Centrum Badań Kosmicznych
Polskiej Akademii Nauk

Space Research Centre
of the Polish Academy of Sciences

Where is snow?

Exploring open research data for knowledge based society.

EUNIS 2025 · BELFAST

Anna Pacholak

Kamil Drejer

Michał Krupiński

Andrzej Z. Kotarba

How does winter in your country usually look like?

Like this?

… or like this?

“This winter is unusual…”

What are the facts?

Where is the data?

cryo.land.copernicus.eu/finder/#

Dział Informatyki CB... | 01_iTRACASA_S1su... | river_ice | cnn_sfcrf_ic_2.pdf | EnviroSolutions mail | Wszystkie zakładki

Copernicus Europe's eyes on Earth | Land Monitoring Service

High Resolution Snow & Ice Monitoring

Log In | Register

SEARCH CRITERIA

Search phrase, e.g. winter in Copenhagen

Search product ID, e.g FSC_20200601T104354

Observed 2024-12-01 2025-01-02

Published YYYY-MM-DD YYYY-MM-DD

Position Latitude Longitude

Cloud cover 0-100 %

Collection:

HR-S&I

Product Type: Product Type

Mission: Mission

https://cryo.land.copernicus.eu/resto/api/collections/H

Polygon Selection | Upload Polygon

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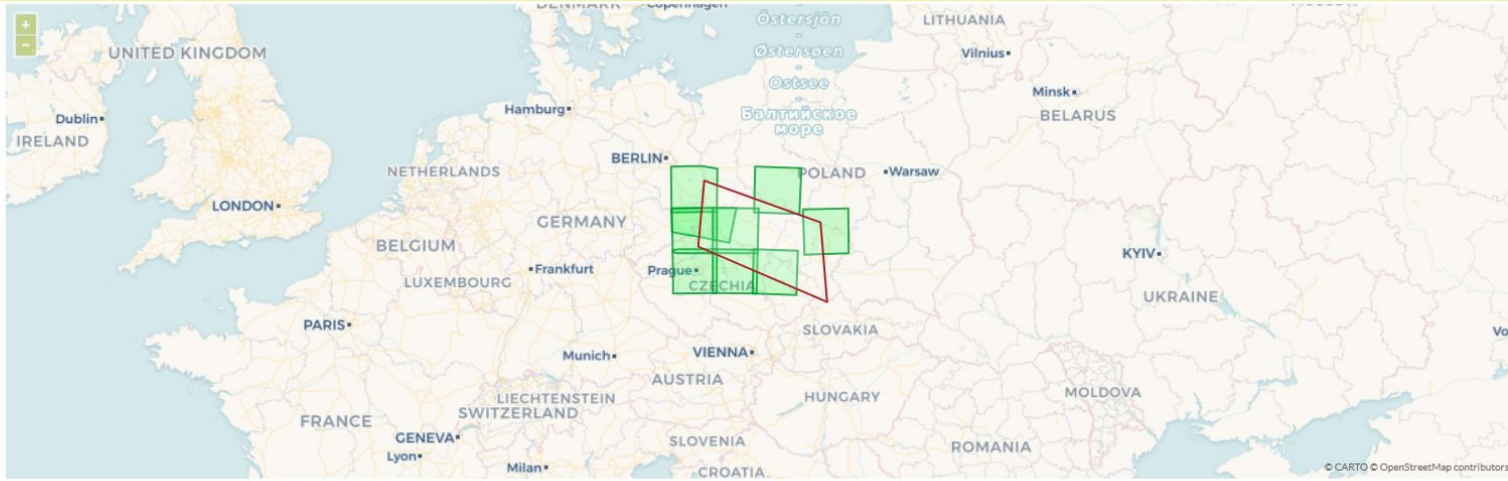
Search



search results

first 1 2 3 4 5 6 7 8 9 10 11 >

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back

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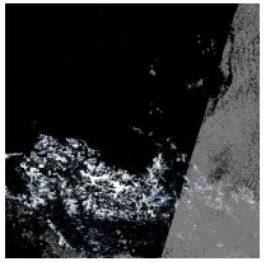

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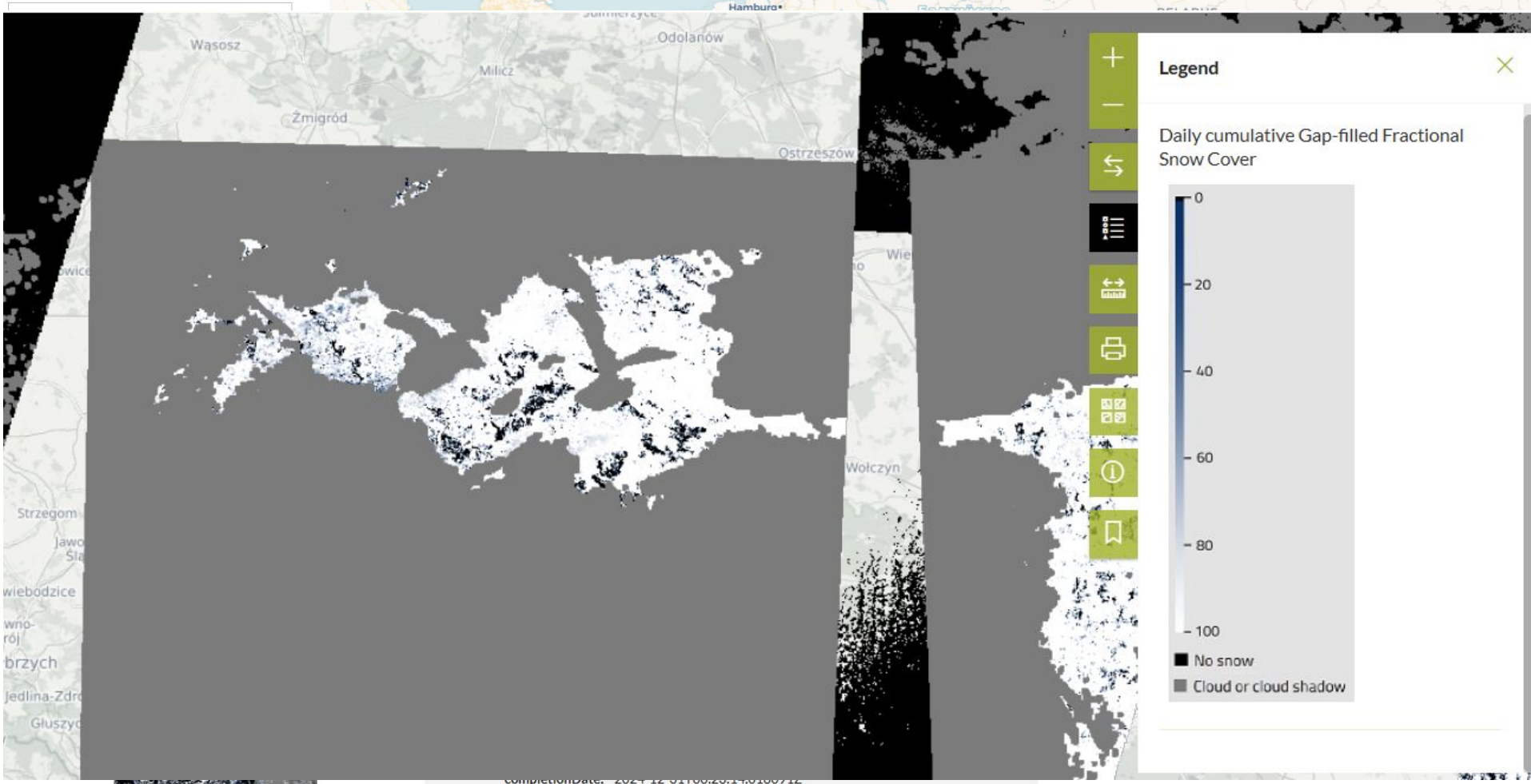
Copernicus Europe's eyes on Earth
Land Monitoring Service

