



Importance of a thick snow cover on viticulture in the cool wine growing regions

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Content

How much snow is on the Earth?

Winter air and snow conditions in vineyards

- Southern Finland (Tuusula)
- Northern and central Europe
- North America

Snow covers and soil temperature in some European vineyards

Benefits and harms of snow

Earth's annual snow cover

Totally

46 000 000 km²

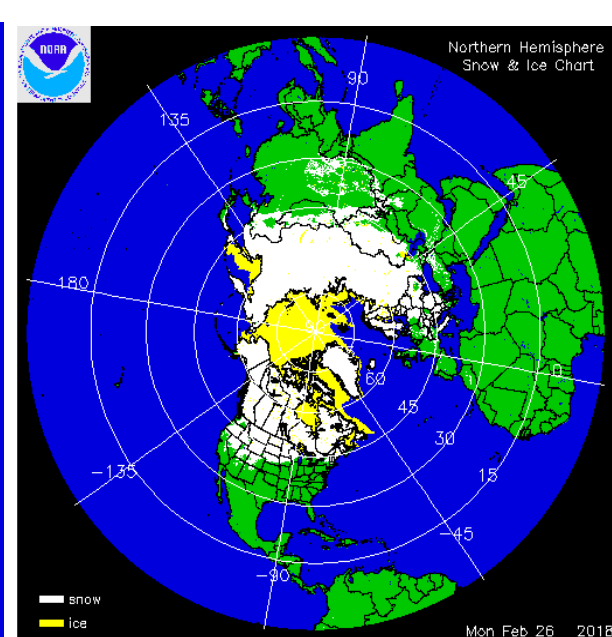
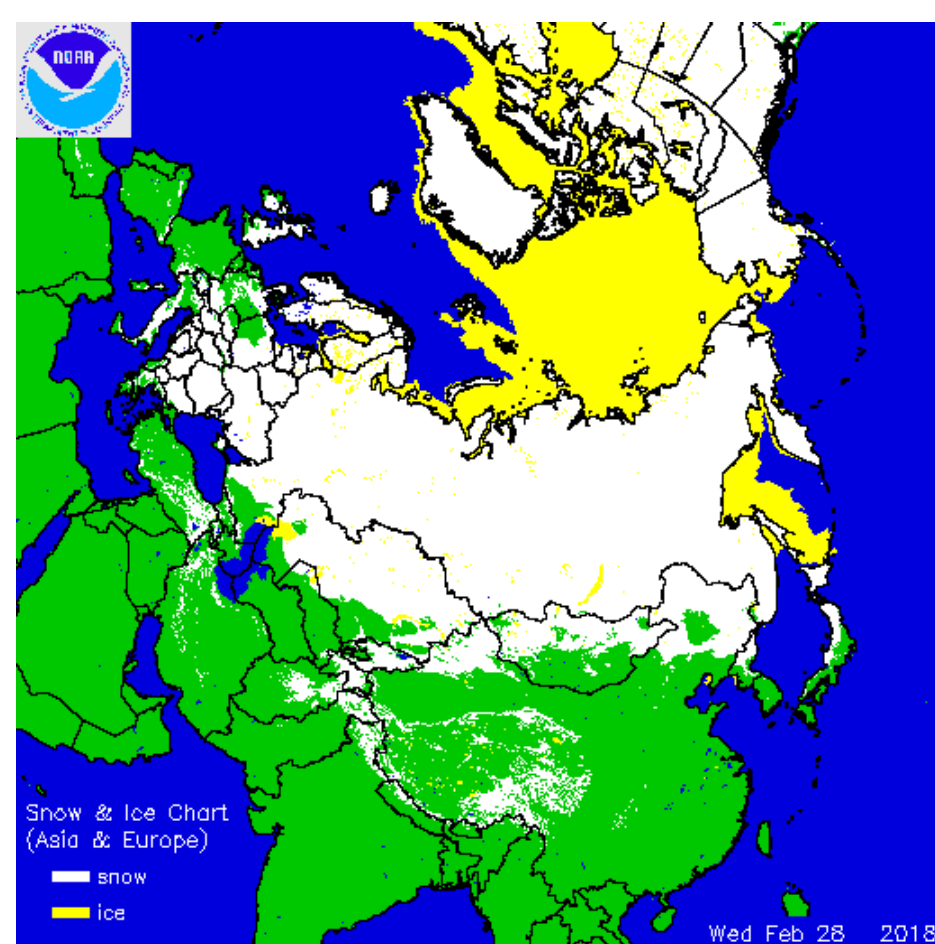
36% of earth's land surface area

