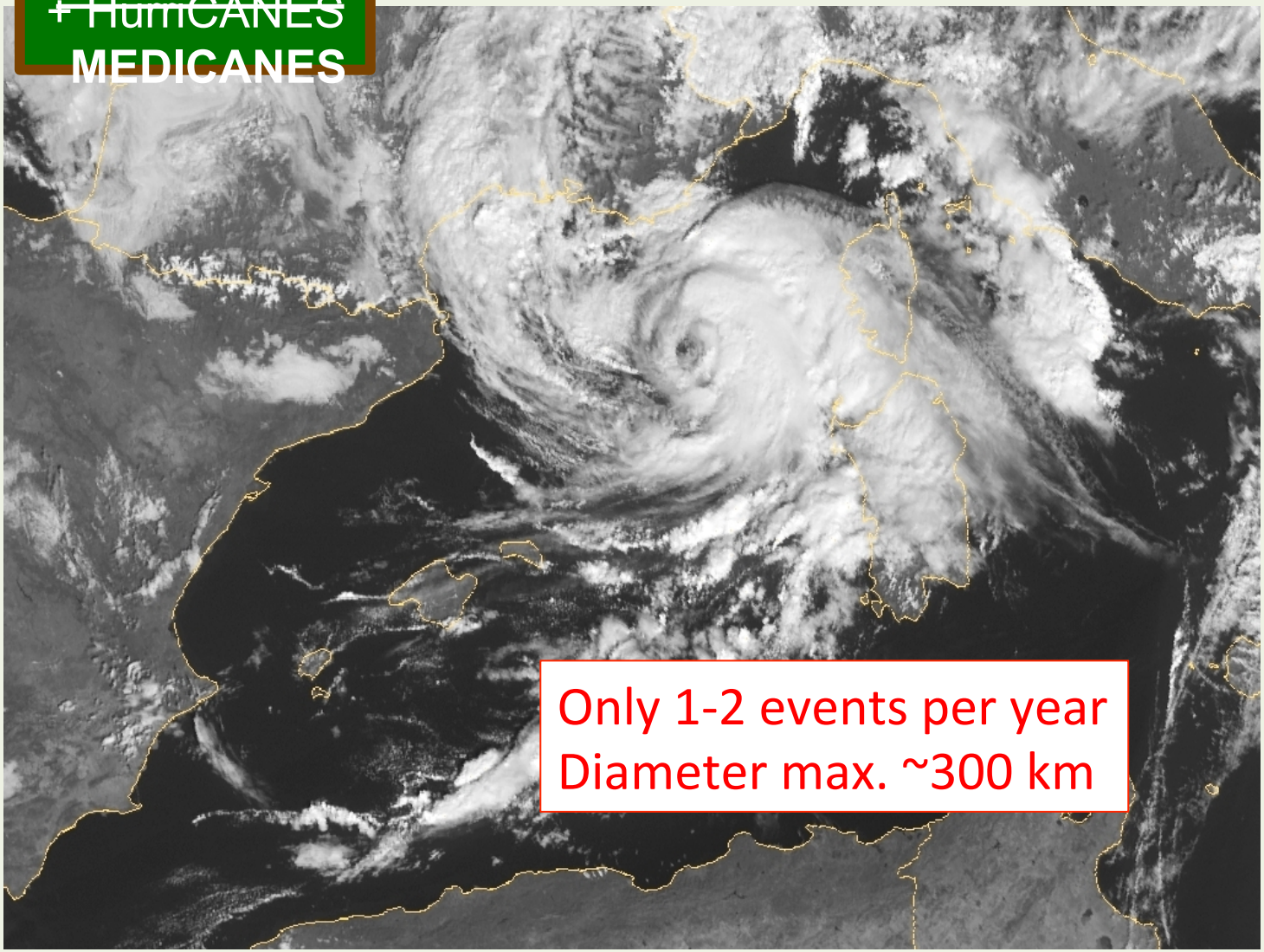
MEDICANE RISK IN A CHANGING CLIMATE

M.Tous[1], R.Romero[1], C.Ramis[1], K.A.Emanuel[2]

[1]Universitat de les Illes Balears, Spain
[2]Massachusetts Institute of Technology, USA

MEDIterranean
~~+ HurriCANES~~
MEDICANES



Only 1-2 events per year
Diameter max. ~300 km

MEDIterranean
~~+ HurriCANES~~
MEDICANES

WHERE?

