

Climatology and Weather Effects in the early Ground War in Russia's Invasion of Ukraine



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Cruces Atmospheric Sciences Forum

19 March 2022

Past is Prologue: August 1968 Soviet, Hungarian, Polish, and Bulgarian troops invade Czechoslovakia, swiftly put an end to Alexander Dubček's "Prague Spring," liberalization of Communist rule.

Invasion, during the night of 20-21 August 1968.

I later heard reports that some invading Warsaw Pact troops got lost on the way to Prague...

Invasion stopped Alexander Dubček's "Prague Spring" reforms, strengthened authoritarian wing of the Communist Party of Czechoslovakia (KSC). Foreign policy of the Soviet Union during this era was 'Brezhnev Doctrine.'



Soviet tanks marked with invasion stripes during the invasion

Overview:

Before Russia's attack on Ukraine, the so-called "experts" in "All-Terrain" ground war fighting told us Russians were well-versed in ground war fighting in Ukraine.

Cautions by Fox News guest Retired Gen Jack Keane, Director, Institute for the Study of War— that Weather would be a strong determinant should the Russians invade – were ignored.

Report: Chairman Xi from the PRC asked "President" Putin to delay the Ukraine invasion until after Beijing Olympics ended on 22 Feb 2022.

Tracked vehicles are used so tracks can propel them cross-country. Not be confined to established roads.

Invasion of Ukraine started ~0500L, 24 Feb 2022. Look at what followed:

Seemingly all Russian tracked vehicles were confined to established roadways, often paved highways.

When Russian forces encountered built-up areas, concealed Ukrainian defenders struck with Javelin anti-tank missiles, to devastating effect.

Russian vehicles seemingly had no convoy discipline: Lanes blocked with stopped vehicles. No logistics apparent.

Mother Nature is a Mother. Weather Guys and Army Commanders know. "Experts" were wrong. Again.

Outline

Bob's Army experience 1979-1982

Climatology of Northern Hemisphere Snow, Cold Temperatures

Geography of Ukraine, "Breadbasket of the World"

Background: Ukraine and its relations with Russia

Russian vs US Tank Training?

Applied US Maneuver. Cold War Example.

Words of The Experts on Weather Effects in Europe

Russian Armored Vehicles

Russian Losses seen by Oryx

Russian Tanks ambushed by Ukrainians.

Russian troops show lack of convoy, resupply, discipline

Compare with US convoy operations.



Inter German Border Cold War

Kelley Barracks



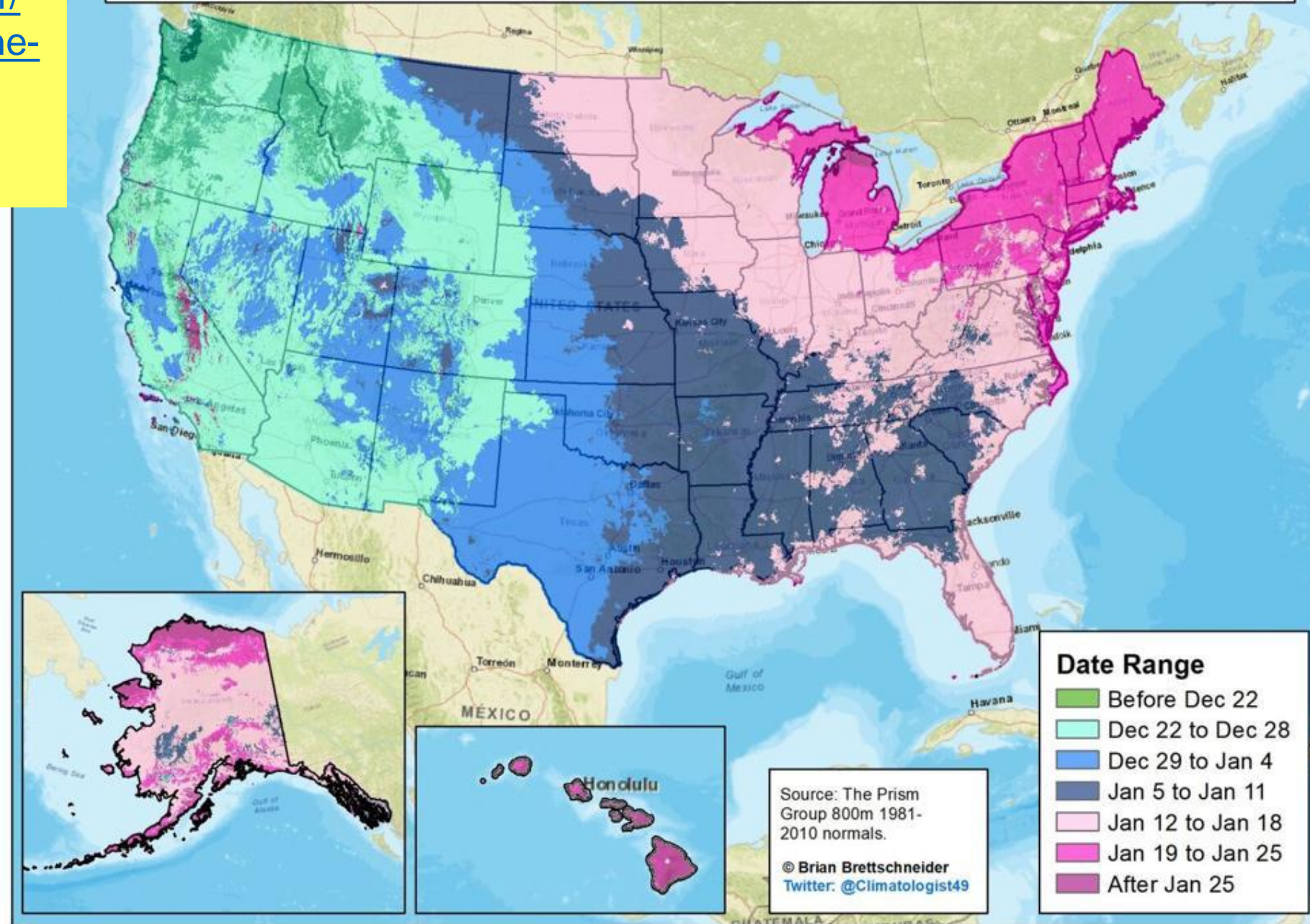
Some Climatology

Locations and Dates of Winter Olympics

Salt Lake	Feb 8	Feb 24	2002
Turin	Feb 8	Feb 26	2006
Vancouver	Feb 12	Feb 28	2010
Sochi	Feb 7	Feb 23	2014
Pyeongchang	Feb 9	Feb 25	2018
Beijing	Feb 4	Feb 22	2022

