



Climate Services for Vineyard Adaptation

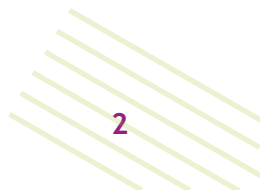
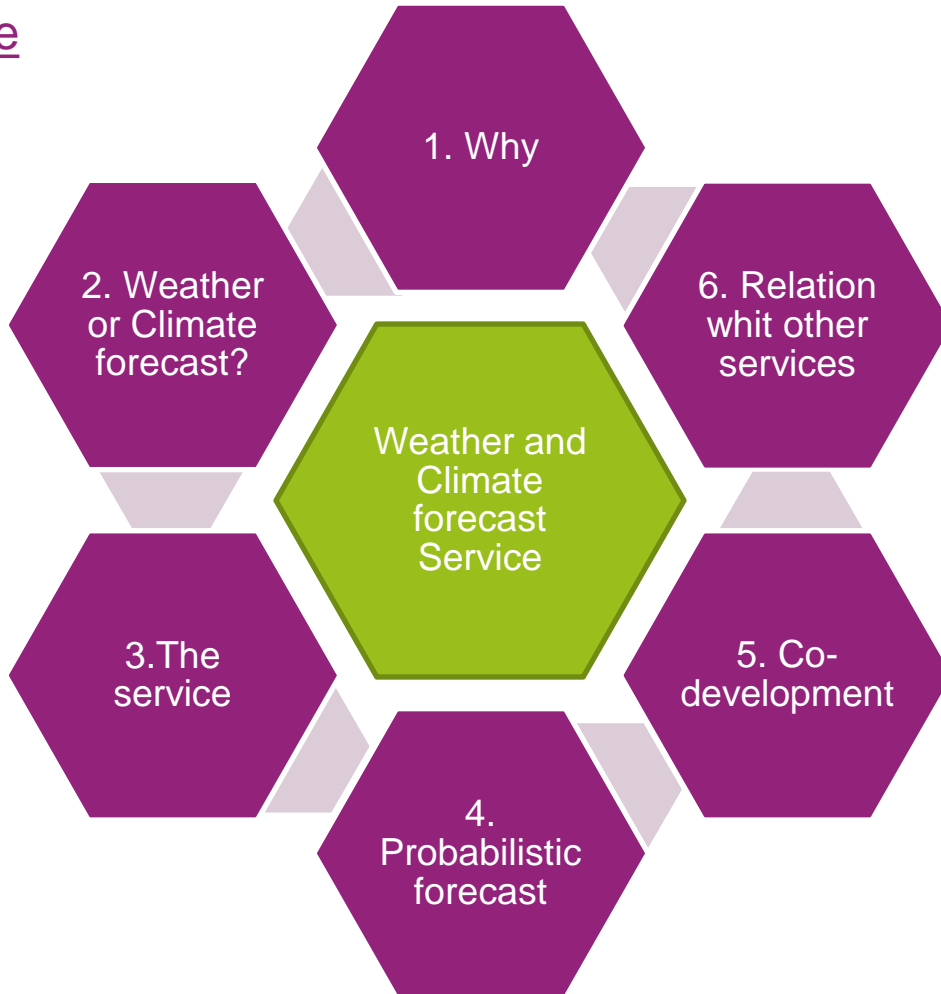
Thursday 23 March, 2023
Climate Europe 2 Webstival