High Resolution Snow & Ice Monitoring

SEARCH CRITERIA

Search phrase, e.g. winter in Copenhagen



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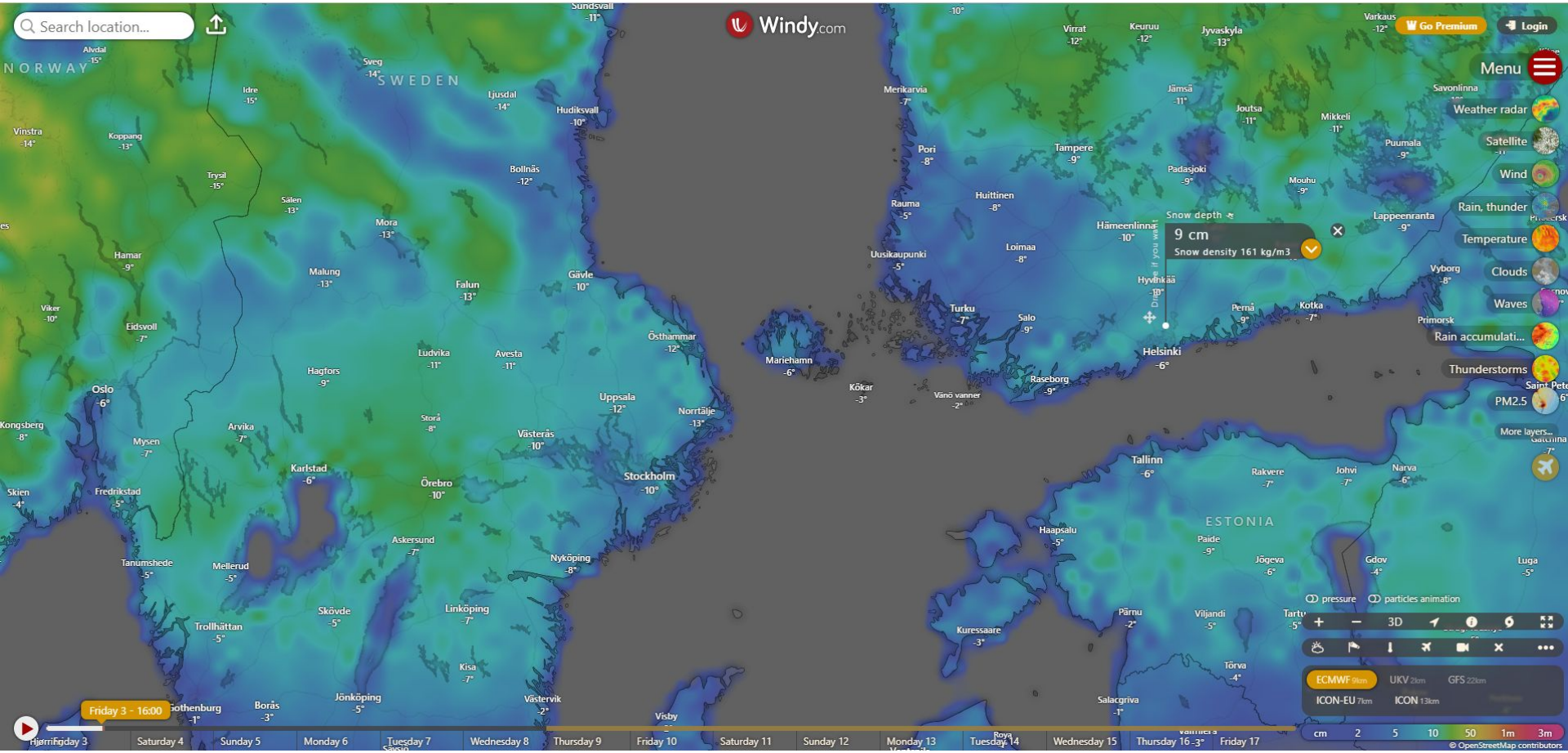
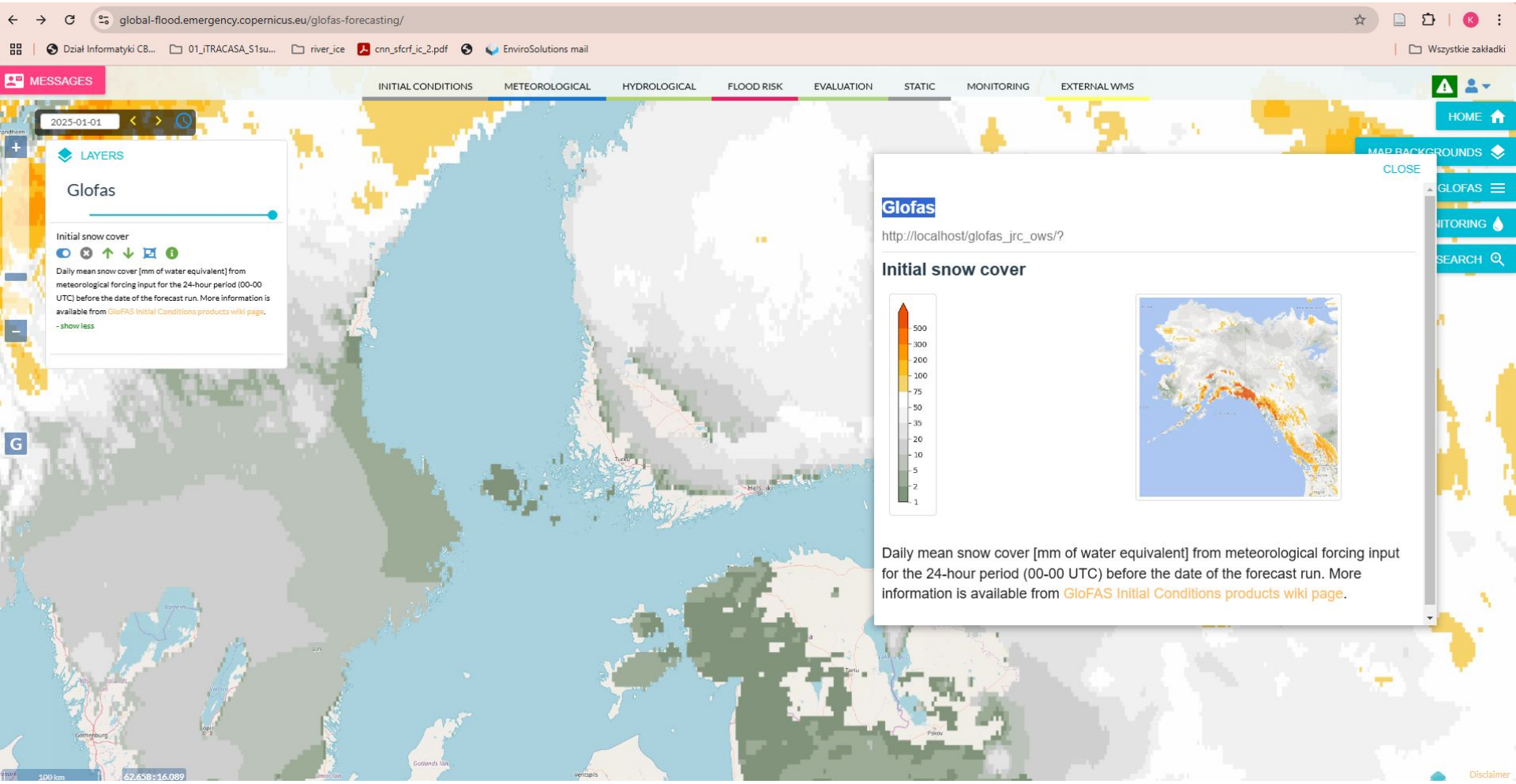
cloudCover:	22