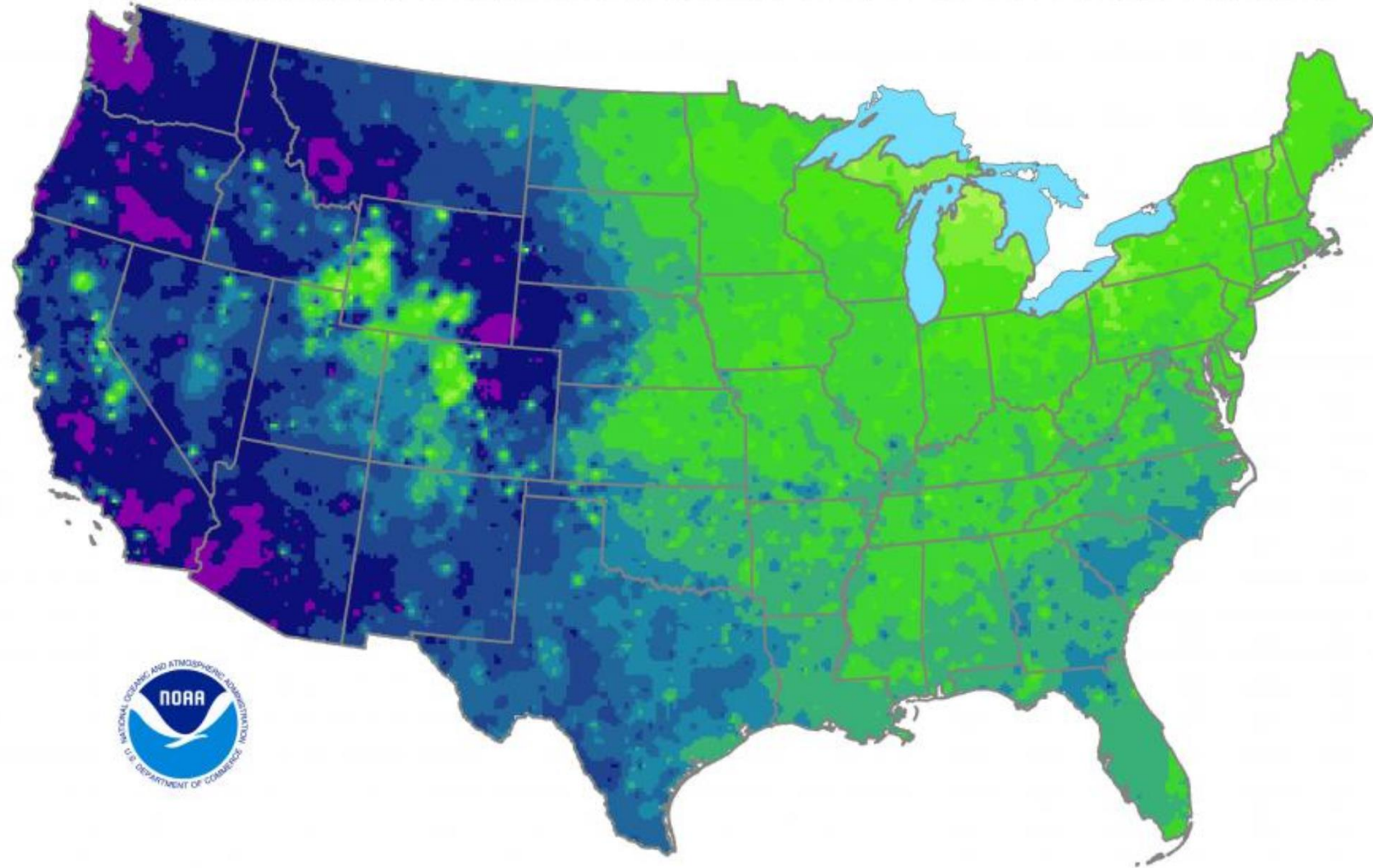
Date of Lowest Climate Normal Temperature (1981-2010)

<https://www.kwwl.com/weather/blog/why-the-coldest-day-of-the-year-occurs-after-the-solstice/article>



