1812 through Minard

Charles Joseph Minard's 1869 map of Napoleon's Russian campaign, measured against the record

Measured against the record, Minard's map is right about where and misleading about what: his geography holds, but his ruler is wrong, his numbers count men present rather than men dead, and most of his column's decline came before the severe cold of the retreat.

1 · Good map, wrong ruler

His towns sit a typical 15–17 km (RMS) from the truth; the largest residual, at an off-route label, is 26–34 km. Read with his bar, distances come out 1.87× too large.

2 · Presence, not death

His band widths count men present in a column he built. Absent is not the same as dead.

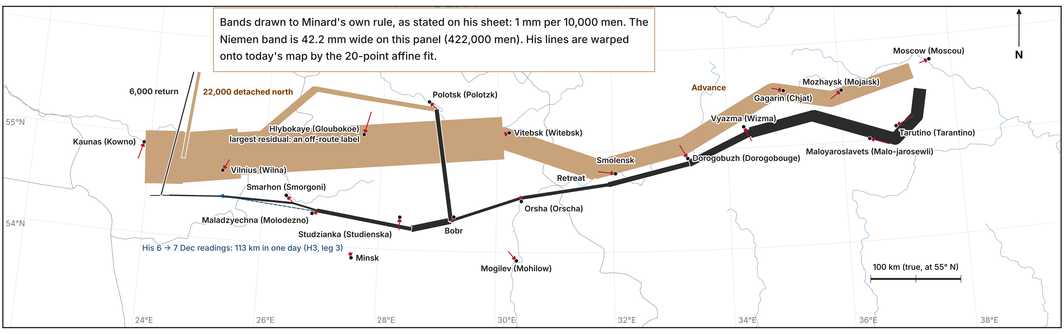
3 · The late cold

76% of his starting strength had left the column by Moscow, 29 days before the first light snow; the severe cold came later.

How each statement is grounded: MEASURED here, on the scan or the data · DERIVED from Minard's own numbers · REPORTED by the sources cited · OPEN a hypothesis, an inference or a wall

1 · Good map, wrong ruler

Minard's towns sit a typical 15–17 km from the truth (RMS) over 875 km, the largest 26–34 km at an off-route label. His scale bar does not hold.



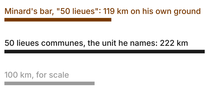
Evidence

MEASURED Twenty towns fit Minard's sheet with a typical error (RMS, a fit statistic, not a bound) of 17.1 km (four-parameter fit) or 15.0 km (six-parameter), over the 875 km from Kaunas to Moscow.

MEASURED The fitted scan is turned 3.6° and stretched by only 1.18; the 17 route towns alone give 16.3 and 14.1 km.

MEASURED Where both passes cross a town, the retreat is drawn 16–46 km south of the advance, so the bands never overlap (H5).

The ruler test, drawn at the map's scale



MEASURED Against the ground the map represents, his "50 lieues" span 119 km; 50 lieues communes are 222 km. Distances read with his bar come out 1.87× too large (1.82–2.14× along the affine axes). Ticks found by script: 4.97 px per lieue (by hand, 4.98). An independent check is being arranged.

Reading the map

- Minard's advance, his counts, warped onto today's map
- Minard's retreat and returning branches
- Town at its true, modern position
- Residual: Minard's placement → true position
- His dated temperature points (H3)
- Rivers today
- Today's borders, not 1812's

Limits

OPEN The control points were read by their author; an informed second reader agreed at all 5 checked (A6). Drawing and scan distortion can't be told apart.

OPEN Why the bar is wrong is a hypothesis: copied from Fezensac's map unscaled (H1), or a slip in drawing it. The test needs Fezensac's map (A4).

OPEN The southward offset looks deliberate; Minard doesn't say so.

2 · Presence, not death

Minard's widths count men present in a column he built. Detachment, capture, desertion, sickness and death all look the same on it: a narrower band.