98% in the northern hemisphere

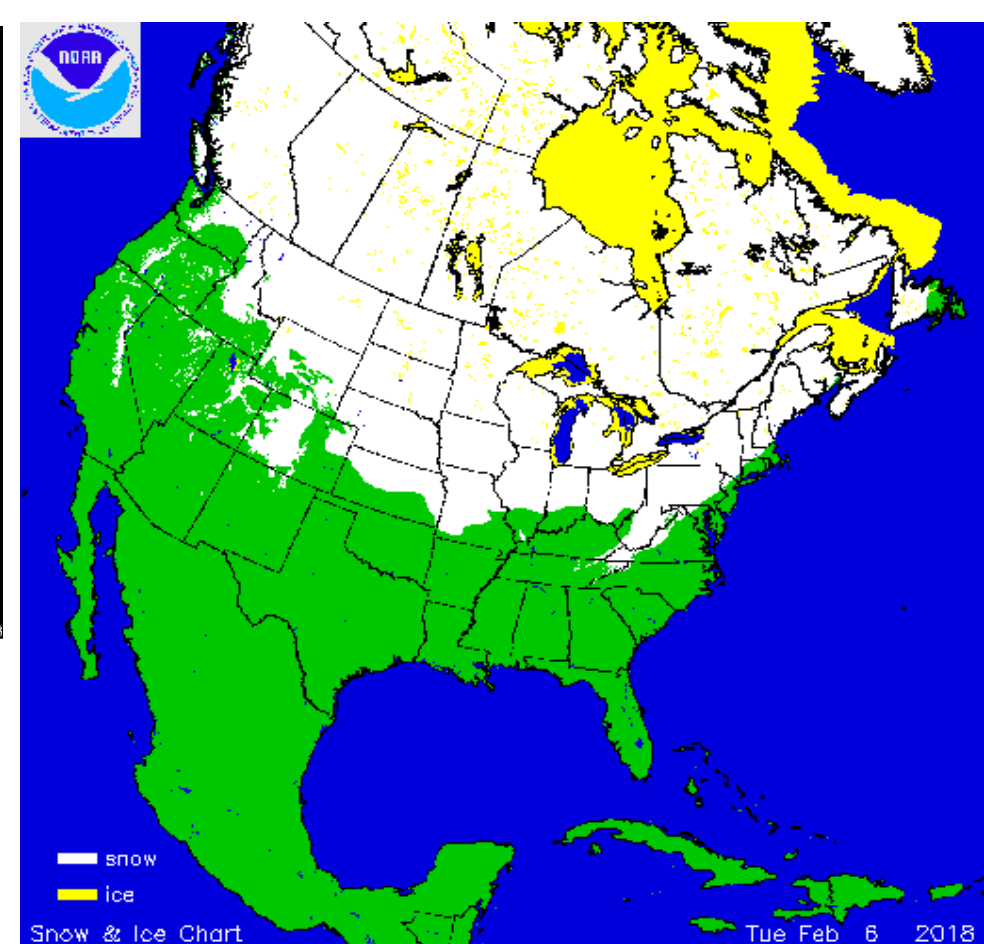
Snow regulates climate

1. reflecting 80 – 90% incoming sunlight into the atmosphere preventing global warming

2. in smaller scale effects on regional weather patterns



Annual snow cover may exist in the northern hemisphere in Europe and Asia until N42° and in North America until N37°



Cool climate vineyards in Canada and USA

- Saint-Hippolyte. Quebec, N45°
- Troy, Hudson Valley, New York, N42°
- New Berlin, Wisconsin, N42°