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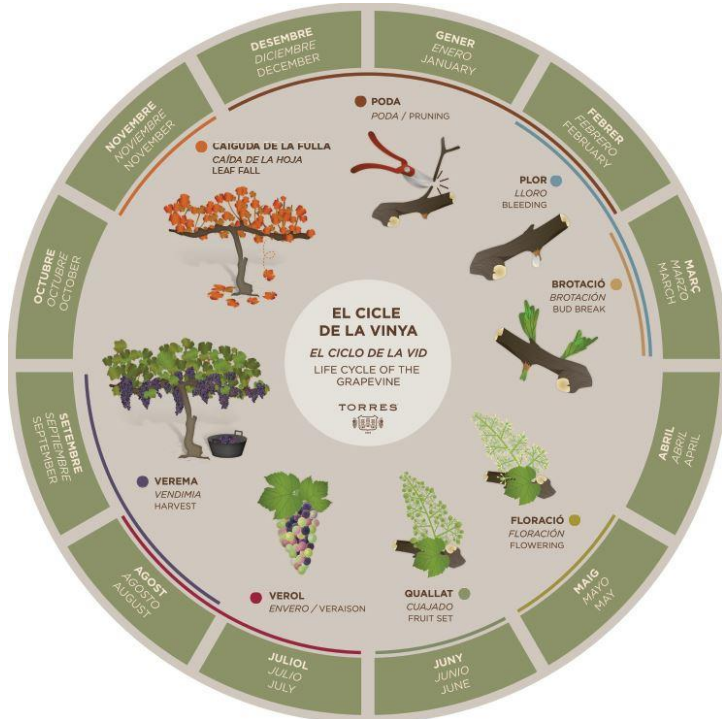


Outline





Why to provide weather and Climate Intelligent Service for viticulture?



<https://www.torres.es/en/blog/life-cycle-grapevine>

The Brussels Times

Disappointing global wine production predicted for 2022

Thursday, 3 November 2022

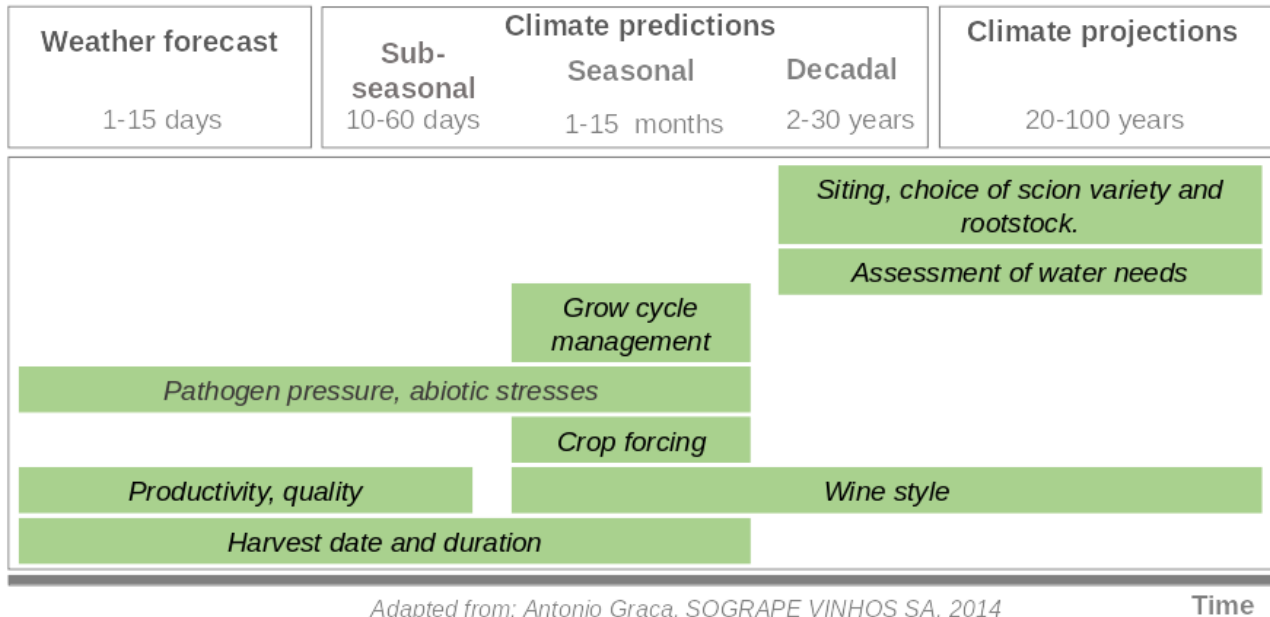
Global wine production, **hit hard by climate change events**

Successive heat waves and drought have led to **poor harvest** of many fruits and vegetables, including grapes.

