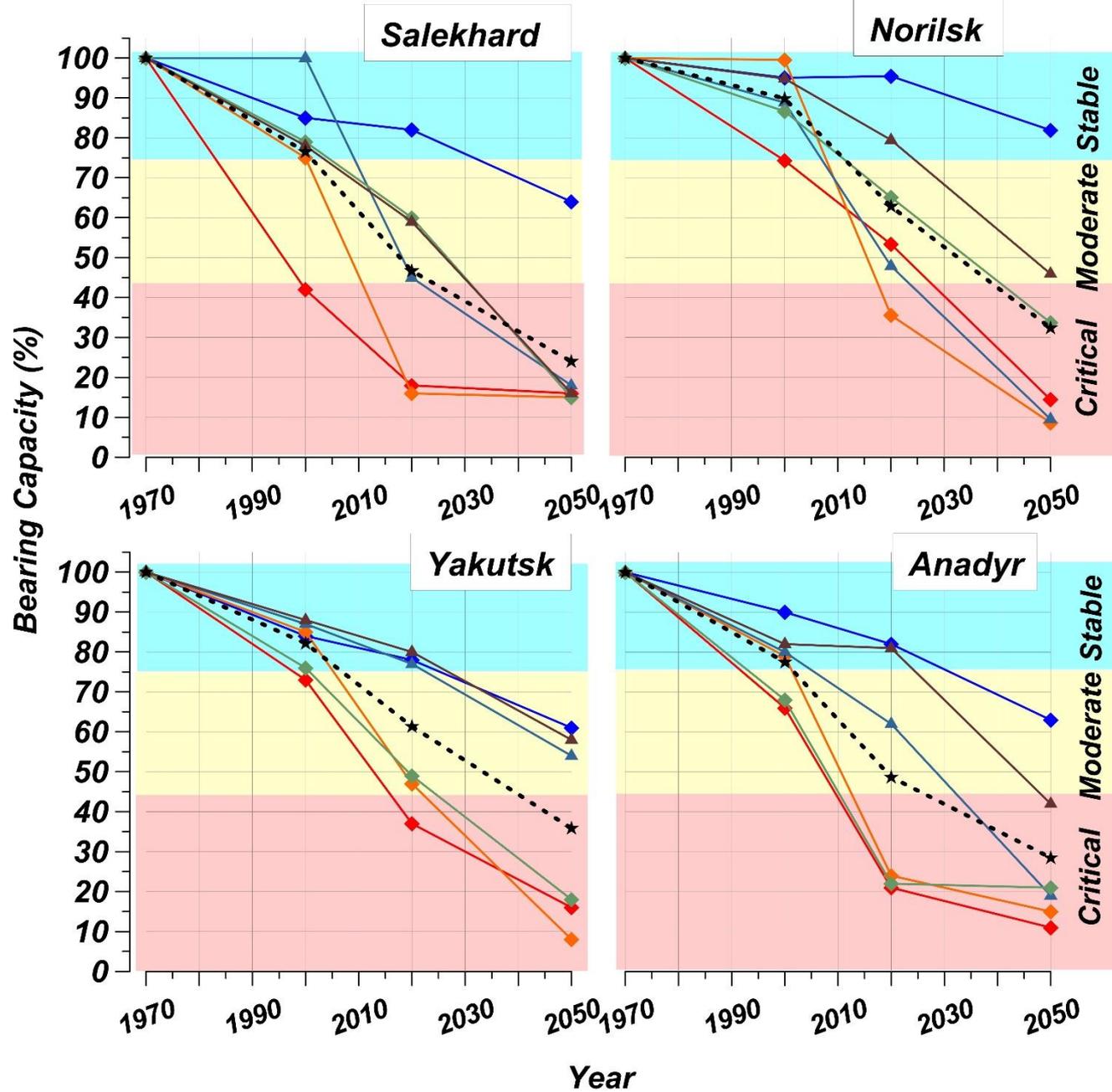
# Intensity of cryogenic processes

*Anisimov et al., 2012*

