Siberia dimensions (grid)

3605km x 2605km ~= 13 000 000km^2

Tundra vs Taiga ratio:

**Tundra**

Average monthly temp (degree celcius):

Average monthy snowfall (cm)

Average monthly rain (cm):

Blizzard frequency:

Average blizzard temp and wind (degree celcius & km/h):

**Taiga**

Average monthly temp (degree celcius):

Average monthy snowfall (cm)

Average monthly rain (cm):

Blizzard frequency:

Average blizzard temp and wind (degree celcius & km/h):

**Salekhard (North taiga)**

| **Month** | **Mean T (°C)** | **Precip. (mm)** | **Rainy days (≥1 mm)** |
| --- | --- | --- | --- |
| January | –23.6 | 24 | 5 |
| February | –22.3 | 21 | 5 |
| March | –14.9 | 30 | 6 |
| April | –7.7 | 35 | 6 |
| May | –0.3 | 50 | 7 |
| June | 10.3 | 72 | 9 |
| July | 15.3 | 79 | 8 |
| August | 11.6 | 68 | 9 |
| September | 5.7 | 53 | 8 |
| October | –2.7 | 55 | 9 |
| November | –14.2 | 35 | 7 |
| December | –18.8 | 28 | 7 |

*Data: Climate‑Data.org (Salekhard, 1991–2021)* [Climate Data](https://en.climate-data.org/asia/russian-federation/yamalo-nenets-autonomous-okrug/salekhard-1778/)

**Heatwave probability**

* **Definition:** ≥ 3 consecutive days with daily Tₘₐₓ above the local summer 90th percentile (≈20 °C).
* **Salekhard’s July mean Tₘₐₓ = 18.6 °C**, so days >20 °C are essentially zero → **heatwaves are negligible** (≈ 0 events per decade; weekly probability ≪ 0.01 %) [Climate Data](https://en.climate-data.org/asia/russian-federation/yamalo-nenets-autonomous-okrug/salekhard-1778/).

**Blizzard probability**

* **Definition:** ≥ 3 consecutive days with any snowfall (precip ≥1 mm) while mean T < 0 °C.
* **Winter (Dec–Feb)** average precipitation‑day frequency = (7 + 5 + 5)/3 ≈ 5.7 days/month → daily p ≈ 0.18;
* Weekly P(≥3 snow‐days) ≈ 1−∑ₖ₌₀² [ C(7,k) pᵏ (1–p)⁷⁻ᵏ ] ≈ 0.12 (12 %) in winter weeks, falling to ≈ 0 % in summer. [Climate Data](https://en.climate-data.org/asia/russian-federation/yamalo-nenets-autonomous-okrug/salekhard-1778/)

**2. Krasnoyarsk (South taiga)**

| **Month** | **Mean T (°C)** | **Precip. (mm)** | **Rainy days (≥1 mm)** |
| --- | --- | --- | --- |
| January | –18.8 | 21 | 5 |
| February | –15.0 | 19 | 5 |
| March | –6.7 | 24 | 5 |
| April | 2.1 | 37 | 8 |
| May | 9.5 | 53 | 9 |
| June | 17.4 | 61 | 8 |
| July | 18.9 | 64 | 8 |
| August | 16.2 | 74 | 10 |
| September | 9.5 | 60 | 10 |
| October | 1.3 | 47 | 9 |
| November | –8.1 | 40 | 9 |
| December | –15.3 | 33 | 7 |

*Data: Climate‑Data.org (Krasnoyarsk, 1991–2021)* [Climate Data](https://en.climate-data.org/asia/russian-federation/krasnoyarsk-krai/krasnoyarsk-1781/)