<https://www.brusselstimes.com/316567/disappointing-global-wine-production-predicted-for-2022>



Which weather or climate forecast helps the most on a decision?

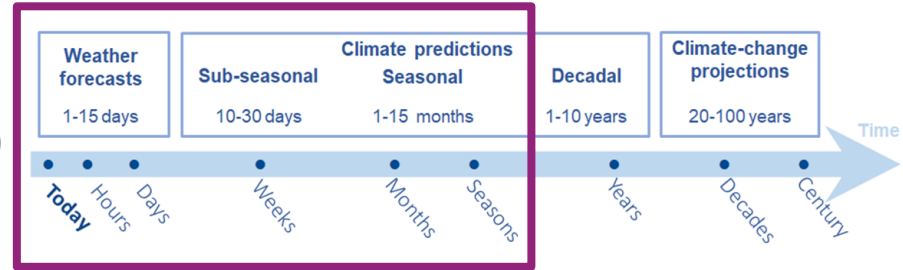


Adapted from: Antonio Graça, SOGRAPE VINHOS SA, 2014



vitiGEOSS Weather and Climate Intelligent Service

- Weather forecasts (3 days)
- MONARCH**
- Sub-seasonal climate forecasts (4 weeks)
- NCEP-CFSv2**
- Seasonal climate forecasts (3 months)
- ECMWF SEAS5**



Target regions (vineyard plots of wine producers in the project):

- Campania region (MASTROBERARDINO)
- Douro Valley (SYMINGTON)
- Catalonia (TORRES)





Help us to create a forecast!





Predictions

**We will think on a rolling dice and ...
do a translation to climate language**

To do it, we will consider the results of a dice by groups:

- 1 or 2 → colder than usual
- 3 or 4 → temperatures as usual
- 5 or 6 → hotter than usual



Remember that we cannot predict weather and climate by rolling a dice! The aim is to approach you to probabilistic forecast in a simplified way!!



THE CONVERSATION

If you want to roll the climate dice, you should know the odds

<https://theconversation.com/if-you-want-to-roll-the-climate-dice-you-should-know-the-odds-6462>



Predictions



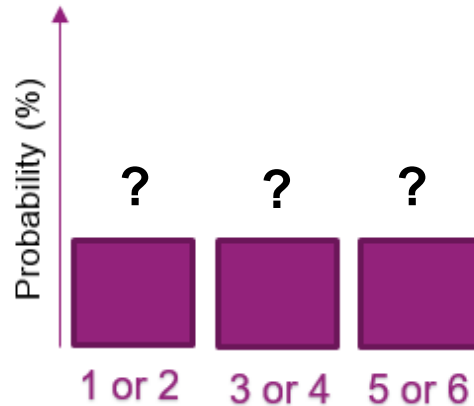
Persistence



Experience



Modelling



1 or 2: colder than usual
3 or 4: as usual
5 or 6: warmer than usual



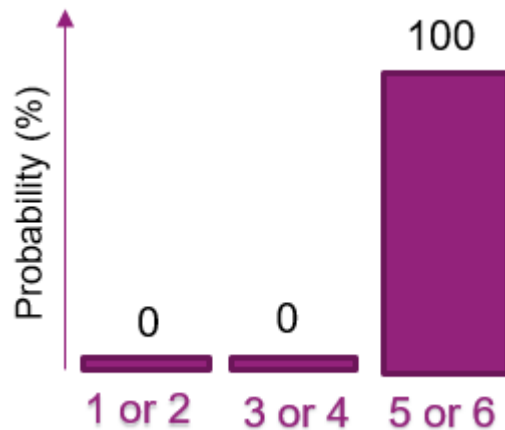
Predictions



Persistence

Dice statement: If I got a 6, next time I roll the dice I will get a 6 too.