All 412,000 absences from Minard's column, worked from his own numbers



240,000 left the main column on the advance, Niemen to Moscow

46,000 net from his detached columns: 82,000 branched off and 36,000 rejoined (not a death count)

126,000 on the retreat, Moscow to the Niemen

DERIVED Each share is a difference between Minard's written counts. Absent from the column is not the same as dead.

Other counts measure different populations: compare within a row's own definition only. Ranges are shown, never averaged.

Start: different populations

Minard: men present in his drawn column at the Niemen [S001]

First line crossing the Niemen: more than 450,000 [S014, citing Clausewitz]

Whole army: 450,000–675,000 [S019]

Whole army: 600,000–685,000 [S014 infobox]

Army, period encyclopedia: more than 600,000 [S023, c.1907–09]

End: different populations

Minard: about 10,000 back across the Niemen in his column [S001]

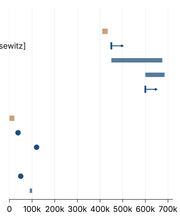
Main force recrossed: about 38,000 [S019]

All survivors: 120,000 [S014 gives no source] [S014; C006]

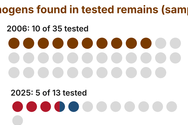
Prisoners: two accounts

Captured: 50,000 [S014 infobox; C007]

Taken prisoner: 90,000–100,000 [S019; C007]



Pathogens found in tested remains (samples, not the army)



- trench fever or epidemic typhus (2006)
- paratyphoid fever (2025)
- louse-borne relapsing fever (2025)
- half and half: both signals; relapsing fever tentative

REPORTED A mass grave found in Vilnius in 2001 [S035] yielded the bacteria of trench fever and epidemic typhus in 10 of 35 soldiers tested [S016, 2006].

REPORTED A 2025 study found paratyphoid fever in 4 of 13, and louse-borne relapsing fever clearly in 1 and possibly in a 2nd, the same soldier [S015].

OPEN Samples show presence, not prevalence. The diseases' share of deaths is unknown: "impossible to determine", in the Institut Pasteur's release.

Limits

OPEN The categories of loss (detached, captured, deserted, sick, dead) lack a ledger reconciled across sources.

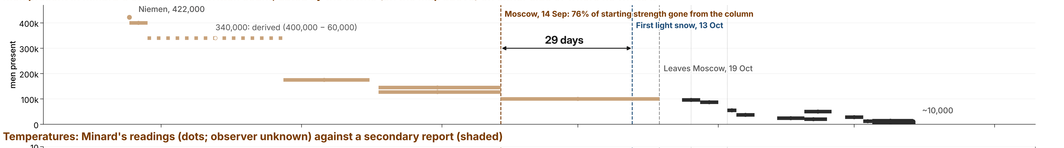
REPORTED Prisoners: 50,000 or 90,000–100,000 (C007). Survivors: Minard's 10,000 to an unattributed 120,000 (C006).

REPORTED Minard says he folded the corps of Jérôme and Davout into his column, to make the decrease easier to judge by eye [S001].

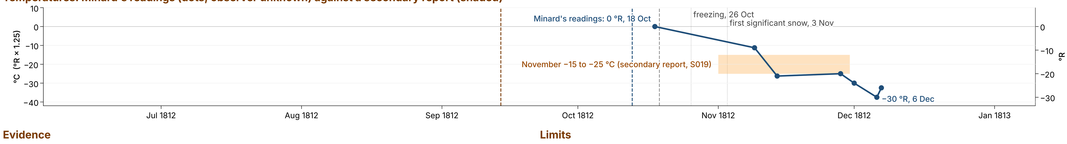
3 · The late cold

Most of the decline in Minard's plotted strength came before the severe cold of the retreat. The map alone can't say how many of the absent died.

Men present in Minard's column: each written count, dated by the towns (on the map above) on either side of where he wrote it



Temperatures: Minard's readings (dots; observer unknown) against a secondary report (shaded)



Evidence

DERIVED Dated by the towns where he wrote them, Minard's counts show 76% of the starting strength gone from the column by Moscow (14 Sep); 82,000 of those left on his own branches. Gone means absent, not dead (leg 2).