Weather forecast applications



https://www.windy.com/

ALTERNATIVE: Global Flood Awareness System



https://global-flood.emergency.copernicus.eu/glofas-forecasting/

Where should I point my mouse to find information about the current snow cover extent?

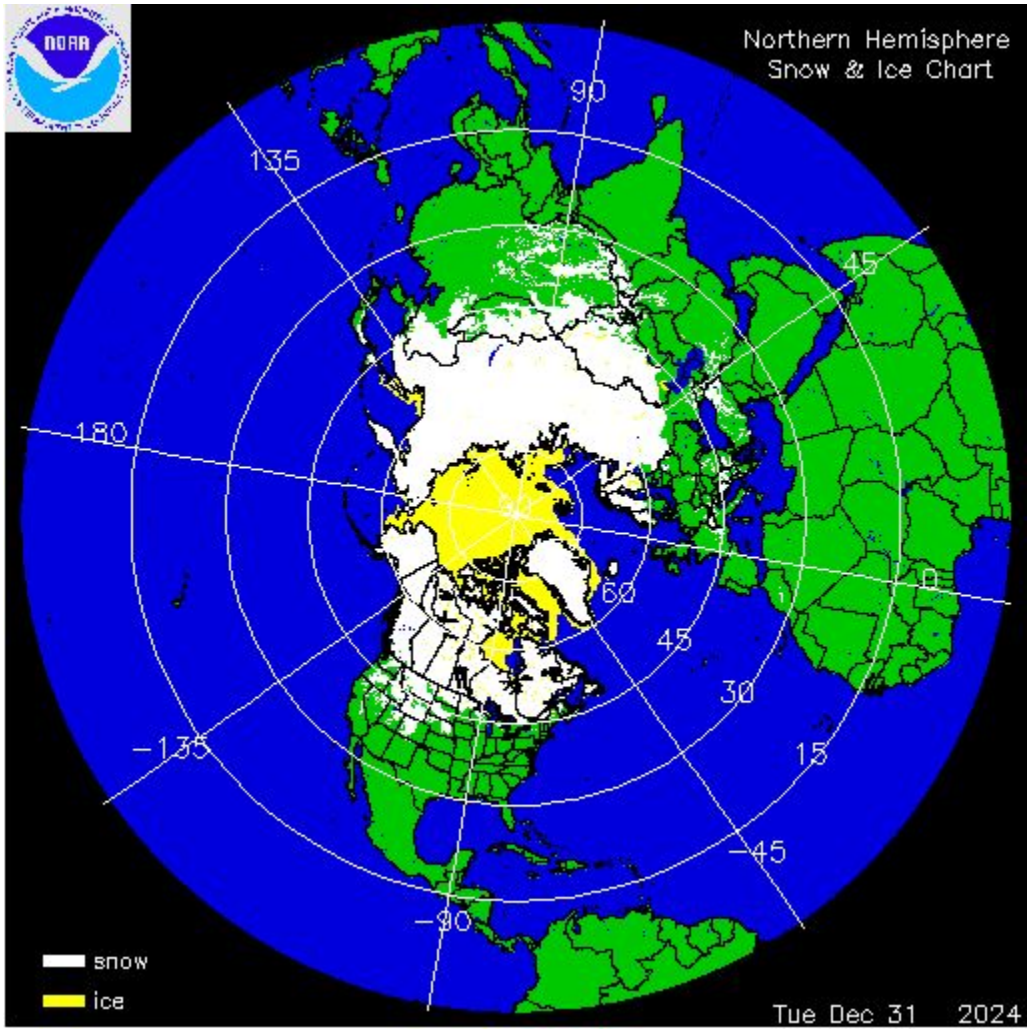
There was no place in the internet, where you could see:

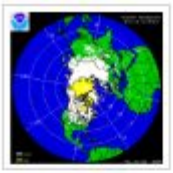
Where is the snow currently?

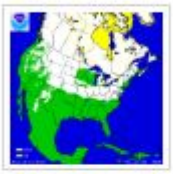
How much snow is there in Europe?

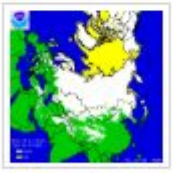
Is the current winter "typical"?

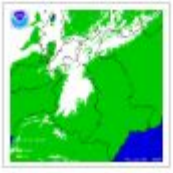
The Interactive Multisensor Snow and Ice Mapping System (IMS)











National Snow and Ice Data Center
a part of CIRES at the University of Colorado Boulder

The Interactive Multisensor Snow and Ice Mapping System (IMS)

USNIC

(IMS) is an operational software package used to demarcate the presence of snow and ice across the entire northern hemisphere:

- various satellite imagery and derived products (from GOES, Himawari, METEOSAT, JPSS, POES, DMSP, EOS, Sentinel 1),
- radar,
- models,
- ground station data.

NOAA

Open Access

ECMWF Feature article
from Newsletter Number 143 – Spring 2015

METEOROLOGY

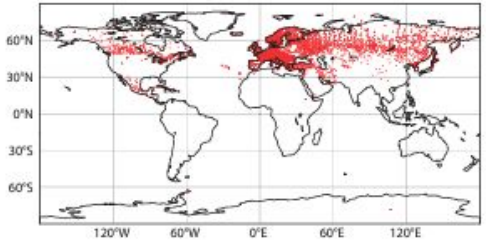
Snow data assimilation at ECMWF

www.ecmwf.int/en/about/news-centre/media-resources
doi:10.21957/kpxq6x5

Snow observations used at ECMWF

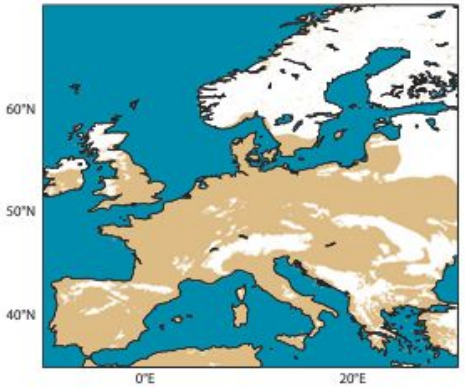
A

The snow analysis relies on SYNOP and national networks of snow depth ground observations available on the GTS as well as on the IMS snow cover information available for the northern hemisphere.