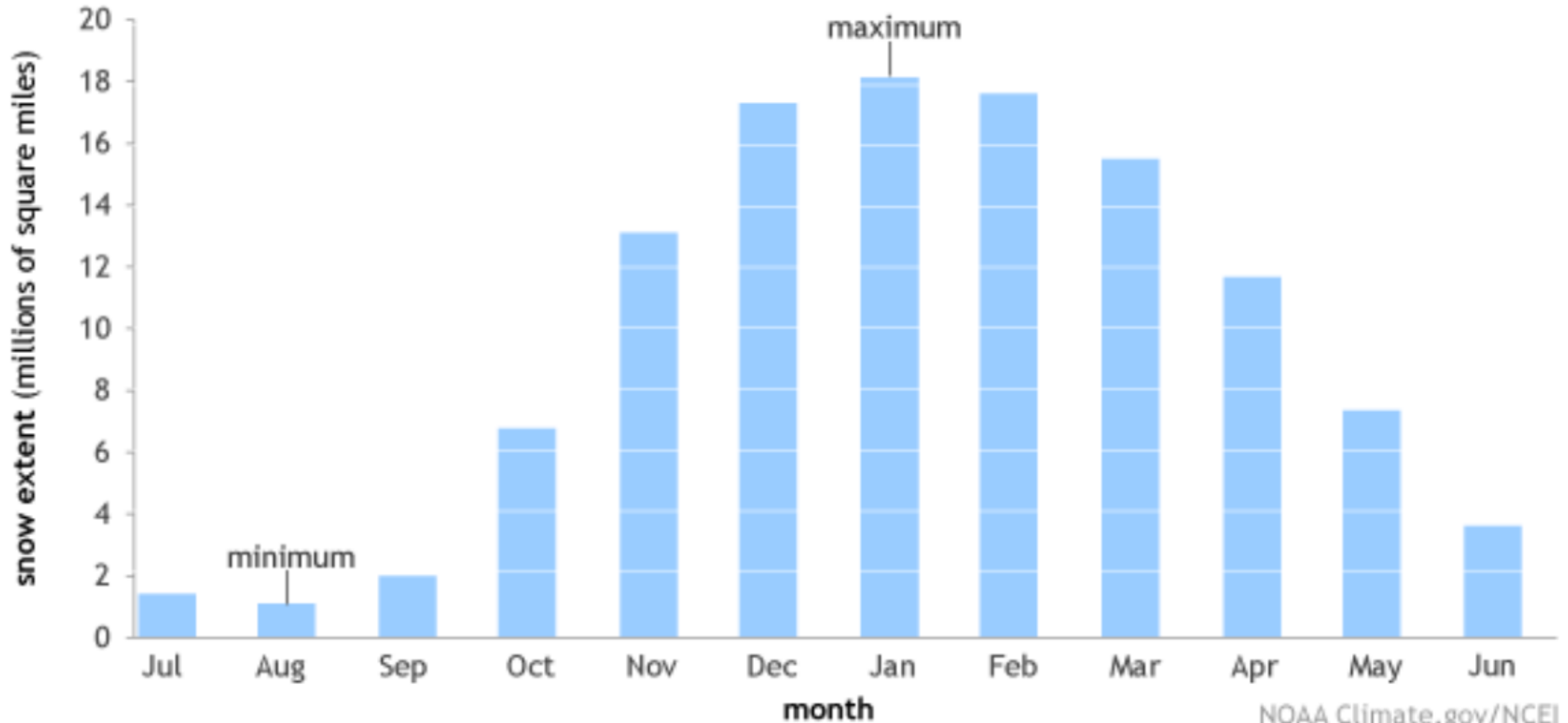
Coldest Day of the Year

Day of Coldest Low Temperature from the 1981–2010 U.S. Climate Normals

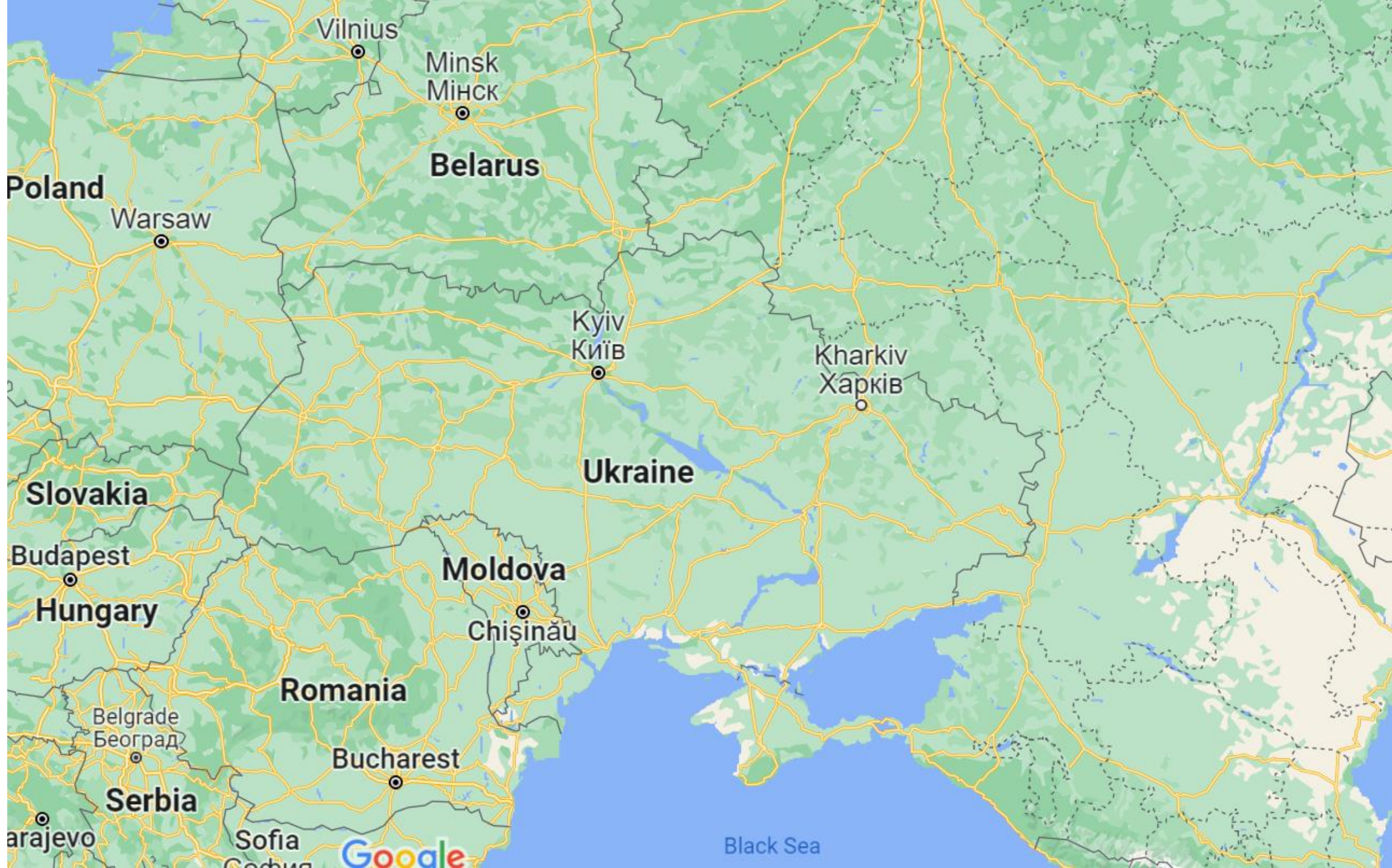


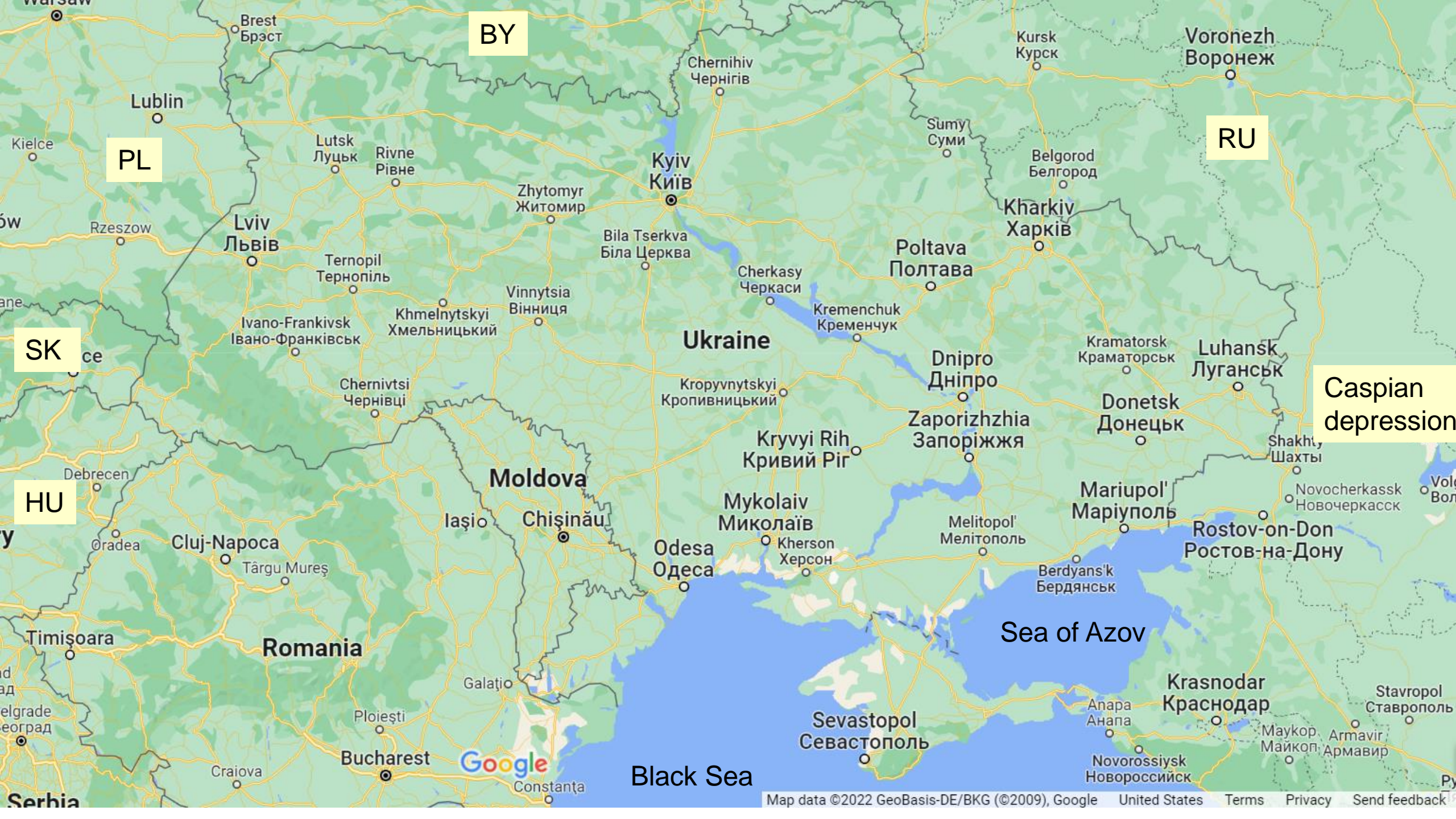
Wonder why the Olympics start in Feb, and not start 3d week of January?

Average snow extent in Northern Hemisphere



Geography of Ukraine





BY

PL

RU

SK

HU

Caspian depression

Ukraine

Moldova

Romania

Black Sea

Sea of Azov

Київ
Kyiv

Львів
Lviv

Lublin

Львів
Lviv

Рівне
Rivne

Житомир
Zhytomyr

Біла Церква
Bila Tserkva

Чернігів
Chernihiv

Суми
Sumy

Белгород
Belgorod

Воронеж
Voronezh

Полтава
Poltava

Харків
Kharkiv

Черкаси
Cherkasy

Кременчук
Kremenchuk

Тернопіль
Ternopil

Хмельницький
Khmelnytskyi

Вінниця
Vinnytsia

Івано-Франківськ
Ivano-Frankivsk

Чернівці
Chernivtsi

Кропивницький
Kropyvnytskyi

Дніпро
Dnipro

Запоріжжя
Zaporizhzhia

Краматорськ
Kramatorsk

Луганськ
Luhansk

Донецьк
Donetsk

Кривий Ріг
Kryvyi Rih

Миколаїв
Mykolaiv

Одеса
Odesa

Херсон
Kherson

Мелітополь
Melitopol'

Маріуполь
Mariupol'