Climate statement: If the weather doesn't change, it will remain the same.



1 or 2: colder than usual
3 or 4: as usual
5 or 6: warmer than usual





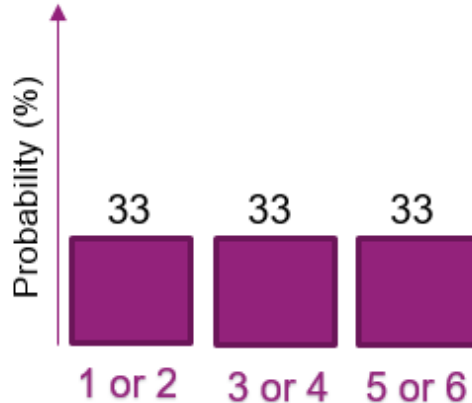
Predictions



Experience

Dice statement: I have roll it thousands of times, and all results occurs the same number of times.

Climate statement: Given past experience, we can know the climate averages (climatology)



1 or 2: colder than usual
3 or 4: as usual
5 or 6: warmer than usual





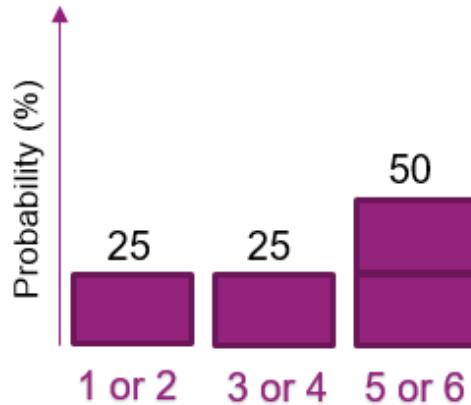
Predictions



Modelling

Dice statement: After rolling it millions of times, I found that there are differences in my dice!

Climate statement: I know components of the climate system and how they interact, let's built a model



1 or 2: colder than usual
3 or 4: as usual
5 or 6: warmer than usual





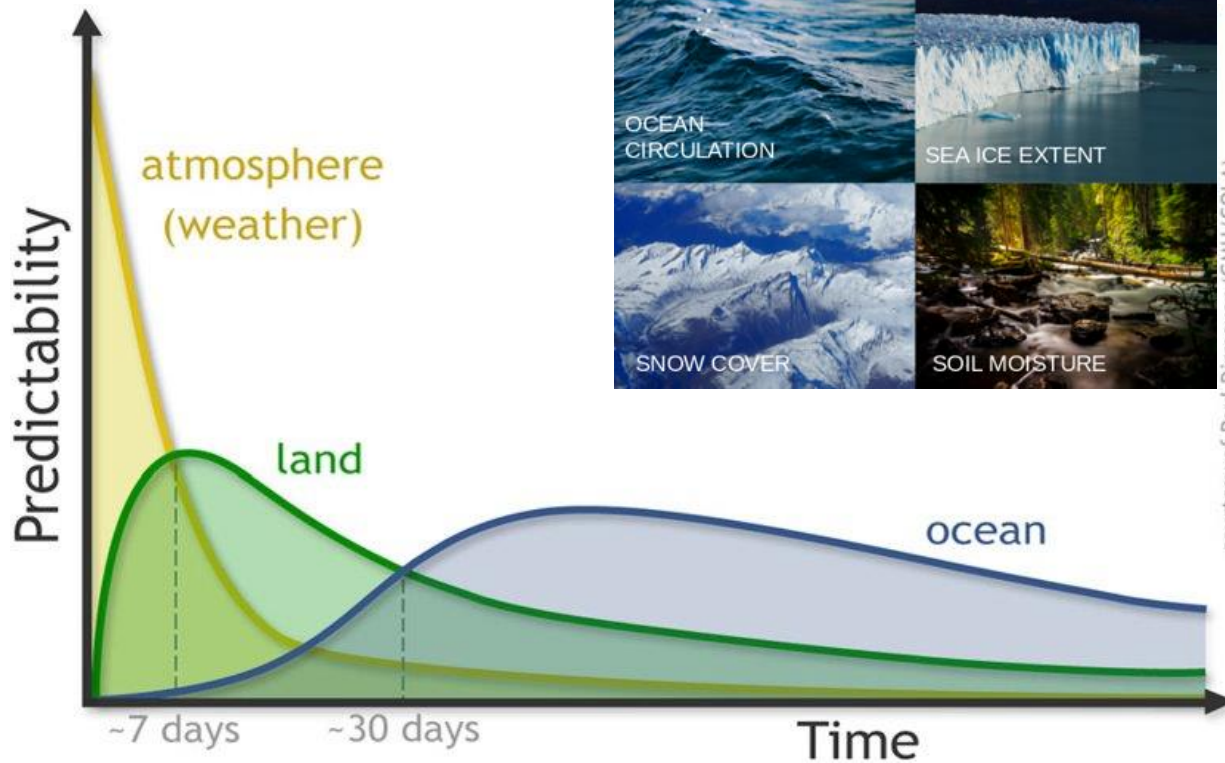
Let's talk about modelling!