The map shows the spatial distribution of in situ station reports available on the GTS on 20 January 2015. On this day, 16,112 snow depth observations were reported from 3,810 stations. A total of 2,844 stations reported snow depth using the Traditional Alphanumeric Code (TAC), 663 stations reported additional snow data using the dedicated snow BUFR template, 303 new SYNOP stations reported in BUFR, and 1,573 stations reported both in BUFR and TAC. In IFS Cycle 40r1, the first two types of snow depth reports are used.

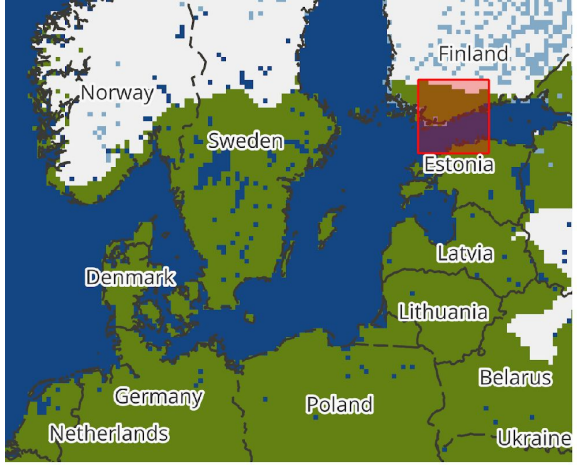
The IMS product provides cover maps for the northern hemisphere. It combines microwave and visible sensors to provide binary snow cover information in all weather conditions. An IMS observation of snow indicates that at least 50% of the grid cell is snow-covered.



IMS snow cover data over Europe on 20 January 2015

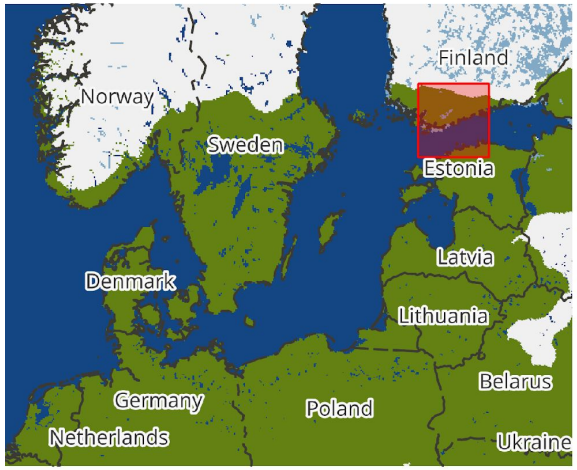
Source: https://www.ecmwf.int/sites/default/files/elibrary/2015/17328-snow-data-assimilation-ecmwf.pdf

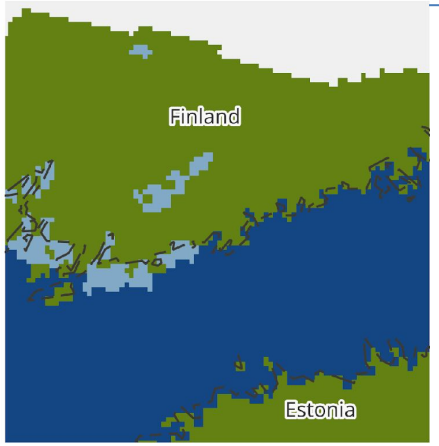
01.01.2025



1997

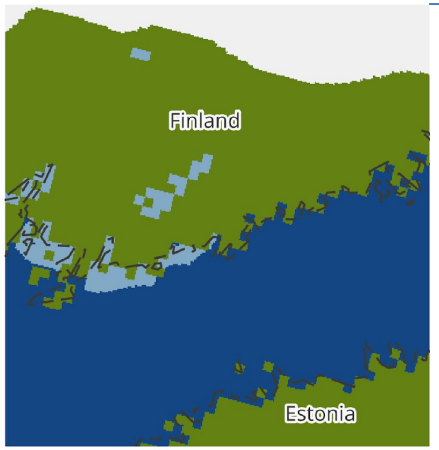
- 24 km





2004

- 4 km



2014

- 1 km

Open access data journey

Open – Source Solutions

PL
EN

snow cover extent

Snow in Europe

based on satellite observation

Snow Cover extent in Europe

Daily updated map on Snow Cover Extent in Europe.

Water (ice free)
Land (snow free)
Ice cover
Snow cover

Read usefull information about the map.

Full resolution (4 km/pixel)

Map is based on the **IMS** snow analysis, as published by NOAA [more].

Is current winter a typical? How much snow is in Europe, or in my country? Where is the snow?

Information presented on this website - i.e. the snow cover map for Europe (above) and plots of snow cover extent

Functionalities

po

Poland

Portugal

NOAA [more].

Is current winter a typical? How much snow is in Europe, or in my country? Where is the snow?

Information presented on this website - i.e. the snow cover map for Europe (above) and plots of snow cover extent (below) - will help you to answer those questions. The information results from satellite monitoring of climate conditions in Poland (and Europe), conducted by Earth Observation Group at Space Research Centre of the Polish Academy of Sciences (CBK PAN).

Presented analysis are based on satellite observations, provided by NOAA Interactive Multisensor Snow and Ice Mapping System (IMS). They are daily updated and report snow cover conditions during current winter season (from July to June). On this website you may also find a historical data for past winters and a climatological averages. Based on them you can independently assess how much current winter differs from a typical one.

Why do we care about the snow cower? Climatologists from CBK PAN examine snow cover because its presence influences the energy budget of the atmosphere and the hydrological budget of the environment. Snow fall influences also our daily life - heavy snow fall makes transport difficult, sometimes leading to disruptions in road and air traffic. Moreover, fast melting of snow may increase level of the rivers and even the onset of winter and spring floods.