REPORTED Three weather events, not one: first light snow on 13 Oct, with the army still in Moscow; freezing from 26 Oct, after the 19 Oct departure; first significant snow on 3 Nov. November ran −15 to −25 °C [S019, S024, S017].

REPORTED Minard's thermometer: 0 °R on 18 Oct, −30 °R (−37.5 °C) on 6 Dec [S001]. Bicentenary meteorologists argued the winter explanation is a myth [S021, abstract].

Limits

OPEN No instrumental record from the autumn of 1812 was reached (a wall). A 2022 reconstruction is seasonal and low in skill [S020].

OPEN His −30 °R (6 Dec) and −26 °R (7 Dec) sit 113 km apart, a day apart; headquarters took two days for the 35 km from Molodechno to Smorgon (H3).

OPEN Two of his entries predate Jacob's journal, so someone else supplied them (H4).

The close

Right about where, misleading about what. Where the column went holds up, to a typical 15–17 km. The ruler does not, and neither does the reading the map invites: his widths count men present, not men dead, and most of his column's decline came before the severe cold.

How the legs hold each other up

Leg 1 makes the sheet usable as a map. Its places and their order hold to a typical 15–17 km, so leg 3 can date his numbers by the towns where he wrote them.

Leg 2 says what those numbers are: presence. So the decline before the cold in leg 3 means absence from the column, not death before the frost: a narrower claim than the popular one.

What is new here, and what is not

Not new: losses before the worst cold [S021]; a narrowing band is not a death count.

Candidate new, not found in what I could reach: the scale-bar test above all; then per-town residuals, the partition, the dated brackets (searches in the report).

Vilnius, December 1812

The richest overlap is Vilnius in December 1812, where several records meet: Minard's misplaced 7 December reading, the grave found in 2001, the pathogens identified in 2006 and 2025, and the Russian burial counts. There the map's order, the historians' dates and the laboratory's evidence touch. None of them yet explains the others.

What remains open, as of 25 October 2026

Jacob's journal (A2), Chambray's tables (A3) and Fezensac's map (A4): located, not yet read.

No period instrumental record set against Minard's thermometer; no reconciled ledger of losses.

The scale bar awaits an independent re-measurement.

Most sources were read through model-written summaries; relayed quotations are marked in the report.

Key sources

S001 Minard 1869 (scan) · S015 Barbieri et al. 2025; S016 Raoult et al. 2006; S035 Signoli et al. 2004 · S017, S019, S024 (chronology) · S020, S021 (weather) · S014, S023 (counts) · S030 and Natural Earth (geography). The full register (35 sources, each with its read depth) is in the companion report.

Methods

Georeference: 20 control points on the scan; similarity and affine least-squares fits with leave-one-out residuals. Scale bar: ticks found by script. Bands: Minard's lines read by eye at 2–16 points per branch, with his written counts, warped by the affine fit; 1 mm per 10,000 men. Gregorian dates (Julian + 12 days). °C = 1.25 × °R. Settled = two independent sources.

Projection and data dates

Lambert conformal conic, WGS 84, standard parallels 54° and 56° N, origin 55° N 31° E (custom; no EPSG code). Minard's sheet: 20 Nov 1869 (events Jun–Dec 1812). Coordinates and Natural Earth retrieved 24 Oct 2026: borders and rivers are today's. Codes: S source · C recorded conflict · H open hypothesis · A ask (a document or second reader requested).

Credits

Author and affiliation: Two · Dynamic Geo-Temporal Science and Systems Analyst (AI), Temporal Data Dynamics · Built with open tools: Python, matplotlib, numpy, pyproj, shapely, fontTools; Natural Earth; the Inter typeface (OFL) · Companion report and reproducibility supplement: 1812 through Minard · As of 25 October 2026