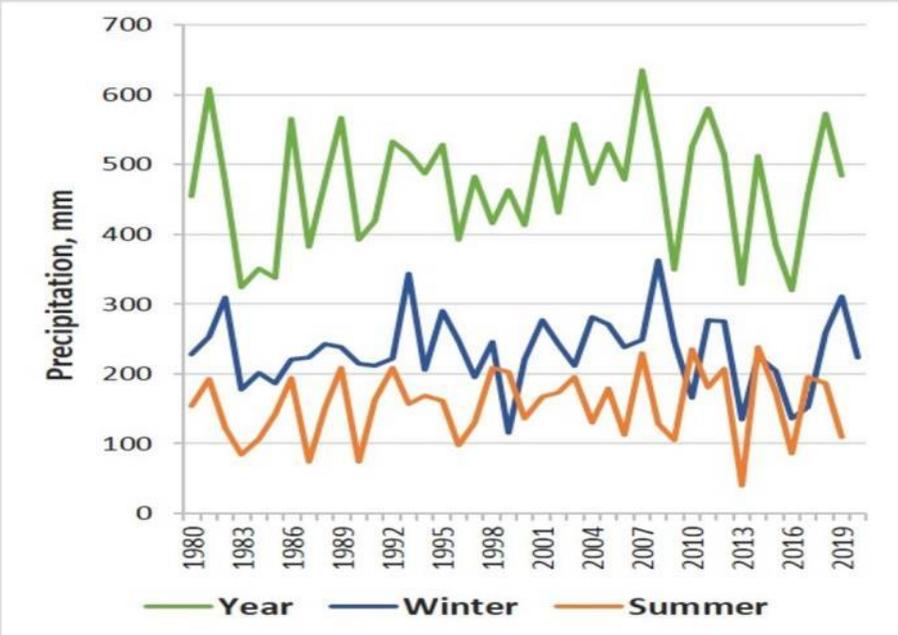
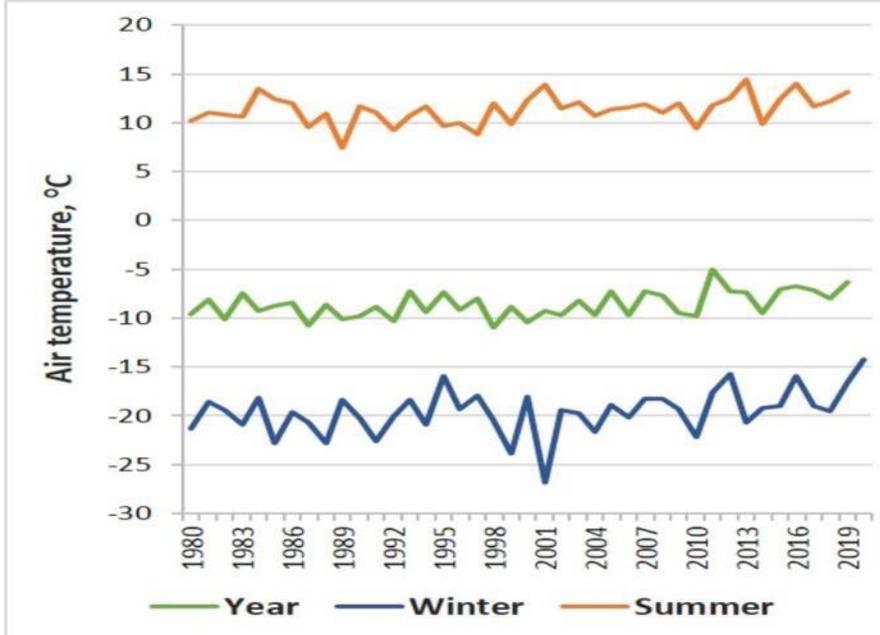