Albania

Get high resolution plot as PDF

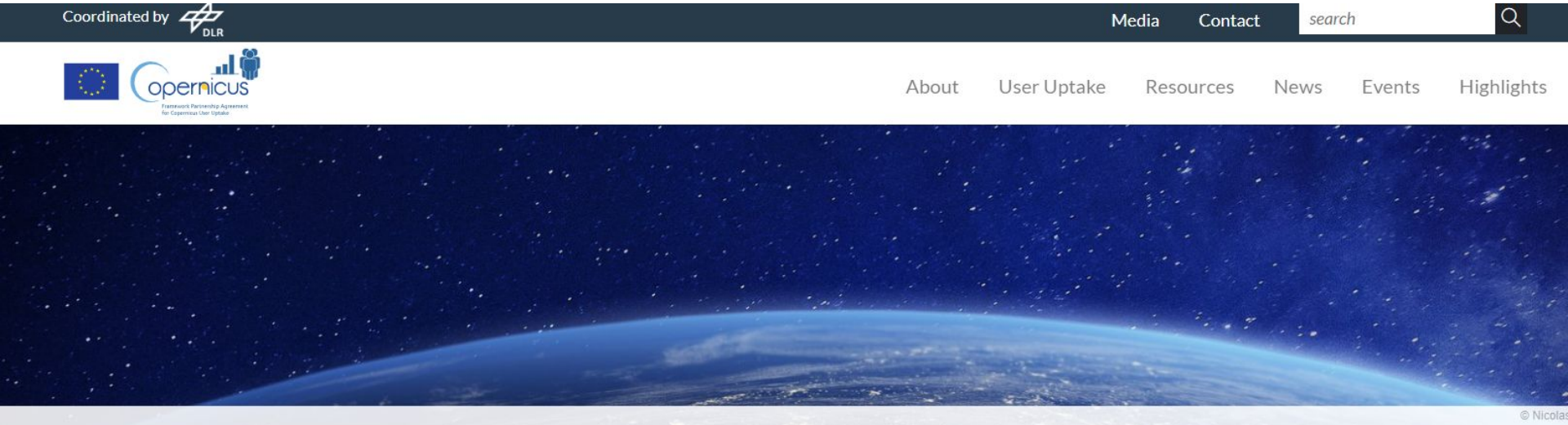
Get historical data on snow

How to read the plot?

Andorra

Get high resolution plot as PDF

Boost from the FPCUP project



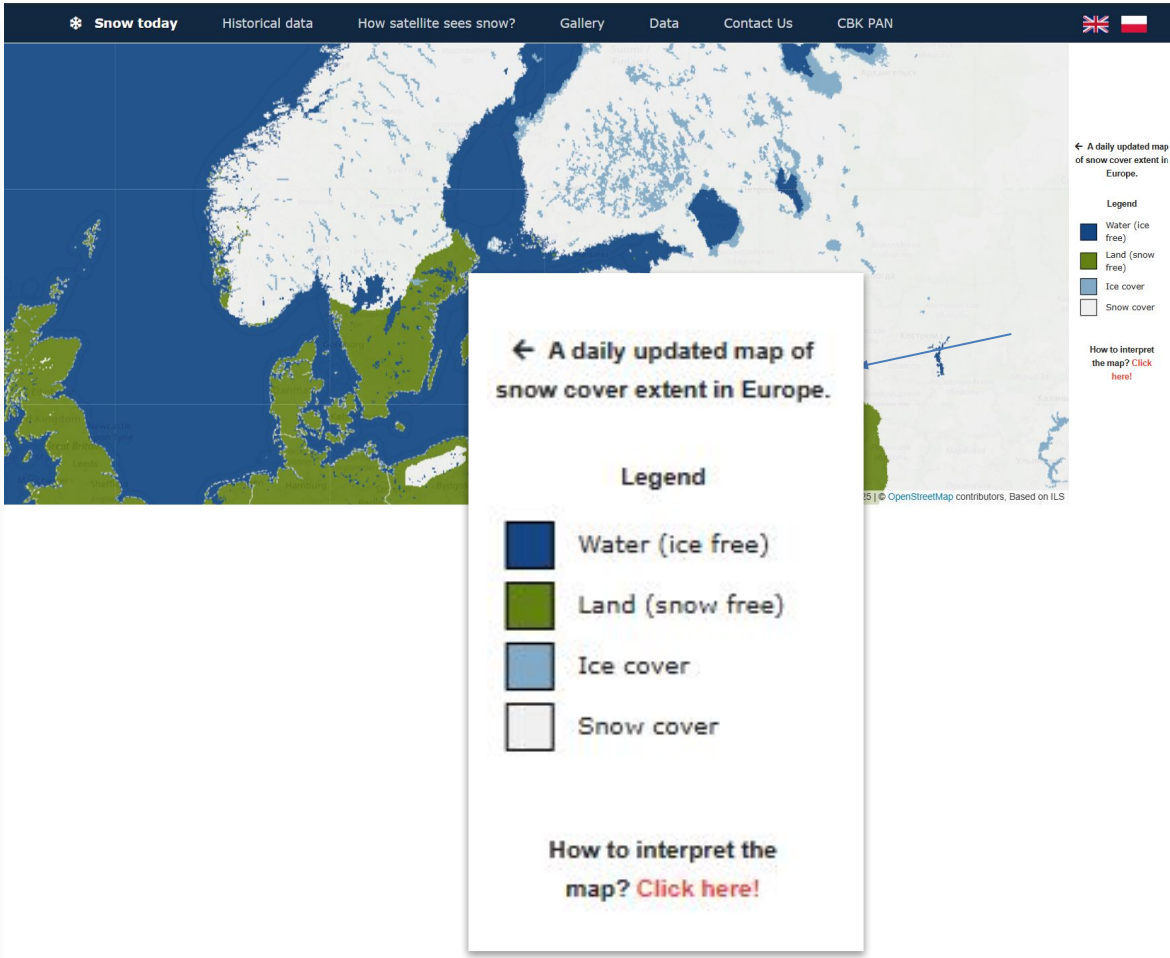
Functionalities

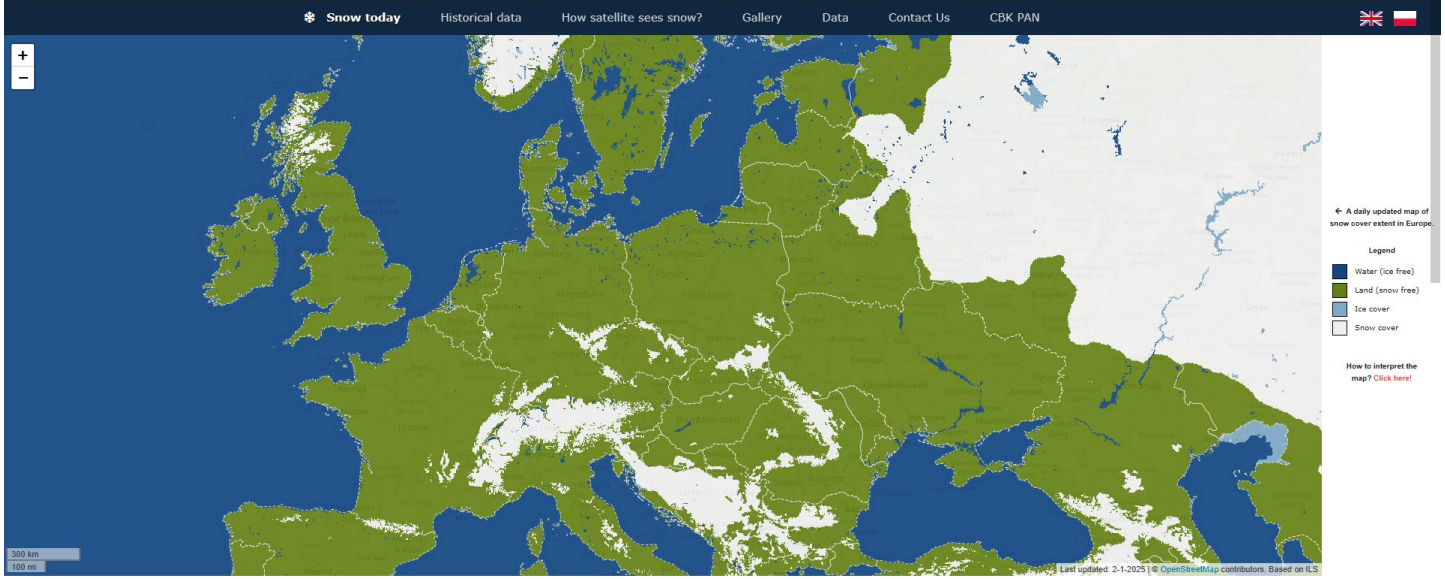
Duration: Apr 2022 - May 2025 Last Update: 03 May 2023

Open Data framework for the Baltic Sea drainage Basin

The main objective of this action is to foster innovative service development for sustainable management in the Baltic Sea catchment area. The innovation aims at open-source development to meet the needs of governmental agencies as well as promote the use of Copernicus data in business applications.