Earth Climate System Components

We know the components





Seasonal and subseasonal climate predictions

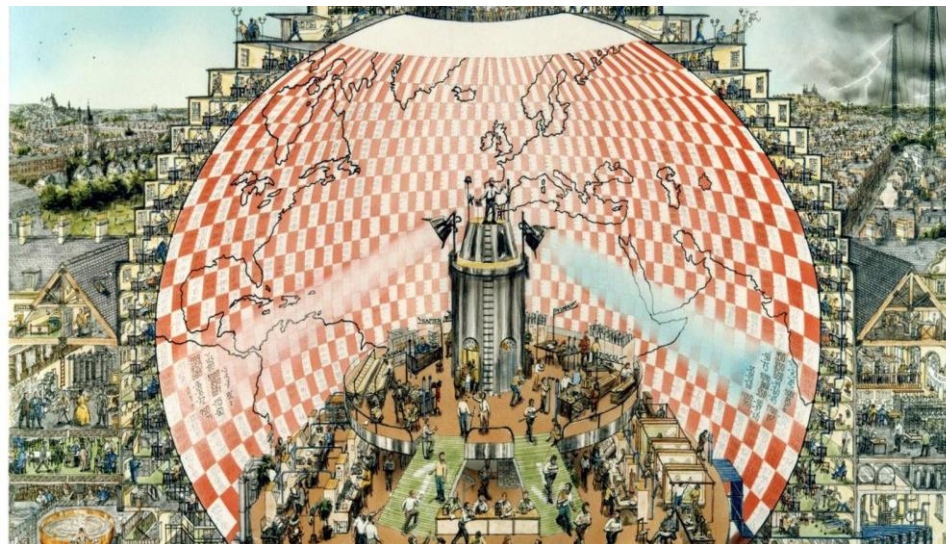
We know the equations
although ...

The atmosphere is a **chaotic system**. Small errors in the initial conditions of a forecast grow rapidly, and affect predictability. Furthermore, predictability is limited by model errors due to the approximate simulation of atmospheric processes of the state-of-the-art numerical models.

Read more: <https://www.ecmwf.int/en/elibrary/79859-chaos-and-weather-prediction>