# Несущая способность фундаментов

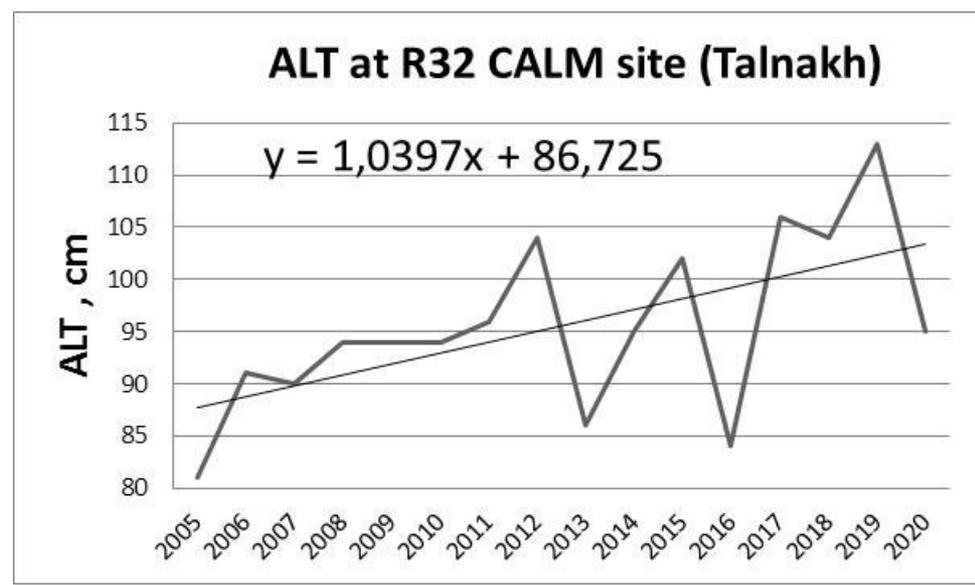
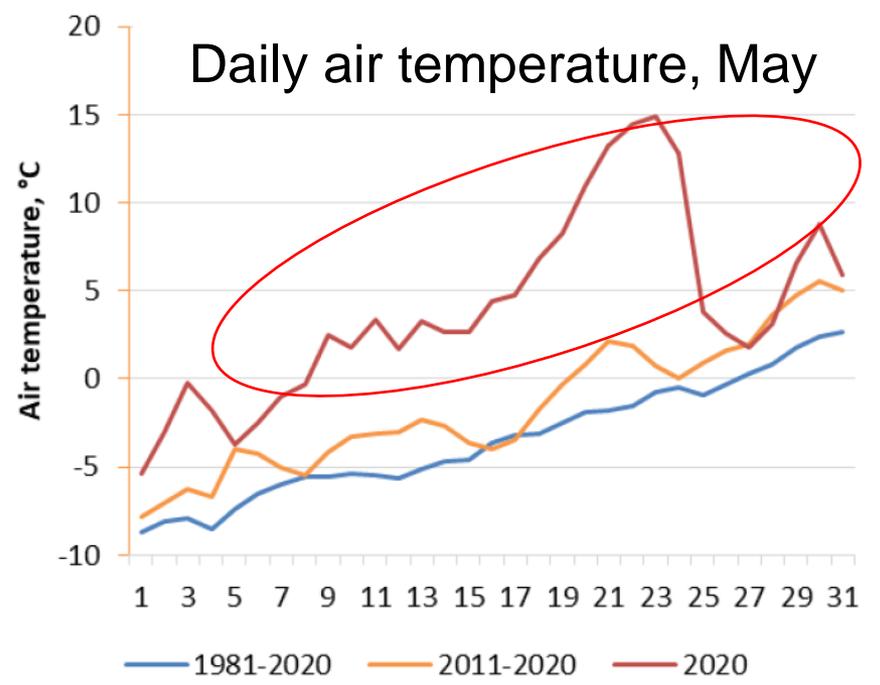