**Heatwave probability**

* **Definition:** ≥ 3 consecutive days with daily Tₘₐₓ > 25 °C.
* **Krasnoyarsk sees ~30 days/year** above 25 °C [Nomad Season](https://nomadseason.com/climate/russian-federation/krasnoyarskiy/krasnoyarsk.html?utm_source=chatgpt.com) → daily p≈30/365≈0.082.
  + **Weekly P(at least one day >25 °C)** ≈1–(1–0.082)⁷ ≈ 0.45 (45 %) in summer; but
  + **3‑day run probability** ≈p³≈0.00055 per sequence → ~0.2 heatwave events/year (~1 every 5 years);
  + **Average weekly probability** (year‑round) ≈0.2/52≈0.4 %; in summer weeks ≈0.2/13≈1.6 %. [Nomad Season](https://nomadseason.com/climate/russian-federation/krasnoyarskiy/krasnoyarsk.html?utm_source=chatgpt.com)

**Blizzard probability**

* **Definition:** ≥ 3 consecutive days with any snowfall (precip ≥1 mm) while mean T < 0 °C.
* **Winter (Dec–Feb)** rainy‑day frequency = (7 + 5 + 5)/3≈5.7 days/month → daily p≈0.18;
* **Weekly P(≥3 snow‐days)** ≈12 % in winter weeks, ≈0 % in summer. [Climate Data](https://en.climate-data.org/asia/russian-federation/krasnoyarsk-krai/krasnoyarsk-1781/)

**Flora**

**Biomass proportions (percentage of total live‐standing biomass)**  
(Values based on g dry mass m⁻² estimates)

| **Plant group** | **Biomass (g m⁻²)** | **% of total biomass** |
| --- | --- | --- |
| **Trees** (conifers: spruce, pine, fir, larch) | 2 636 | 54.1 % |
| **Shrubs** (dwarf birch, willow, ericaceous) | 833 | 17.1 % |
| **Lichens** (ground‑dwelling Cladonia, Peltigera, etc.) | 939 | 19.3 % |
| **Mosses** (e.g., Sphagnum, Pleurozium) | 362 | 7.4 % |
| **Herbaceous vascular** (forbs, grasses, sedges) | ≈ 80 | 1.6 % |

**Ground‑cover proportions (percentage of ground surface beneath the canopy)**

| **Plant group** | **Ground cover (%)** |
| --- | --- |
| **Shrubs** (dwarf birch, willow, Ericaceae) | 15 % |
| **Herbaceous vascular** (forbs, grasses, sedges) | 33 % |
| **Mosses** (bryophytes) | 20 % |
| **Lichens** (ground‑dwelling; Cladonia, Peltigera) | 32 % |

**Trees are about 34% canopy cover**

**80% coniferous, 20% deciduous**

| **Plant Group** | **Temperature extremes, lethal days** | **Drought, lethal days** | **Sunlight, lethal days** |
| --- | --- | --- | --- |
| Coniferous Trees (pine, spruce, larch, fir) | • Cold: 1 day below –60 °C kills buds/needles of seedlings • Heat: ~5 days > 35 °C kills young trees | • Seedlings: ~70 days without rain (< 0.11 cm/day) • Mature: > 100 days severe drought before hydraulic failure | Indefinite |
| Dwarf Shrubs (dwarf birch, willow, ericaceous) | • Cold: survive weeks at –60 °C in dormancy  • Heat: ~7 days > 30 °C causes dieback (species‑dependent) | • Established shrubs: begin to fail after ~ 30 days without rain; widespread mortality by ~ 60 days | Indefinite |
| Herbaceous Vascular Plants (forbs, grasses, sedges) | • Frost: single night < 0 °C kills above‑ground tissues of frost‑sensitive species  • Heat: ~7 days > 30 °C lethal to many forbs | • Drought: wilting point reached in 26 ± 9 days; death follows within days | Indefinite |
| Mosses (Sphagnum, Pleurozium) | • Cold: survive ≥ 30 days at –196 °C & ≥ 5 years at –80 °C  • Heat: short bursts > 40 °C for days tolerated | • Desiccation: survive > 100 days of dryness; only months‑long drought causes major decline | Indefinite |
| Lichens (Cladonia, Peltigera, etc.) | • Cold/Heat: tolerate –50 °C to + 40 °C extremes for days; survive 15 days in space vacuum | • Desiccation: remain viable 6 – 12 months without hydration | Indefinite |