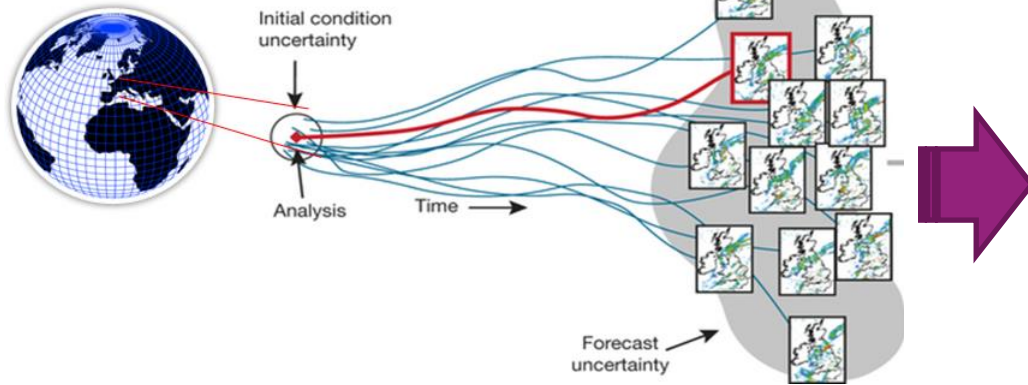
मौसम



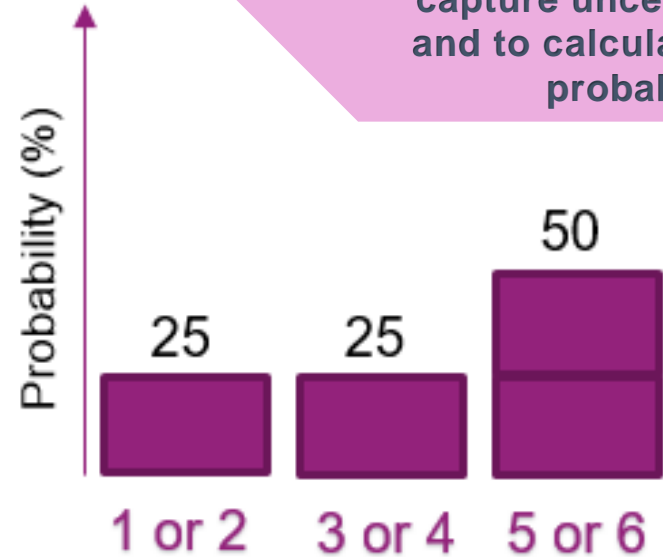
Stephen Conlin, 1986; based on the description of .F. Richardson, 1922



Seasonal and subseasonal climate predictions



A model is set and run several times to capture uncertainty and to calculate the probabilities