Implementing Partner: CBK PAN, FMI, IGiK, SNSA, TO
Type of Action: Developing and piloting downstream applications and services





Search for the names of the country you are interested in

Finland

Why do we care about the snow cower? Climatologists from CBK PAN examine snow cover because its presence influences the energy budget of the atmosphere and the hydrological budget of the environment. Snow fall influences also our daily life - heavy snow fall makes transport difficult, sometimes leading to disruptions in road and air traffic. Moreover, fast melting of snow may increase level of the rivers and even the onset of winter and spring floods.

Where is the snow currently? | How much snow is there in Europe? | Is the current winter "typical"?

Information presented on this website - i.e. the snow cover map for Europe and plots of snow cover extent - will help you to answer those questions.

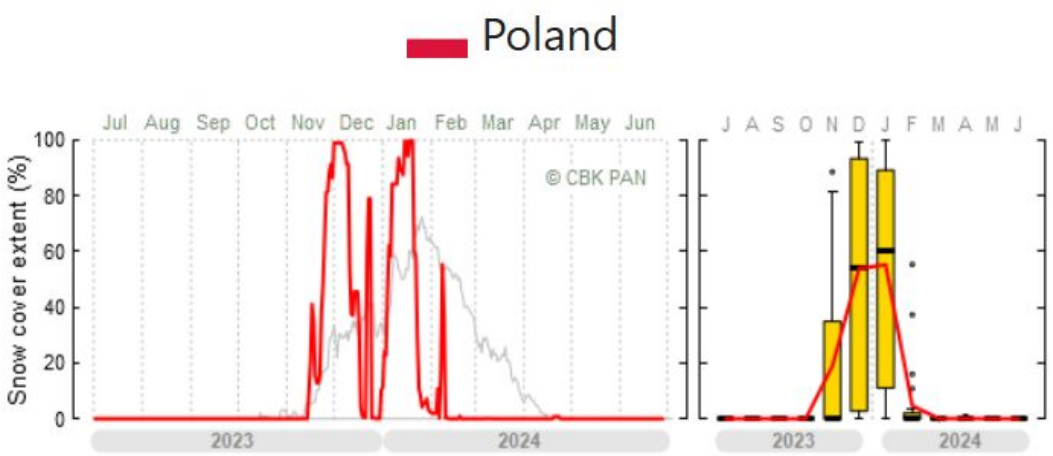
Historical data

Upon closely examining satellite data on changes in snow cover extent in individual countries, analyzed at the Space Research Centre of the Polish Academy of Sciences (CBK PAN), it is immediately noticeable that not all winters are alike. In recent years, there have been both "harsh" and "mild" winters.

We would call a winter "harsh" if snow cover persisted for a long time and covered the largest possible area of the country. An example of such a situation in Poland is the winter of 2005/06, when snow covered almost the entire country from mid-December until the end of April. This significantly impacted the average for the entire year—statistically, on each day between July 1, 2005, and June 30, 2006, snow cover extended over as much as one-third of Poland!

A mild winter is one where snow cover appears and quickly disappears, only occasionally covering more than 80-90 percent of the country. A good example of such a situation is the winter in Poland during the 2006/07 season, when snow appeared on a larger scale only at the turn of January and February.

How to read the plot? Get help.



Are you interested in winter in other countries?

Search for the names of the country

- Poland
- Albania
- Armenia
- Andorra
- Austria
- Azerbaijan
- Bosnia and Herzegovina
- Belgium
- Bulgaria
- Belarus
- Czech Republic
- Denmark
- Estonia
- Finland

Snow today | **Historical data** | H | llery | Data | Contact Us | CBK PAN

lities

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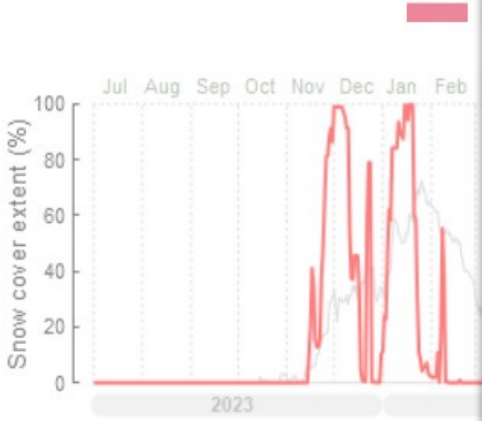

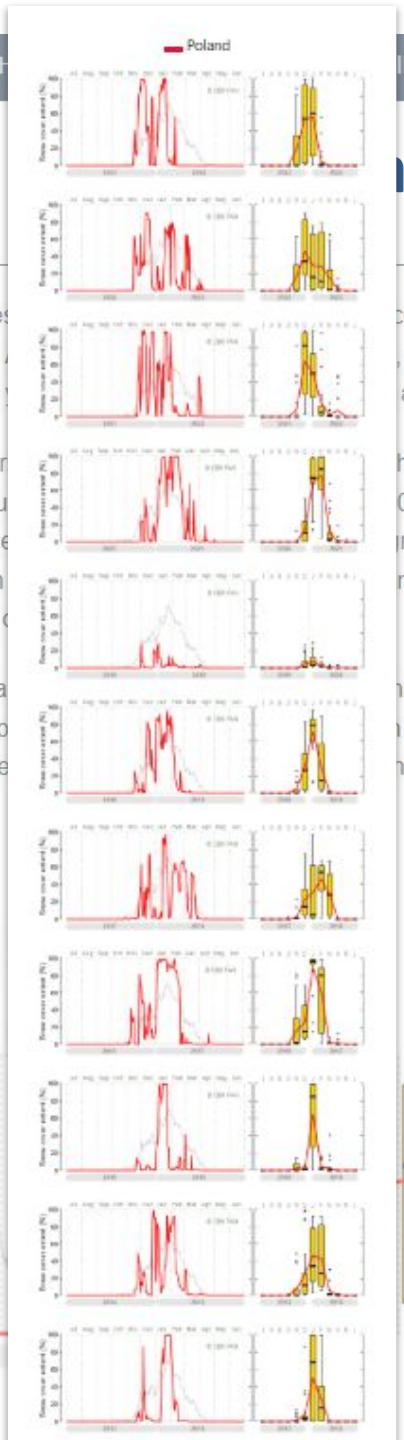

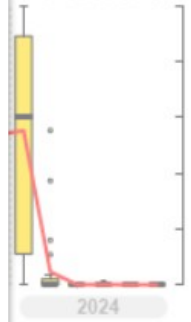

Are you interested in winter in other countries?