Ростов-на-Дону
Rostov-on-Don

Бердянськ
Berdyans'k

Клуш-Напоса
Cluj-Napoca

Тâргу Муреш
Târgu Muresh

Іашо
Iasi

Chişinău

Галаці
Galati

Крайова
Craiova

Бухарест
Bucharest

Констанца
Constanta

Севастополь
Sevastopol

Анапа
Anapa

Новоросійськ
Novorossiysk

Краснодар
Krasnodar

Майкоп
Maykop

Армавір
Armavir

Ставрополь
Stavropol

Google

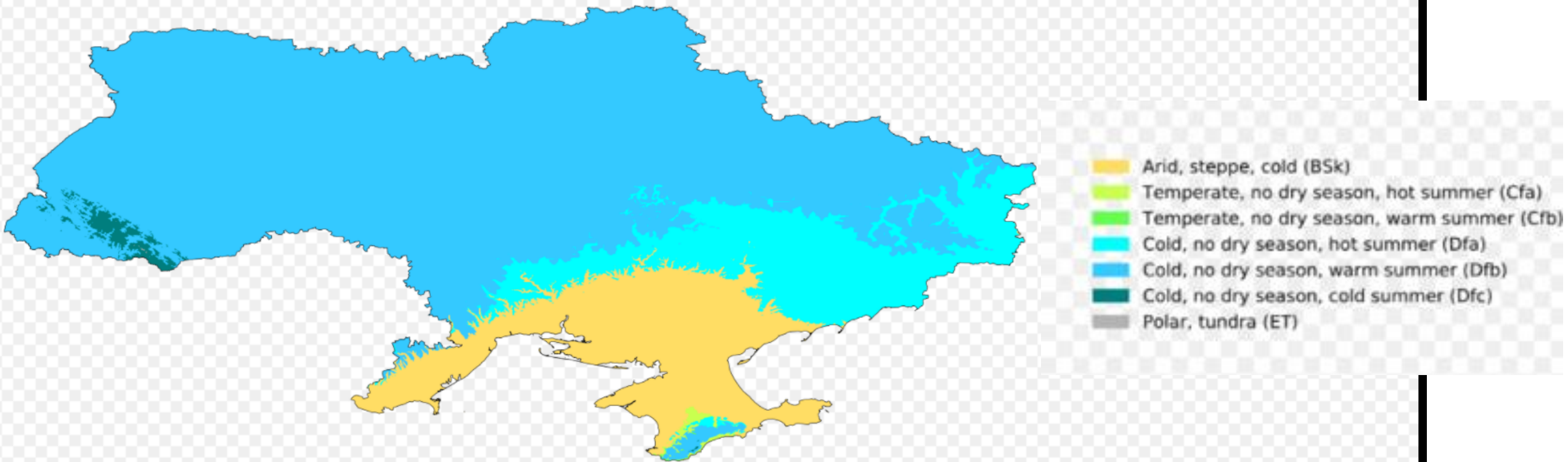
Relief Map of Ukraine





https://en.wikipedia.org/wiki/Geography_of_Ukraine#/media/File:Topographic_map_of_Ukraine.svg

Köppen-Geiger climate classification map for Ukraine (1980-2016)



Source: Beck et al.: Present and future Köppen-Geiger climate classification maps at 1-km resolution, Scientific Data 5:180214, doi:10.1038/sdata.2018.214 (2018)



Prairie Black Earth

<https://en.wikipedia.org/wiki/Chernozem>

Chernozem (from Russian: чернозём, tr. chernozyom, IPA: [tʂɪrnɐˈzʲɐm]; "black ground")[1] is a black-colored soil containing a high percentage of humus[2] (4% to 16%) and high percentages of phosphoric acids, phosphorus, and ammonia.

Chernozem is very fertile and can produce high agricultural yields with its high moisture storage capacity. Chernozems are a Reference Soil Group of the World Reference Base for Soil Resources (WRB).

Chernozem

Chernozemic soil



Chernozem field in Black Dirt Region of Orange County, New York, United States

Red: Distribution of Prairie Black Earth
Soil Type: Chernozym



Dominant



Associated



Inclusions



Miscellaneous lands
(Inland waterbodies, Glaciers, M...)



Russian war in world's 'breadbasket' threatens food supply

BARCELONA, Spain (AP) – The Russian tanks and missiles besieging Ukraine also are threatening the food supply and livelihoods of people in Europe, Africa and Asia who rely on the vast, fertile farmlands of the Black Sea region — known as the "breadbasket of the world."



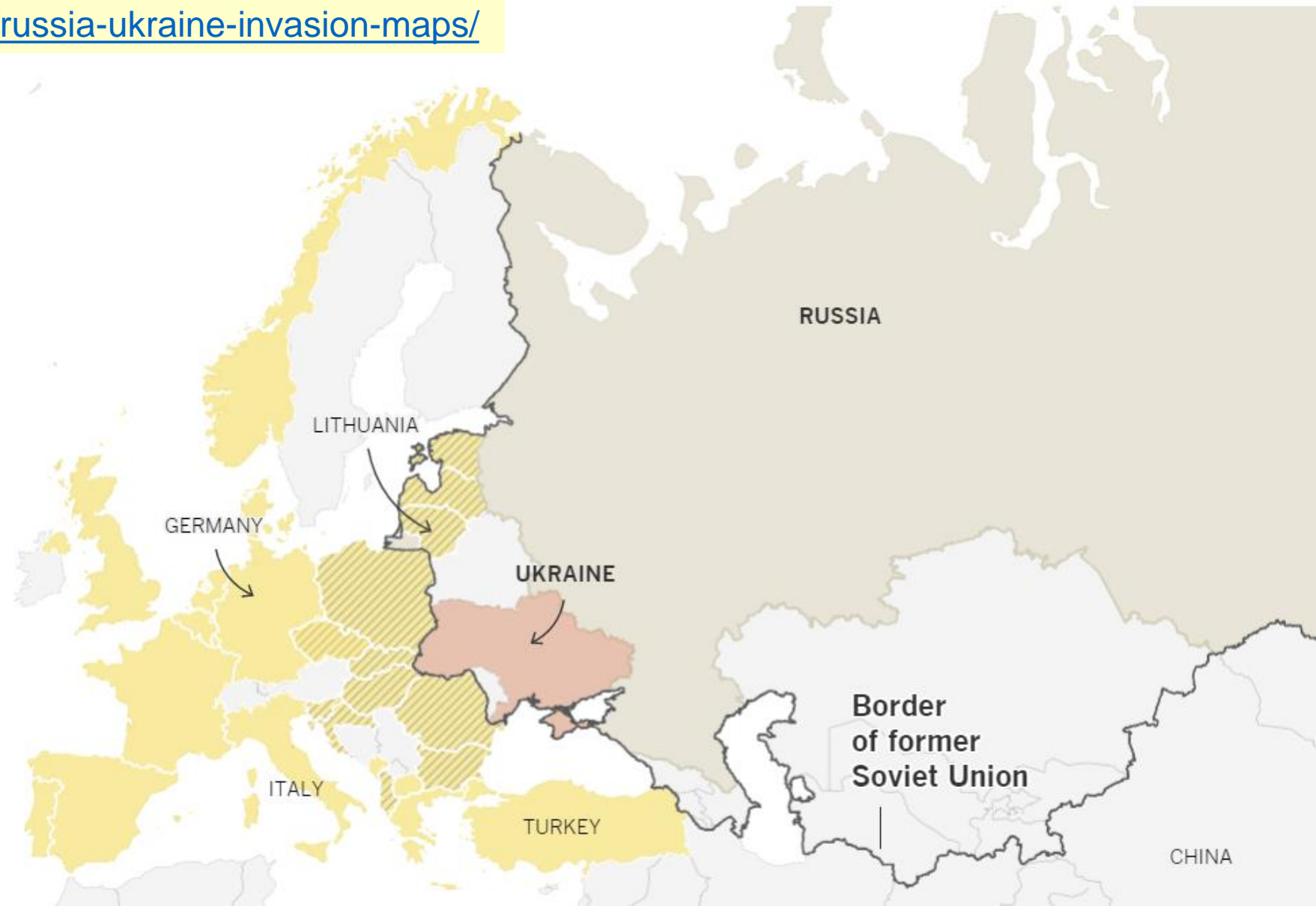
FILE - Farmers harvest with their combines in a wheat field near the village Tbilisskaya, Russia, July 21, 2021. The fertile farmlands known as the "breadbasket of the world" - Russia and Ukraine combine for about a third of the world's wheat and barley exports and provide large amounts of corn and cooking oils. *Vitaly Timkiv, AP*