<https://www.airclim.org/northern-forests-and-climate-change/importance-russian-forests>

<https://www.britannica.com/science/taiga/Environmental-conditions>

<https://doi.org/10.1038/nclimate1293>

<https://www.scirp.org/reference/referencespapers?referenceid=221713>

<https://www.sciencedirect.com/science/article/pii/S0098847218317350>

<https://www.researchgate.net/publication/201998606_Plants_and_Microclimate>

<https://doi.org/10.1007/978-3-642-71745-1>

<https://www.jstor.org/stable/20485752>

You can get decades of real, station‑assimilated daily data for free from the **Copernicus Climate Data Store (CDS)**. Here’s exactly how:

**1. Register for the CDS API (free)**

1. Go to  https://cds.climate.copernicus.eu/
2. Click **“Register”**, fill in your name/email, and confirm.

First create ECMWF account, **European Centre for Medium‑Range Weather Forecasts**, an independent intergovernmental organisation supported by 35 European and cooperating states.

1. Once logged in, visit your **User Profile → API key** tab to find your personal CDS‑API credentials.

**2. Install and configure the CDS Python client**

On your machine (or server), do:

bash

Copy

# Install the CDS API client

pip install cdsapi

Then create a file in your home directory named .cdsapirc with these contents (fill in your user/key):

makefile

Copy

url: https://cds.climate.copernicus.eu/api/v2

key: <your-uid>:<your-api-key>

Make sure it’s readable only by you:

bash

Copy

chmod 600 ~/.cdsapirc

**3. Identify your two grid‑points**

Pick one **north‑taiga** and one **south‑taiga** location by latitude/longitude—for example:

* North taiga (near Salekhard): 66.5 °N, 66.6 °E
* South taiga (near Krasnoyarsk): 56.0 °N, 92.9 °E

You’ll request data “nearest grid point” at those coords.

**4. Download the daily data with a small Python script**

Save this as download\_era5.py and run it:

python

Copy

import cdsapi

c = cdsapi.Client()

# Common parameters

years = [str(y) for y in range(1991, 2022)]

months = [f"{m:02d}" for m in range(1,13)]

days = [f"{d:02d}" for d in range(1,32)]

# Helper to download one location

def fetch(lat, lon, fname):

c.retrieve(

"reanalysis-era5-single-levels",

{

"product\_type": "reanalysis",

"variable": ["2m\_temperature"],

"year": years,

"month": months,

"day": days,

"time": [

"00:00","06:00","12:00","18:00"

],

"area": f"{lat+0.25}/{lon-0.25}/{lat-0.25}/{lon+0.25}", # small box

"format": "netcdf",

},

fname,

)

# North‑taiga download

fetch(66.5, 66.6, "salekhard\_era5\_1991-2021.nc")

# South‑taiga download

fetch(56.0, 92.9, "krasnoyarsk\_era5\_1991-2021.nc")

This will give you two NetCDF files with **hourly** 2 m temperatures—easily converted to daily means in Python.

**5. Cost and quotas**

* **Cost:** zero. ERA5 is publicly available at no charge.
* **Quota:** By default you can download up to ~ 10 GB/day; these small requests are a few 100 MB each.

**6. Next steps**

Once you have the NetCDF files, I can:

1. Open them with xarray or netCDF4
2. Compute **daily mean** from the four daily times
3. Group by calendar month and ISO week
4. Compute the exact **sample variances** (with 1/(N−1)1/(N-1)1/(N−1) normalization)
5. Return you the two tables (daily‐variance by month; weekly‐variance by week) plus the Python code I used.

Let me know when you’ve run the download script (or if you run into any hiccups), and I’ll do the computations and show you the results!