Search for the names of the country

- Poland
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- Bosnia and Herzegovina
- Belgium
- Bulgaria
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- Czech Republic
- Denmark
- Estonia
- Finland

Where should I point my mouse to find information about the current snow cover extent?

Where is the snow currently?

How much snow is there in Europe?

Is the current winter "typical"?

Automatic daily update!

Where has the snow gone?

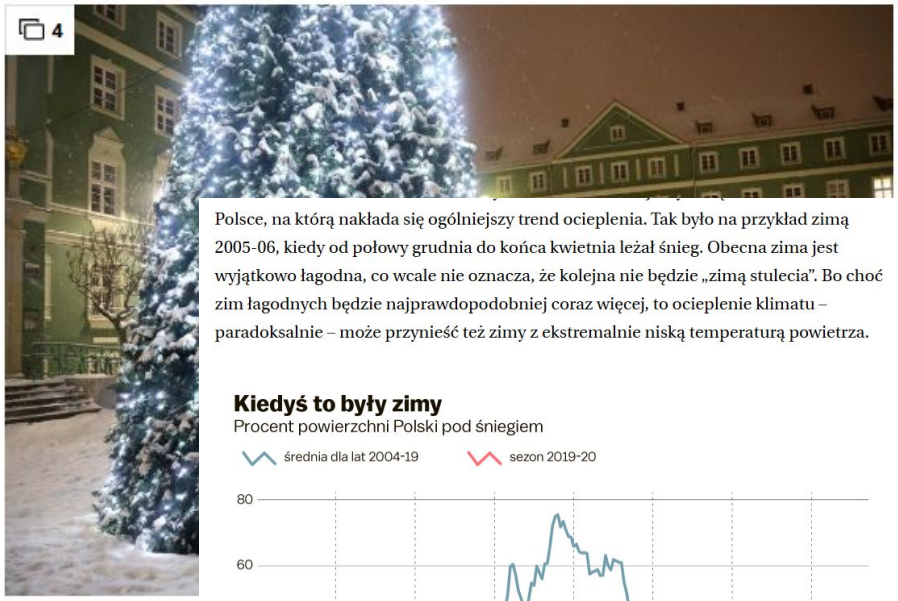
Next * Środowisko * Wigilia, zima i śnieg. Zajrzeliśmy w statystyki. Są nieprzejednane. To już nie jest jednorazowa klęska

Białe święta to "ginący gatunek". Śnieg na Wigilię staje się rzadkością

Patryk Strzałkowski
23.12.2024 17:52

Posłuchaj artykułu

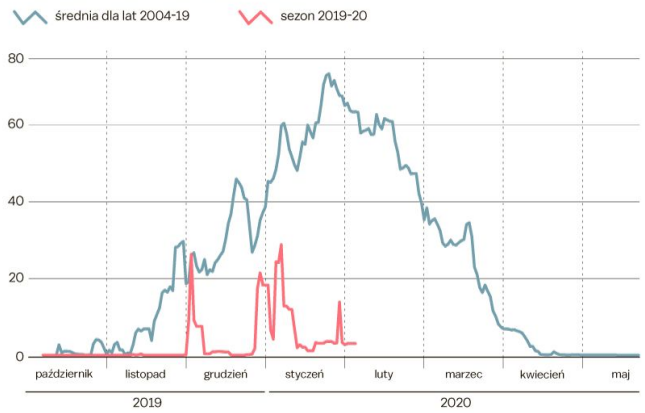
W tym roku w niemal całej Polsce nie ma co liczyć na białe święta. I chociaż okres Bożego Narodzenia kojarzy nam się z ośnieżonym krajobrazem, to dane pokazują, że w Polsce jest to coraz częściej wyjątek, a nie reguła.



Fot. Cezary Aszkiełowicz / A

Polsce, na którą nakłada się ogólniejszy trend ocieplenia. Tak było na przykład zimą 2005-06, kiedy od połowy grudnia do końca kwietnia leżał śnieg. Obecna zima jest wyjątkowo łagodna, co wcale nie oznacza, że kolejna nie będzie „zimą stulecia". Bo choć zim łagodnych będzie najprawdopodobniej coraz więcej, to ocieplenie klimatu – paradoksalnie – może przynieść też zimy z ekstremalnie niską temperaturą powietrza.

Kiedyś to były zimy
Procent powierzchni Polski pod śniegiem



ŹRÓDŁO: CENTRUM BADAŃ KOSMICZNYCH PAN

tech NAUKA MILITARIA TLDR NEWS

W internecie sprawdzisz, gdzie w Polsce leży śnieg

Internetowy serwis, pokazujący - na bazie danych satelitarnych - jak dużą część Polski pokrywa śnieg, uruchomili naukowcy z Centrum Badań Kosmicznych PAN (CBK PAN) w Warszawie.

W internecie można sprawdzić, gdzie w Polsce leży śnieg

Czwartek, 24 listopada 2011 (10:05)

Jesteś ciekawy, gdzie w Polsce leży śnieg? Teraz możesz to sprawdzić w internecie. Naukowcy z Centrum Badań Kosmicznych PAN (CBK PAN) w Warszawie uruchomili internetowy serwis, który na bazie danych satelitarnych pokazuje, jaką część Polski pokrywa śnieg.

Pod tym adresem można obejrzeć aktualizowaną codziennie grafikę, która pokazuje pokrywę śnieżną kraju. W serwisie dostępne są również dane archiwalne nawet sprzed 14 lat.

Satelita pozwala nam za jednym razem zobaczyć, co się dzieje w całym kraju, a nie tylko w wybranych miastach, jak ma to miejsce przy obserwacjach naziemnych. To ważne przy badaniach pokrywy śnieżnej, która nie ma rozkładu ciągłego - mamy śnieg pod stopami, ale kilometr dalej może go już nie być. Obserwator naziemny o tym nie wie, a satelita - już tak - wyjaśnił dr Andrzej Kotarba, klimatolog z CBK PAN, pomysłodawca serwisu.

Naukowcy zaznaczyli, że z zamieszczonych w serwisie informacji nie dowiemy się, czy najbliższy weekend spędzimy odśnieżając podjazd lub chodnik. Pozwalają jednak ogólnie oszacować, na ile jest to prawdopodobne. Bardziej dociekliwi internauci znajdą w serwisie wiele danych ilustrujących charakter minionych zim.

Serwis CBK PAN powstał w ramach międzynarodowego projektu GEONetCab (GEO Network for Capacity Building). Celem programu jest określenie i wspomaganie warunków funkcjonowania rynku produktów, wykorzystujących zobrazowania satelitarne Ziemi. Szczególny nacisk położono na monitoring środowiska i klimatu. Projekt realizują specjaliści z Polski (CBK PAN) oraz Holandii, Francji, Czech, Maroka i RPA.

Źródło: RMF24/PAP

How satellite sees snow?