Some Background on Ukraine and Ukraine-Russia relations

NATO members

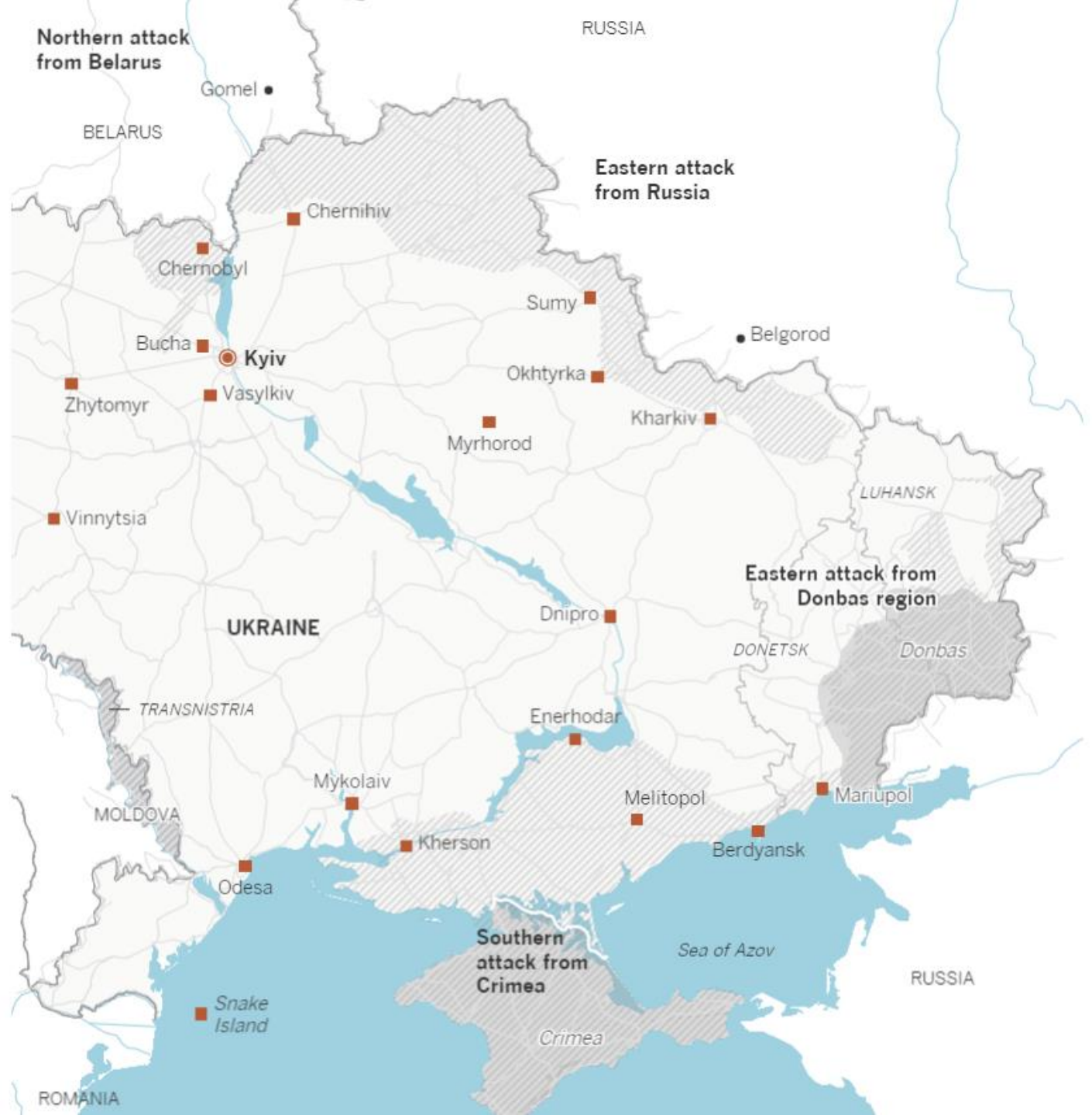
■ NATO ▨ Joined after fall of Soviet Union

<https://www.latimes.com/projects/russia-ukraine-invasion-maps/>



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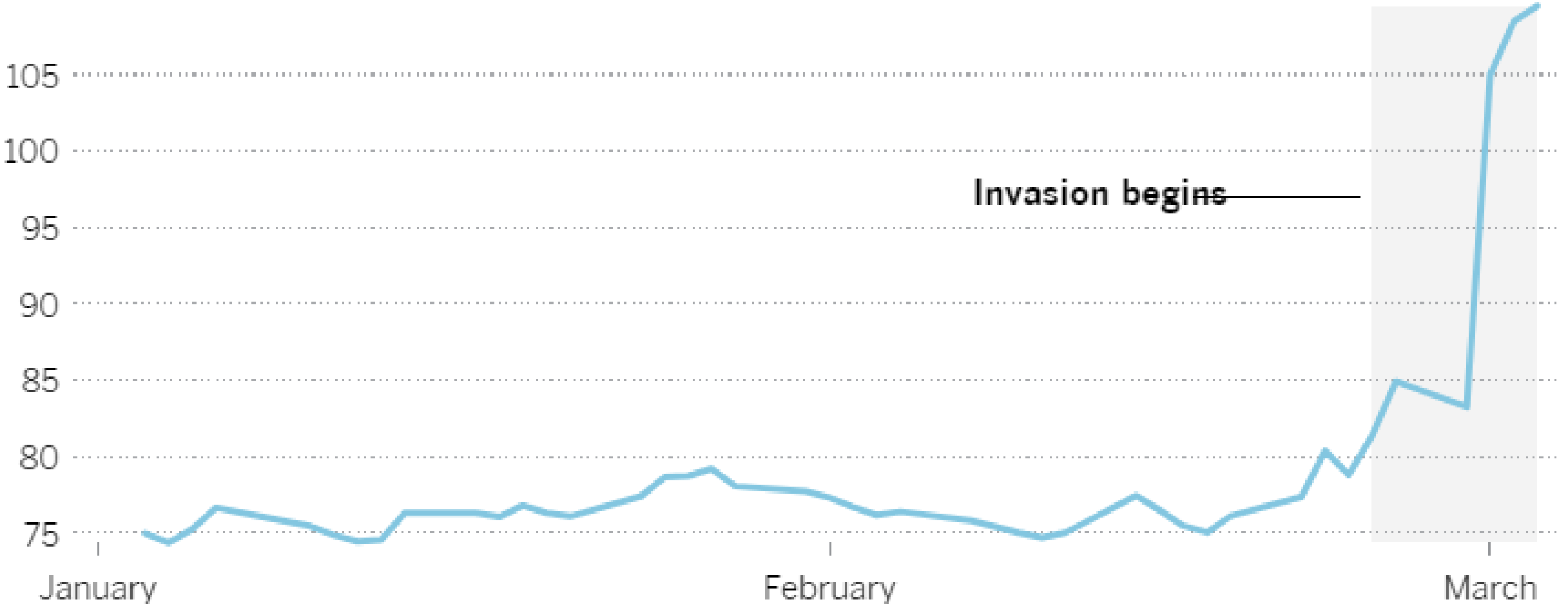




Russian ruble value

After Western countries imposed sanctions, the ruble began trading at more than 100 per dollar.

Rubles per U.S. dollar



Looks like a main Russian Tank Training Base.

Tank Training in the middle of the flat Steppe?





ОСТОРОЖНО ТАНКИ





Video player controls including a progress bar, play/pause button, volume icon, and a timestamp of 2:56 / 8:56. A red star logo and the text "IA MAGMA HD" are overlaid on the left side of the controls. On the right side, there are icons for closed captions (CC), settings (gear), full screen, and a square icon.

<https://www.youtube.com/watch?v=eD6FmCGoerQ>



Video player controls including a red progress bar, a play button, a volume icon, a timestamp of 3:40 / 8:56, a pause button, a closed captions icon, a settings gear, a full screen icon, and a share icon. A red star logo is visible on the left side of the control bar.



Video player controls including a red progress bar, a play button with a red star, a volume icon, a timestamp of 5:01 / 8:56, a pause button, a CC icon, a settings gear, a full screen icon, and a close icon.

LA MAGNA HD

Some US and Western Tank Training Areas.
Use of Tanks for Maneuver Advantage.





Paladin Self Propelled Howitzer at Ft Hood

https://kdhnews.com/military/fort-hood-unit-tests-new-tank-by-putting-rounds-down-range/article_78856d64-e185-11ea-9c14-8bc7600e4c4f.html

Fort Hood unit tests new tank by putting rounds down range



Ft Hood Ranges allow tank training for maneuver effectiveness using broken terrain for cover, concealment.



Students in the Regional Training Site (RTS)-Maintenance Tracked Vehicle Recovery Course hooked an M88A1 Medium-Tracked Recovery Vehicle to another M88A1 during course operations July 19, 2018, at a training area on North Post at Fort McCoy, Wis.

