Introduction	Initial steady state	Snow Cave	Rigid container	Conclusion
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	Comparing the long t	orm fato of a ch	ow covo and a rigi	
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	container bur	ried at Dome C,	Antarctica	

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* Now at: Institute of Earth Surface Dynamics, University of Lausanne, Lausanne, Switzerland

Wednesday, 6 May 2020







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Welcome				
Hi				

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Please, follow me ...

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$\circ \bullet$				
Context				
Ice Memory				



Here are two people drilling an ice core at Col du Dôme (France) for the project.

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Context				
Ice Memory				
		_		



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Other cores have already been drilled at Illimani (Andes, 2017), Belukha (Altaï,2018), Elbrus (Caucasus, 2018)

All the cores will then be transported to Antarctica for long-term storage (>100a) within the firn at Dome C

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All the cores will then be transported to Antarctica for long-term storage (>100a) within the firn at Dome C

But this implies a need for a perennial subsurface storage solution !

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Context				
Ice Memory				
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Here, we are using the ice/firn flow model to investigate possible storage solutions that would meet the specific requirements of the project.

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We are going two consider two end-member cases in terms of rigidity of the facility: an **ice cave** dug into the firn and a **perfectly rigid container** buried within it.

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But first we need to construct a model initial state...



















Introduction	Initial steady state	Snow Cave	Rigid container	Conclusion	
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Model Description					
Production of an initial steady state					







-250

 $v = -2.9 \text{ cm a}^{-1}$















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Introduction	Initial steady state	Snow Cave	Rigid container	Conclusion			
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Construction							
A polar snow cave in practise: a construction recipe							



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Photo Credit: J.P. Steffensen, NEEM 2012 report



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= - 2.9 cm a⁻¹

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Introduction	Initial steady state	Snow Cave	Rigid container	Conclusion		
			00000			
Concept						
Shipping containers in Antarctica						



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Normal stresses are **independent** of the consideration **of weight** (not shown) and are slightly **higher for the large trench case** due to higher initial densities





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Introduction	Initial steady state	Snow Cave	Rigid container	Conclusion
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Conclusion				
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Thank you for your attention !

Here are a few messages to take home ...



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Thank you for your attention !

Here are a few messages to take home ...

A snow cave excavated at Dome C could be perennial over decades provided that a sufficiently large trench of high density is constructed around it !

After 100a, a **rigid container** would have to support normal stresses of the order of **100 kPa in the center of roof and floor** and **above 400 kPa at angles**

Normal stresses on the containers sides after 100a are about 40 kPa

These normal stresses differ from purely hydrostatical loads

A **usual shipping container is not able to bear these loads.** A reinforcement structure or another ad hoc storage solution has to be designed !

This work is the topic of a paper submitted to the journal Cold Regions Science and Technology and currently under review...