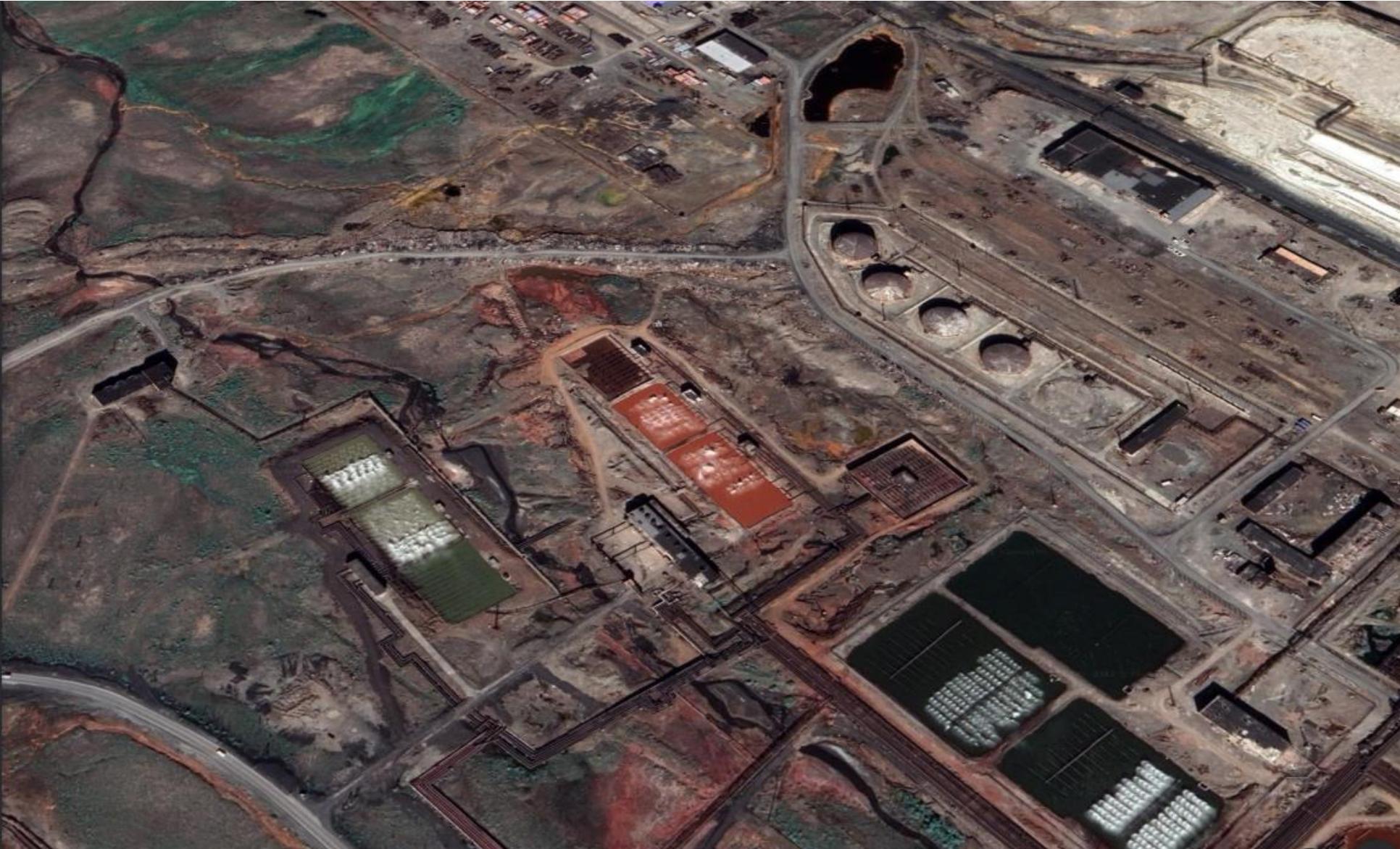
2019/2020 – warmest winter since 1980; In 2019 - maximum ALT.