The M88A1 is a diesel-powered, full-tracked armored vehicle used to perform battlefield rescue and recovery missions. It performs hoisting, winching, and towing operations supporting recovery operations and evacuation of heavy tanks and other tracked combat vehicles.



M1A1 Abrams stuck in the mud during exercise Aurora 17 in Sweden

Training. Freeing a US M-1 Tank stuck in Norway

<https://www.youtube.com/watch?v=m7eRqK51oQ0>



<https://i.ytimg.com/vi/m7eRqK51oQ0/maxresdefault.jpg>

SIDEBAR:

How we used the terrain for maneuver advantage to be ready for a Soviet/Warsaw Pact invasion of the VII Corps Sector

Meiningen Avenue of Approach
In our Sector in the Cold War.
Forests in Dark Green
Open areas Light Green
Dashed line Old Inter German Border.



VII Corps planned to ambush Soviet Tanks if they emerged from the tree line from concealed positions near Mellrichstadt.



In the distance, perfect terrain for tank assault



End Sidebar

Words of the Washington “Experts:”

Frozen Ground and Mud Season

Historically the marshes have been an obstacle to forces. But muddy landscape might not be a deciding factor this time around, according to a written analysis by the Center for Naval Analyses Russia Studies Program (CNA) in response to questions from The Washington Post.

While these marshes were flagged as a potential hazard for Western forces fighting a hypothetical war in the U.S.S.R. and considered ‘impassible except during winter,’ Russian troops have long proved quite adept at handling marsh and swamp terrain.”

A Little Mud Won't Stop Putin

Frozen ground may aid a Russian invasion of Ukraine, but it's not a decisive factor.



While frozen ground would certainly make life easier for Russia's military, experts believe that the Russian mechanized forces, which have undergone multiple rounds of upgrades and investments in recent years, have the capabilities to invade at any time of year.

“There are multiple factors, the ground is one of them, but it's not in itself determinative,” said Rob Lee, a fellow at the Foreign Policy Research Institute who previously served in the U.S. Marine Corps. **“Russia is well versed in operating in this area,”** he said.

Ukrainian service members work on their tank close to the front line with Russian-backed separatists near Lysychansk, Luhansk region, on April 7, 2021

A Little Mud Won't Stop Putin

Frozen ground may aid a Russian invasion of Ukraine, but it's not a decisive factor

Bob Comments.

Wrong. Wrong headed.

The mud season was in full effect immediately after invasion started on 24 Feb 2022.

Terrain situation forced Russian Army forces to stay on roads, paved roads in many cases.

Maneuverability engendered by tracked armored vehicles was completely lost.

Russian maneuver vehicles confined to established roads were ambushed by Ukrainian forces when Russians entered towns, villages.

Ukrainian ambush tactics forced Russians to delay entry into cities. Initiative Lost.

Caused Russians to resort to "rubble tactics," in view of Western Press, social media posts.

Head Fake! Who was deceived?



0:40

Russian Defense Official Says Some Troops Are Leaving Ukraine Border

Russia's Defense Ministry said that some troops were sent back to their home bases, but that large-scale military drills would continue. U.S. officials said they were still assessing Russia's troop announcement. Sergey Pivovarov/Reuters



Some Russian Ground Assault Vehicles used in Ukraine



Russian T-90 Main Battle Tank



Kord 12.7mm Heavy Machine Gun

PKMT 7.62mm Machine Gun

Wire Cage Armor

Explosive Reactive Armor

125 mm (5-inch) Main Gun fires missile with range of 6 km (3.7 mi)

T-90 Armament

The T-90 tank's main tank gun, the 2A46M **125mm smoothbore tank gun**.

Can be replaced without dismantling the inner turret and is capable of firing:
armour-piercing fin-stabilised discarding sabot (APFSDS),
high-explosive anti-tank (HEAT-FS)
high explosive fragmentation (HE-FRAG) ammunition
9M119M Refleks anti-tank guided missiles.

Refleks missile has semi-automatic laser beam-riding guidance and a tandem hollow-charge HEAT warhead. **It has an effective range of 100 m to 6 km: takes 17.5 seconds to reach maximum range.** Refleks can penetrate ~ 950 millimetres (37 in) of steel armor. Can engage low-flying air targets such as helicopters.

Kord 12.7mm (12.7×108) remotely controlled anti-aircraft heavy machine gun can be operated from within the tank by the commander **has a range of 2 km.** Rate of fire of 700 rounds per minute with 300 rounds available.

PKMT 7.62mm (7.62×54mm) coaxial machine gun. <Range est. 1.5 km—Bob>

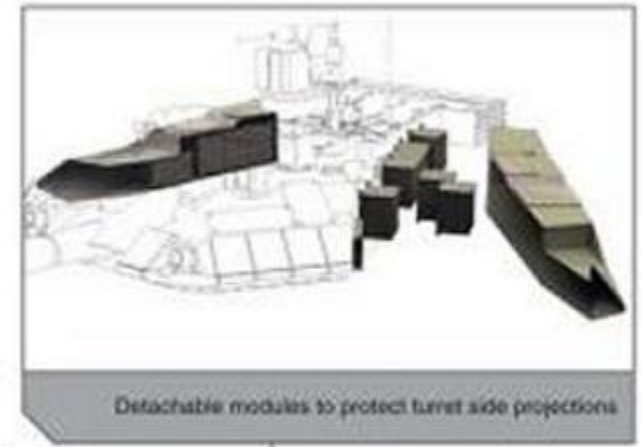


A remote-controlled weapon station armed with a 7.62mm machine gun is mounted on the top of the turret

T-90 Explosive Reactive Armor and Wire Cage Armor

Arrangement of protection components

- 1 Detachable modules to protect hull front projections
- 2 Detachable modules to protect turret front projections
- 3 Detachable modules to protect hull side projections
- 4 Detachable modules to protect turret side projections
- 5 Louver panels to protect power pack compartment and turret rear from antitank grenades



The hull and turret of the T-90MS are fitted with ERA (Explosive Reactive Armour) and wire cage armour.



Specifications	
Mass	42 tonnes (93,000 lb)
Length	7.15 m (23 ft 5 in)
Width	3.38 m (11 ft 1 in)
Height	2.99 m (9 ft 10 in)
Crew	5
Elevation	-4° to +68°
Traverse	360°
Rate of fire	2S19: 6-8 rounds per minute 2S19M2: 10 rounds per minute
Maximum firing range	Base bleed: 25 km (16 mi) RAP: 28.9 km (18.0 mi)
Armor	Classified
Main armament	152.4 mm howitzer 2A65
Secondary armament	12.7 mm NSVT anti-aircraft machine gun
Engine	Diesel V-84A 840 hp (630 kW)
Power/weight	20 hp/tonne
Suspension	Torsion bar
Operational range	500 km (310 mi)
Maximum speed	60 km/h (37 mph)

Maximum Range: 25 km (16 mi) RAP Round 28.9 km (18 mi)

2S19 Msta (Russian: Мста, after the Msta River) **152.4 mm self-propelled howitzer** designed by the Soviet Union



28/02/2022

Abandoned in Ukraine

<https://www.oryxspioenkop.com/2022/02/attack-on-europe-documenting-equipment.html>

25/02/2022



6-inch gun with range of 18 miles or 28.9 km

Towed Russian Artillery Piece: 152mm 2A65 Msta-B Howitzer

Production history

Designer	Central Design Bureau Titan
Designed	1976 – 1986
Manufacturer	Motovilikha Plants
Produced	1987 – present
Variants	see Variants

Specifications

Mass	Combat: 6,800 kg (15,000 lb)
Barrel length	7,200m L/47
Crew	6–11
Shell	OF45 (High explosive)
Caliber	152.4 mm (6.00 in)
Carriage	Split trail
Elevation	-3.5° to +70°
Traverse	28°
Rate of fire	5-6 rounds per minute
Muzzle velocity	828 m/s (2,720 ft/s)
Maximum firing range	28.9 km (18.0 mi)

The website Oryx has counted significantly more Russian equipment losses than Ukrainian losses: 993 versus 277.
(~15 Mar 2022)

Of particular importance, it has counted losses of 465 Russian heavy vehicles (tanks, armored fighting vehicles, infantry fighting vehicles, armored personnel carriers), versus 138 for the Ukrainians.