Post-processing climate predictions

LAG ENSEMBLE

Combine subseasonal model runs to create the ensemble



Initial condition uncertainty

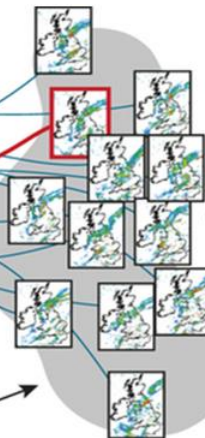
Analysis

Time →

Forecast uncertainty

TEMPORAL AGGREGATION

Weekly and monthly aggregations



DOWNSCALING

Increase spatial resolution
correct for local effects

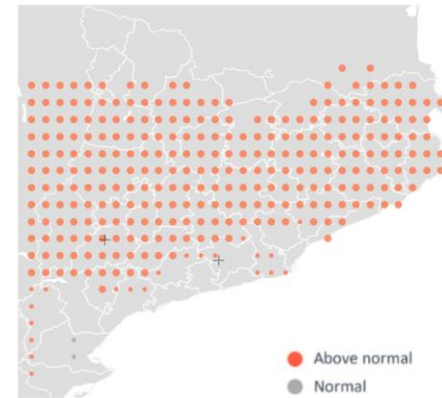
BIAS ADJUSTMENT

Remove systematic biases and
adjust members spread

QUALITY ASSESSMENT

Skill scores

Valid for Mar 2022, issued on 01 Dec 2021



- Above normal
- Normal
- Below normal

Probability

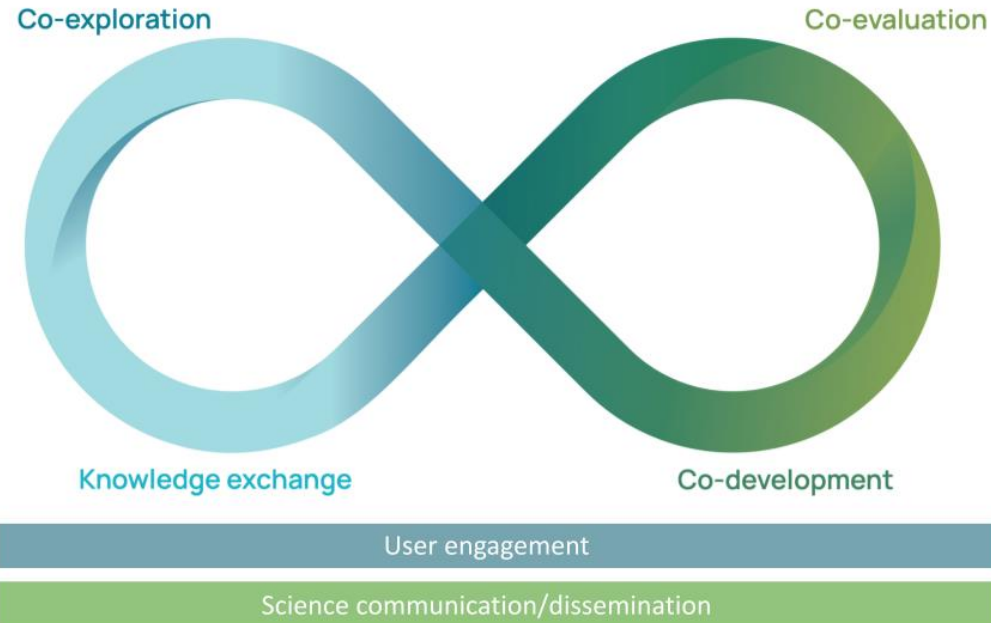
- 50-100%
- 34-49%





Co-design approach

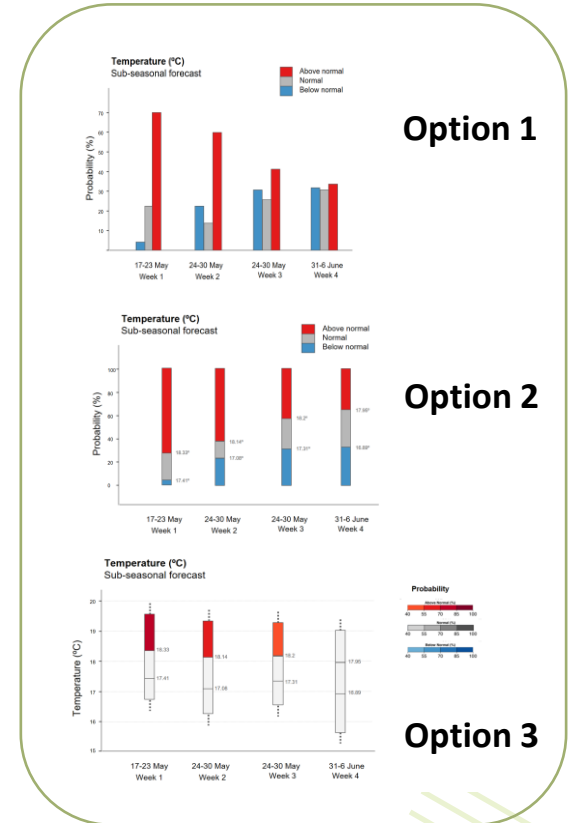
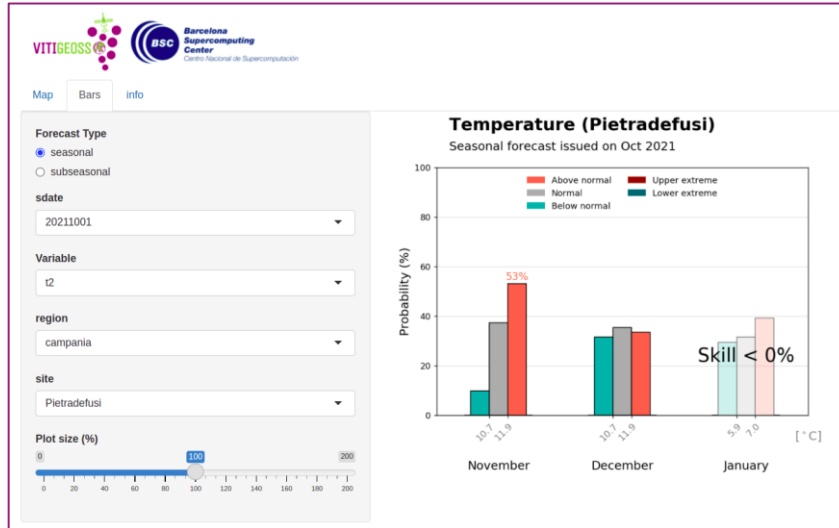
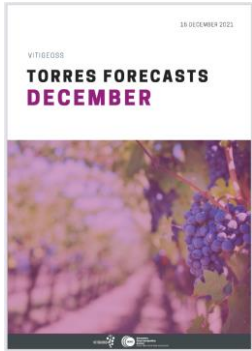
Co-production of services & products for a more resilient society