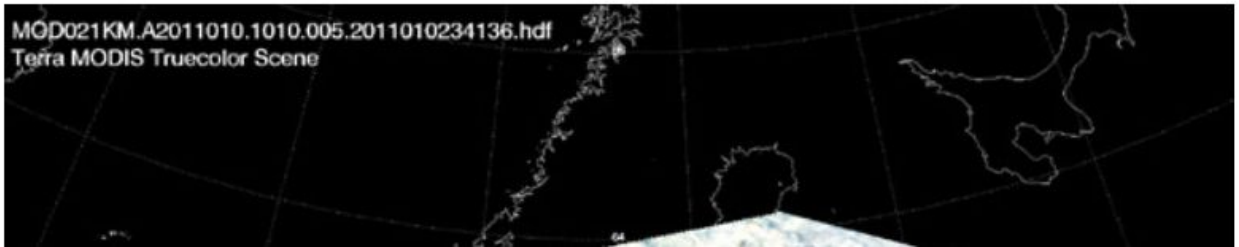
Attention! Only for the brave! The following text, while written in a popular science style, contains spine-chilling scientific terms and even one formula. What's worse, the length of the text exceeds three sentences, requiring several minutes of focused attention.

If we were to briefly answer the question of how a satellite "sees" snow, the response might be surprising: satellites don't see snow. Meteorological satellites "see" only electromagnetic radiation. This radiation is a signal, sometimes visible and sometimes not, emitted by all objects around us. Everything emits radiation — mountains, clouds, oceans, people, stars, air, computers. The warmer the object is, the more radiation is emmited. Different objects can also reflect and absorb radiation differently. Modern satellite observations of Earth involve analyzing electromagnetic radiation.

Satellite instruments used for snow research measure the intensity of this radiation. They do not measure air temperature, precipitation, wind speed, or any properties of the snow cover. The satellite's role is simply to record radiation within a specific spectrum range (e.g., visible, microwaves, infrared) and transmit the measurements to Earth. Scientists then step in to interpret whether a particular measurement indicates the presence of snow or something else. So, satellites see only radiation, and scientists detect snow by analyzing the characteristics of that radiation.

To better understand this, let's follow the process of satellite snow observation step by step. We will use data from the MODIS instrument on the Terra satellite, which has been in orbit since late 1999. Terra is one of the three flagship satellites of the U.S. environmental research program for the "Blue Planet." Constructing and launching this five-ton satellite cost the U.S. $1.3 billion, with another $0.5 billion spent on mission operations over the following years. Terra orbits Earth at about 700 km altitude, completing one orbit in approximately 98 minutes.

On January 10, 2011, at 11:10 AM Polish time, Terra was passing over Europe. MODIS sensor observed a significant part of the Europe, including Poland (Fig. 1). MODIS was operating at full capacity and, within five minutes, conducted approximately 100 million measurements of radiation emitted or reflected by Earth's surface (land, oceans, atmosphere). MODIS records radiation in 36 spectral ranges—or, to simplify, 36 colors — most of which are invisible to the human eye. Let's focus on six ranges that cover shortwave radiation. This is solar radiation reflected by Earth and eventually detected by the satellite.



Satellite images of snow in Europe

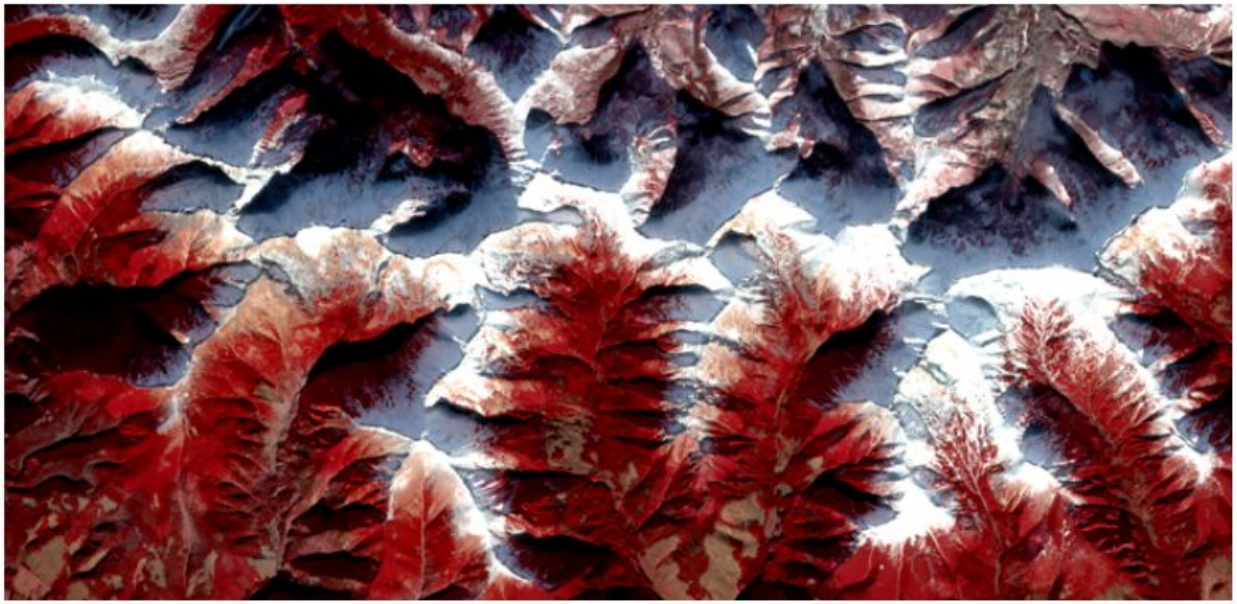


Fig. 1. The peaks of the Tatra Mountains covered with snow. Areas covered with vegetation are marked in red. Image captured by the MSI sensor of the Sentinel-2 satellite on November 29, 2018. Click the image to enlarge. *(M. Krupiński/CBK PAN, based on Copernicus data)*

So … where is snow?

Check for yourself:

https://whereissnow.com/en/

Thank you!

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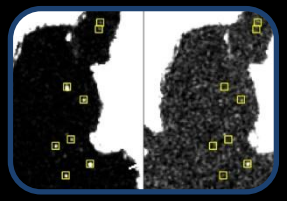
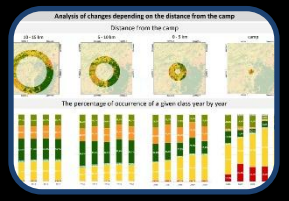
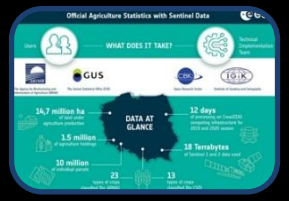
Land Cover / Land Use



Object Detection

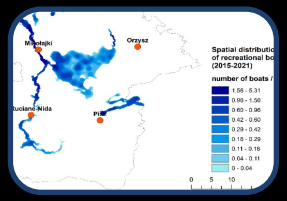


Environment Monitoring



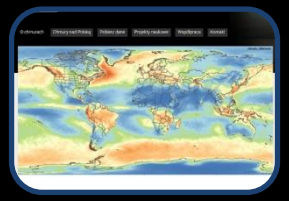
Crops mapping

Marginal Lands



Ecosystem Services

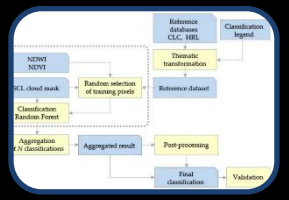
Snow Cover



Cloud Cover

Crisis Management

Light Pollution



Machine Learning / AI

Capacity Building