Oryx <https://www.oryxspioenkop.com/>



Attack On Europe: Documenting Equipment Losses During The 2022 Russian Invasion Of Ukraine

By Stijn Mitzer in collaboration with Joost Oliemans Kemal, Dan, Jakub Janovsky and Дмитро Путята



A detailed list of the destroyed and captured vehicles and equipment of both sides can be seen below. This list is constantly updated as additional footage becomes available.

Attack On Europe: Documenting Equipment Losses During The 2022 Russian Invasion Of Ukraine

Sample Just below was captured on 19 March 2022 at 0550Z (Each listed is a separate hyperlink to photo)

Russia - 1542, of which: destroyed: 712, damaged: 27, abandoned: 223, captured: 579

Tanks (228, of which destroyed: 85, damaged: 3, abandoned: 39, captured: 101)

- >  4 T-64BV: (1, destroyed) (2, damaged) (3, captured) (4, captured)
- >  7 T-72A: (1, destroyed) (2, destroyed) (3, captured) (4, captured) (5, captured) (6, captured) (7, captured)
- >  3 T-72AV: (1, destroyed) (2, destroyed) (3, captured)
- >  35 T-72B: (1, destroyed) (2, destroyed) (3, destroyed) (4, destroyed) (5, destroyed) (6, captured and later destroyed) (7, destroyed) (8, destroyed) (9, destroyed) (10, damaged) (11, damaged and abandoned) (12, abandoned) (13, abandoned) (14, abandoned) (15, abandoned) (16, abandoned) (17, damaged and captured) (18, captured) (19, captured) (20, captured) (21, captured) (22, captured and stripped) (23, captured) (24, captured) (25, captured) (26, captured) (27, captured) (28, captured) (29, captured) (30, captured) (31, captured) (32, captured) (33, captured) (34, captured) (35, captured)
- >  5 T-72B Obr. 1989: (1, destroyed) (2, abandoned) (3, abandoned) (4, captured)
- >  15 T-72B3: (1, destroyed) (2, destroyed) (3, destroyed) (4, destroyed) (5, destroyed) (6, damaged) (7, abandoned) (8, abandoned) (9, abandoned) (10, abandoned) (11, captured) (12, captured) (13, captured) (14,

25/02/2022

6-inch gun with
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These dates mean the source is Oryx

28/02/2022



Abandoned in Ukraine

<https://www.oryxspioenkop.com/2022/02/attack-on-europe-documenting-equipment.html>



ТАНК ЗАСТРЯЛ В ГРЯЗИ!!! OFF-ROAD ОТ ТАНКИСТОВ. Tank Stuck In Mud | Youtube, History, World



A charred Russian tank and captured tanks are seen in the Sumy region, Ukraine, March 7, 2022. Irina Rybakova/Press service of the Ukrainian Ground Forces/Handout via REUTERS

Russia's attempts at a fast-paced assault haven't brought its forces inside Kyiv, the capital and the seat of the Western-leaning government the Kremlin appears intent on removing. Instead, the strategy has stretched supply lines and morale to a breaking point, while Russian tanks and military equipment have, at times, gotten stuck in mud or run out of gas.



Smoke rises from a Russian tank destroyed by the Ukrainian forces on the side of a road in Lugansk region last week



A view shows a destroyed Russian Army all-terrain infantry mobility vehicle Tigr-M (Tiger) on a road in Kharkiv, Ukraine February 28, 2022. REUTERS/Vitaliy Gnidy



View shows destroyed Russian Army all-terrain infantry mobility vehicles Tigr-M (Tiger) on a road in Kharkiv, Ukraine February 28, 2022.



10/3/2022

3 March 2022 Image of the destruction of a BMD-2 Infantry Fighting Vehicle on a road in Ukraine by a Turkish Drone Bayraktar TB2s, courtesy Oryx.

<https://www.oryxspioenkop.com/2022/02/defending-ukraine-listing-russian-army.html>



Destroyed Russian tanks are seen, amid Russia's invasion of Ukraine, in the Sumy region, Ukraine, March 7, 2022. Irina Rybakova/Press service of the Ukrainian Ground Forces/Handout via REUTERS

Bad day to be a Russian Tank Company
Commander in Ukraine

SKYBYN, OUTSKIRTS OF KYIV, UKRAINE

THE Sun



Defence intelligence of Ukraine via Storyful

0:02 / 1:23

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https://www.youtube.com/watch?v=h_ie6vAvGnM

Inbound tank company, moving towards Kiev from the northeast.



Defence intelligence of Ukraine via Storyful

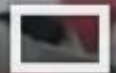
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Defence intelligence of Ukraine via Storyful

0:20 / 1:23



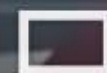
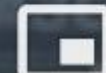
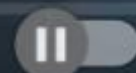
SKYBYN, OUTSKIRTS OF KYIV, UKRAINE

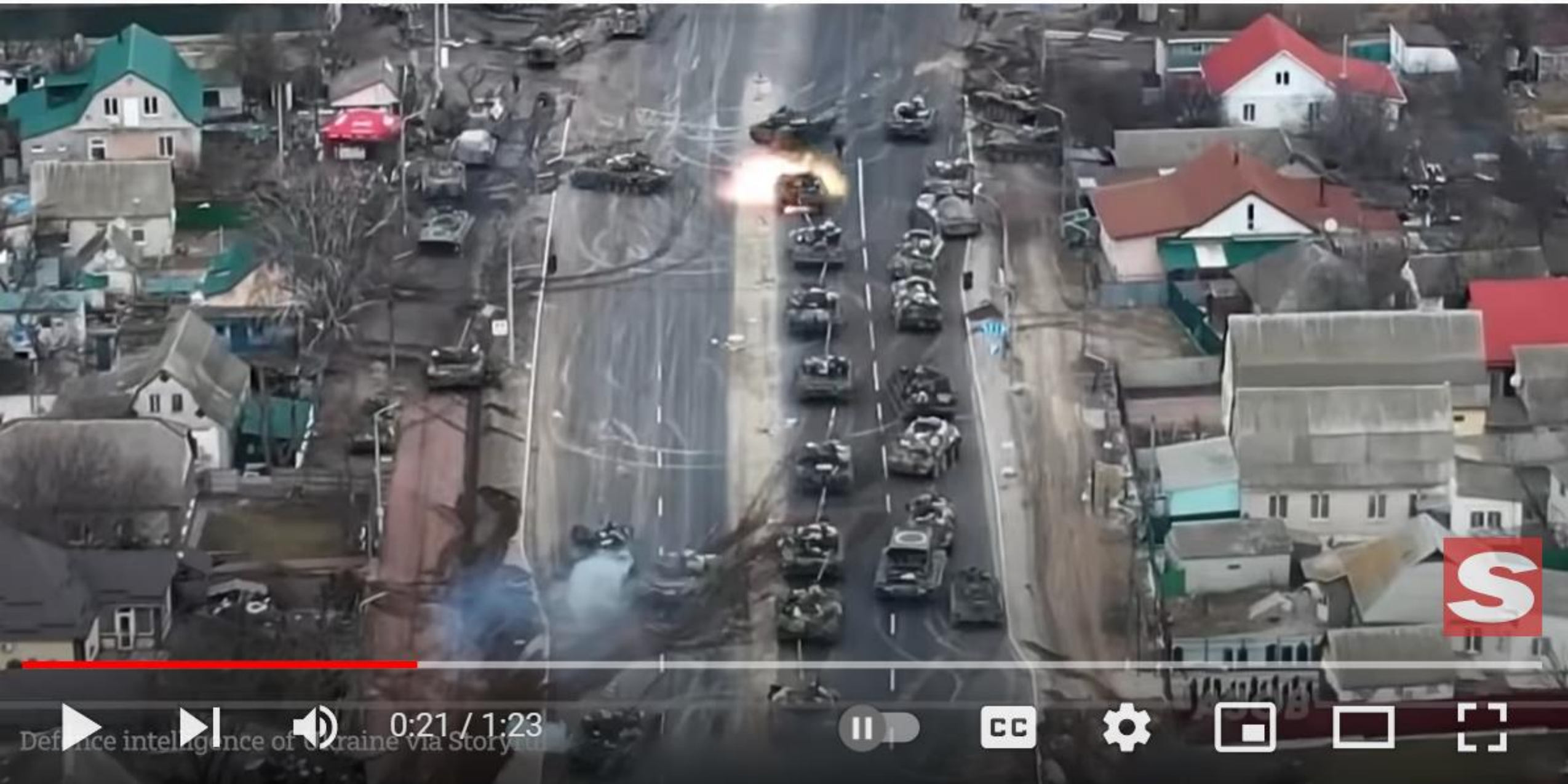
THE Sun



Defence intelligence of Ukraine via Storyful

0:26 / 1:23







Defence intelligence of Ukraine via Storyful

0:29 / 1:23





Defence intelligence of Ukraine via Storyful

0:29 / 1:23



Tanks in full retreat in the eastbound lanes after the encounter.