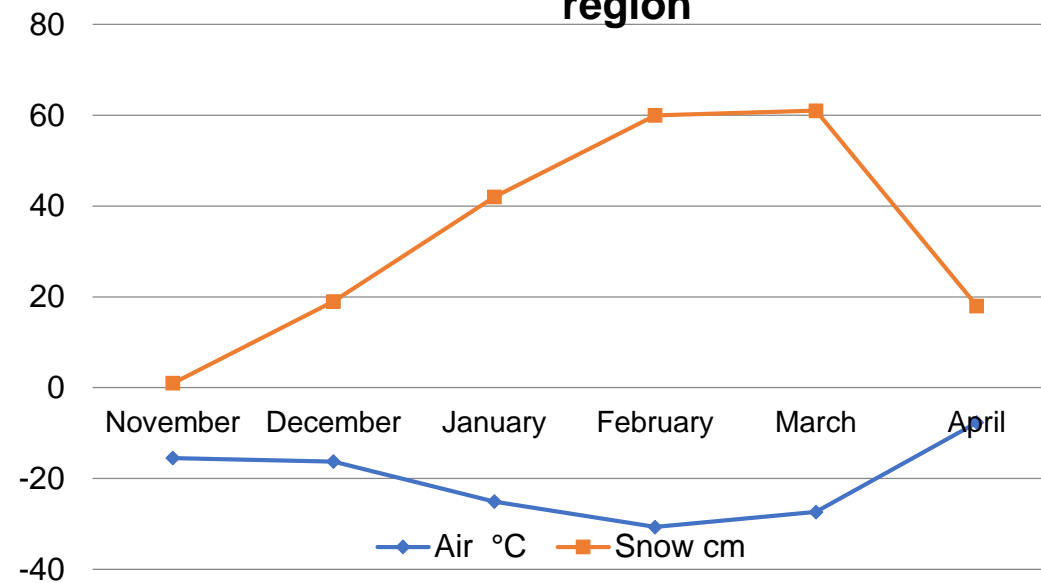
Cool climate vineyards in Europe and Siberia

- Tuusula, Helsinki area, Finland, N60°
- Ålsgårde, Copenhagen area, Denmark, N56°
- Bayevsky, Altai, Siberia, Russia, 53°N, "Chateau Permafrost"
- Visperterminen, Valais canton, Switzerland, N46°

Month/ year	Mean snow cover cm	Min. air temperature °C	Min. ground surface temperature °C
Nov 2009	1	-15.5	-3.3
Dec 2009	19	-16.3	-2.6
Jan 2010	42	-25.1	-1.4
Feb 2010	60	-30.7	-0.5
Mar 2010	61	-27.4	-0.5
Apr 2010	18	-7.7	-0.3
X±SD	33±23	-20.5±8.0	-2.1±1.7

Month/ year	Mean snow cover cm	Min. air temperature °C	Min. ground surface temperature °C
Nov 2006	11	-6.1	-5.8
Dec 2007	1	-8.1	-7.2
Jan 2008	24	-7.2	-6.8
Feb 2008	16	-10.6	-7.6
Mar 2008	3	-16.1	-10.8
Apr 2008	1	-6.8	-5.2
X±SD	9.0±9.0	-9.0±3.5	-7.4±1.8

Air temperature vs. snow cover in Helsinki region



Locality	Köppen-Geiger climate classification	Mean altitude above sea level m	Average annual temperature °C	Annual rainfall mm	Snow cover duration days	Average annual snow fall cm	January, February, March snow depth cm
Tuusula (Helsinki) Finland	Dfb	63	5.5	700	116	130	35, 42 and 12
Ålsgårde (Copenhagen) Denmark	Cfb (Dfa)	32	8.3	765	25	41	3, 3 and 5
Unterstalten (Canton of Valais) Switzerland	Dfb	1150	7.0	600	118	173	52, 49 an 40
Bayevsky District, Altai Krai, Siberia, “Chateau Permafrost”	Dfa	300	1.6	500	210	210	50, 81 and 36
Saint-Hippolyte, Quebec, Canada	Dfb	250	4.0	1164	138	299	70, 55 and 47
Troy, Hudson Valley, NewYork, USA	Dfa	100	8.9	1067	102	91	28, 25 and 13
New Berlin, Wisconsin USA	Dfa	281	7.2	854	125	135	33, 28 and 18