Co-design approach for probabilistic forecast

- Outlooks (PDF documents)
- Shiny App (web interface)
- Mock-ups





Weather and Climate Intelligent Services: the outputs

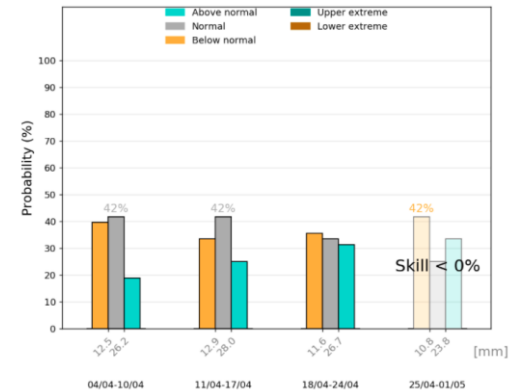
The services are being updated in the THREDDS catalog with different frequencies:

- Daily Weather forecast
- Weekly Subseasonal climate forecast
- Monthly Seasonal climate forecast

Subseasonal		
Variable name	Variable description	Units
t2	temperature 2m weekly average	°C
acprec	accumulated precipitation	mm/week
rswin	shortwave radiation at ground	W/m ²
Forecast probabilities for each variable:		
Variable name	Variable description	Units
prob_bn	probability below normal category	%
prob_n	probability normal category	%
prob_an	probability above normal category	%
prob_bp10	Probability below extreme category	%
prob_ap90	Probability above extreme category	%
Category limits for each variable:		
Variable name	Variable description	Units
p33	Lower tercile	var units
p66	Upper tercile	var units
p10	Lower extreme	var units
p90	Upper extreme	var units
Skill measure for each variable:		
Variable name	Variable description	Units
rpss	Terciles skill score (Fair Ranked Probability Skill Score)	%
bsp10	Lower extreme skill score (Fair Brier Skill Score)	%
bsp90	Upper extreme skill score (Fair Brier Skill Score)	%

Total precipitation (Santa Gre)

Subseasonal forecast issued on 31 Mar 2022





Other vitiGEOSS Intelligent Services making use of the Weather and Climate Service



Disease management system

provides short-term and sub-seasonal term forecast of disease risk

Phenological monitoring

includes phenological status prediction at sub-seasonal time scale



Crop water demand

also makes use of the short-term predictions to provide predictions on the crop status



Thanks for your attention!



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 869565.

The word "Cheers!" is written in a large, bold, yellow-green font, slanted upwards from left to right. The background of the slide is a dark, blurred image of wine glasses filled with white wine.