“A Little Mud Won’t Stop Putin”

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Bob Comment:

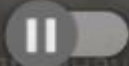
There wasn’t “A Little Mud,” the countryside was seemingly all mud.

Tracked vehicles were confined to roads, often paved roads. When Russians got into the villages, Ukrainian defenders destroyed many tanks, devastated Russians.

<https://www.youtube.com/watch?v=fngPVC4V4Gk>



0:10 / 1:35



HD

Окремий загін спеціального призначення «Азов»

17 Mar 2022

Ukrainian forces destroy a Russian Self-Propelled Howitzer (2S19 Msta?) on the streets of Marioupol, Ukraine

<https://www.the-sun.com/news/4914336/russian-z-tank-blown-to-bits-drone-video-mariupo>

Sloppy terrain conditions were among the factors which confounded the Russians and the Washington Experts who predicted the Russians would take Kiev within four days.

Examples Follow: Poor training and non-existent convoy discipline within the Russian advance, which stalled, seemingly within a day.

27 FEB 2022

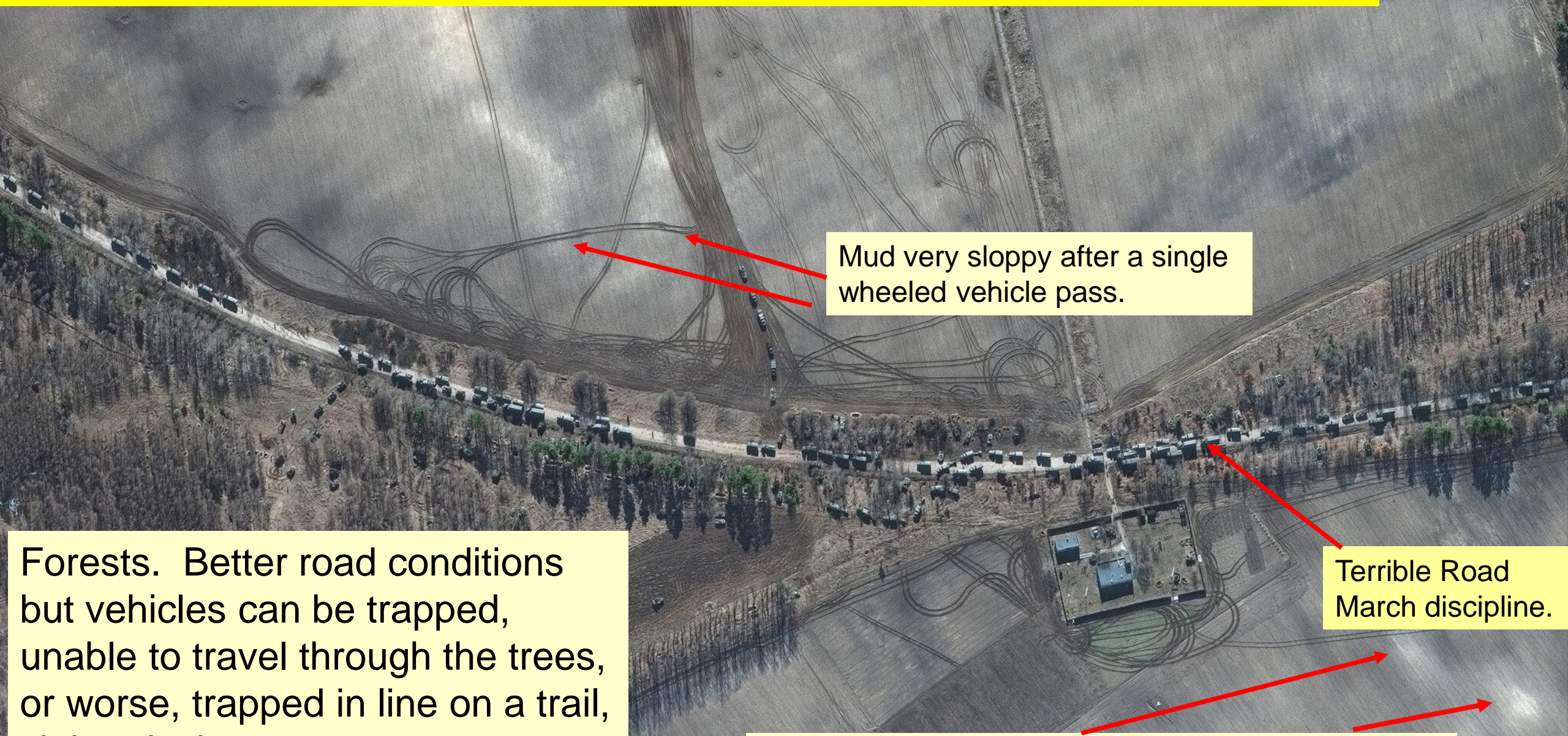
IVANKIV, UKRAINE

<https://www.ndtv.com/world-news/satellite-pics-show-large-convoy-of-russian-forces-40-kms-from-kyiv-2793943>

A satellite image showing a large military convoy of dark-colored vehicles, including trucks and cars, moving along a road in a rural area. The road is flanked by fields and some buildings. The text 'RUSSIAN GROUND FORCES CONVOY' is overlaid in the center of the image.

**RUSSIAN GROUND
FORCES CONVOY**

Wet Fields. Number of passes of vehicles goes to zero after multiple wheeled, tracked vehicle passes.



Mud very sloppy after a single wheeled vehicle pass.

Terrible Road March discipline.

Forests. Better road conditions but vehicles can be trapped, unable to travel through the trees, or worse, trapped in line on a trail, sitting ducks.

High sun reflectivity. Probably means standing water.





Russian vehicle convoy north of Kiev.
The vehicles can not travel through the forest.
Apparent terrible road discipline, with 3-abreast vehicles preventing refueling, resupply, or on-road / off-road maneuver.

Compare with US Convoy Operations



A gun truck from the Nevada National Guard's 1864th Transportation Company prepares for a convoy escort detail During the company's deployment in support of Operation Iraqi Freedom.

<https://www.reviewjournal.com/news/military/guard-unit-to-mark-10th-anniversary-of-first-iraq-deployment>





DEMON convoy staging just inside Ali Al Salem AB main gate. Base junkyard and Kuwaiti AF compound behind.

Some concluding remarks:

We are (only) four weeks into what could be a protracted brutal conflict.

Early expectations by some in the Media Elite Class have been way off the mark.

Early predictions of a “three days until Kiev falls and a replacement regime is in place,” were misplaced.

Early pronouncements that weather’s effects on the terrain would be no factor because of the expertise of the Russian invaders were also wrong.

My analysis, based on experience forecasting weather’s effects on VII Corps in Europe, observations of TV, Internet sources, is that weather and weather effects controlled the early days and weeks of the war.

Invading forces were constrained to roadways, many of them main, paved roads.

Advantages of tracked vehicles to use maneuver to envelop and summarily defeat the defenders were lost by the Russians at the outset.

Failure by the Russian attackers in these early days, and the ability of the Ukrainian defenders to shape the defensive battle may have fatally blunted offensive blows of the Russians.

Early claims by many experts have been wrong. Only time will tell the outcome.