Dfb; warm summer and humid continental climate

Cfb; oceanic climate

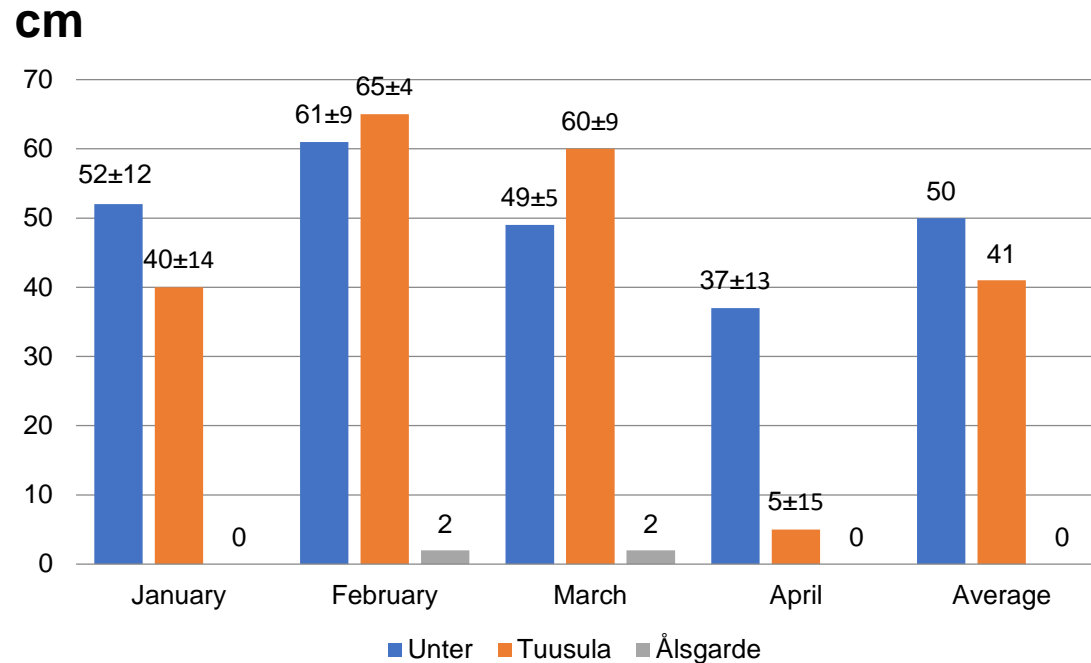
Dfa; hot summer and humid continental climate

Chateau Permafrost, Bayevsky, Siberia



Siberia may be the new frontier for freedom loving people who soon may decide to leave the West for greener pastures. Pete Wagner, Maryland US, 27/09/2016 22:38

<http://siberiantimes.com/PICTURES/BUSINESS/Altai-wine-Vladimir-Vagner/inside%2010.jpg>



In 2012 – 2013:

1. There was no permanent snow cover in Ålsgårde through the whole winter.
2. In Unterstalten, the ground surface temperature was at its lowest, from -1.0 to -1.5°C, under a snow cover of 61 cm in February, which was the coldest month in the locality.
3. The temperature remained at above zero for the whole time at depths of 20 cm and 40 cm, at a level of 0.5 –1.0°C.

The lowest single temperature recordings in the vineyard soils in 2012 - 2015

Locality	Coldest month	At the depth of 20 cm, °C	At the depth of 40 cm, °C
Tuusula, Helsinki Region, Finland	January - February	0.5	1.0
Tervete, Jelgava Region, Latvia	February	0.5	1.0
Ålsgårde, Copenhagen Region, Denmark	February	0.5	1.0
Unterstalten, Valais, Switzerland	February	0.5	1.0
Neubrandenburg, Mecklenburg-Vorpommern	February	1.0	2.5
Freyburg, Saale-Unstrut Region, Germany	February	2.0	2.5
Herrlisheim-prés-Colmar, Alsace, France	February	1.0	2.5



Temperature recording thermologgers

20 cm

40 cm

Harms caused by snow

- Heavy snow can damage shoots, branches and trunks as the weight accumulates on vines
- Melting snow freezes and ice layer damages bark of the base of grapevine
- On the slopes of valleys melting snow carries humus away.
- Thick snow protects field mice and other damaging animals from predators
- Thick snow cover and albedo delay soil warming in spring
- In spring "April snowstorm" destroys fresh shoots
- In summer a snowfall and hail breaks shoots and destroys foliage
- Lack of snow cover and hard frost can destroy surface root system

Vineyard's snow cover

- is an excellent insulator of the soil
- prevents the soil from freezing and protects microbiota in soil
- prevents damage to plant's base and root system from frost
- helps to preserve the soil moisture over the winter and in spring
- If frost damages a grapevine above snow layer, the suckers that survive under the snow can be used to grow a new trunk
- A snow cover looks nice in vineyards

Conclusion

Snow is a winegrower's friend more than an enemy