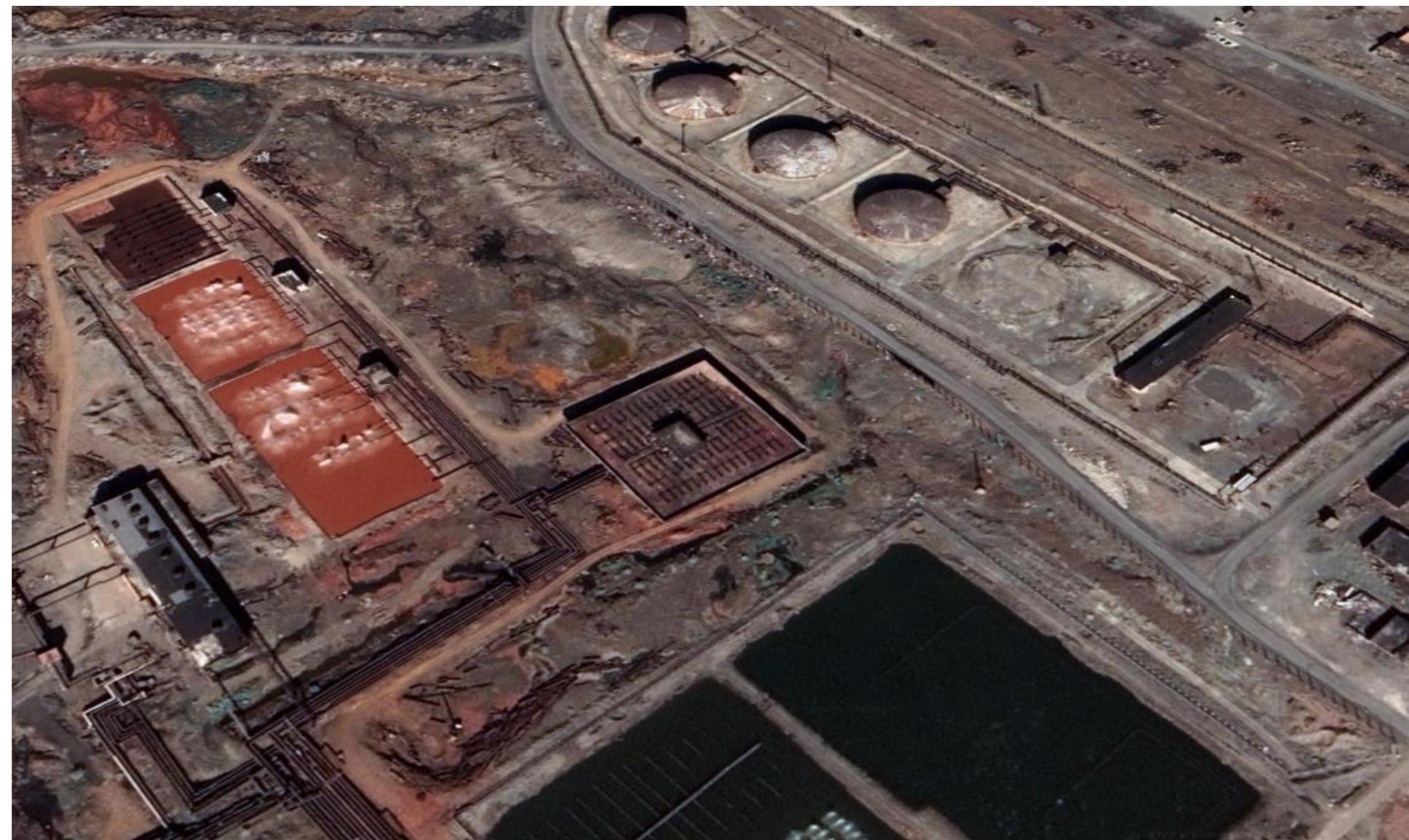
Who's the next, and when?



Who's the next, and when?



Who's the next, and when?



Who's the next, and when?



# Who's the next, and when?



This study is supported by the Russian foundation for Basic Research, project 18-05-60005