HOW?

WHEN

MEDICANE RISK IN A CHANGING CLIMATE. M.Tous (maria.tous@uib.es), R.Romero, C.Ramis and K.A.Emanuel

MEDIterranean
~~+ HurriCANES~~
MEDICANES

WHERE?

HOW?

WHEN

1.Nested climatic simulations

2.Statistical-deterministic approach

3.Very high resolution climate model

MEDICANE RISK IN A CHANGING CLIMATE. M.Tous (maria.tous@uib.es), R.Romero, C.Ramis and K.A.Emanuel

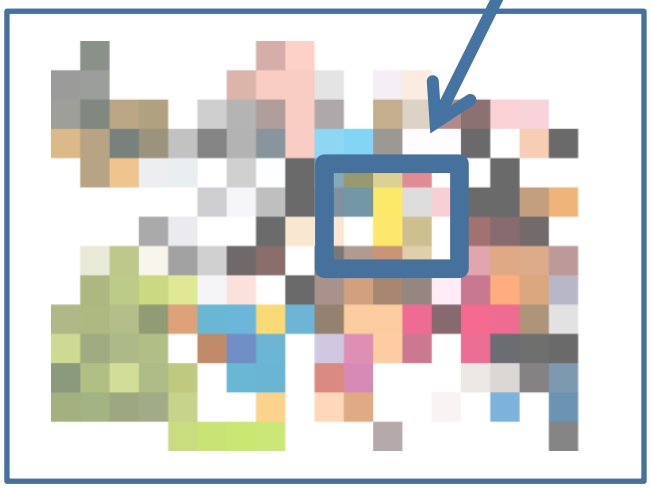
1.- Nested climatic simulations

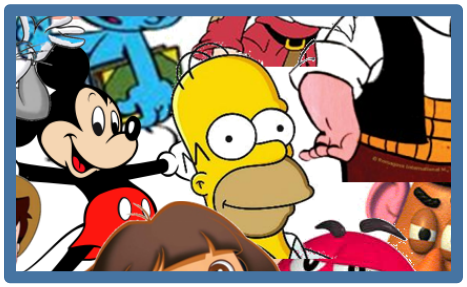
≡ Ideal resolution of the GCMs data

We would like Global Climate Models (GCMs) have enough resolution to distinguish well all the structures. But they have not.

Medicanes are too small to be represented there.

The Simpson characters are yellow

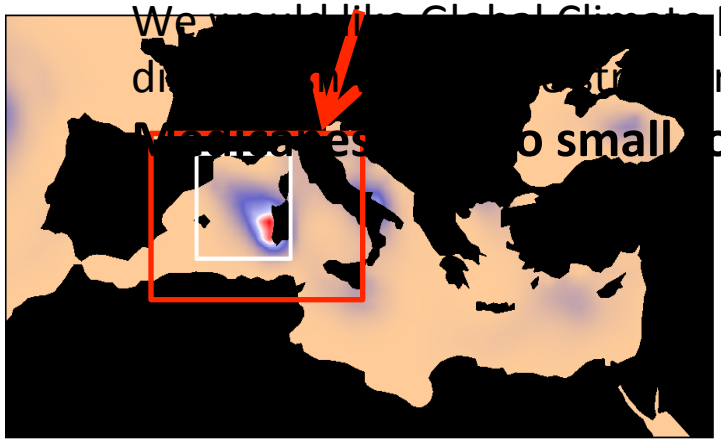


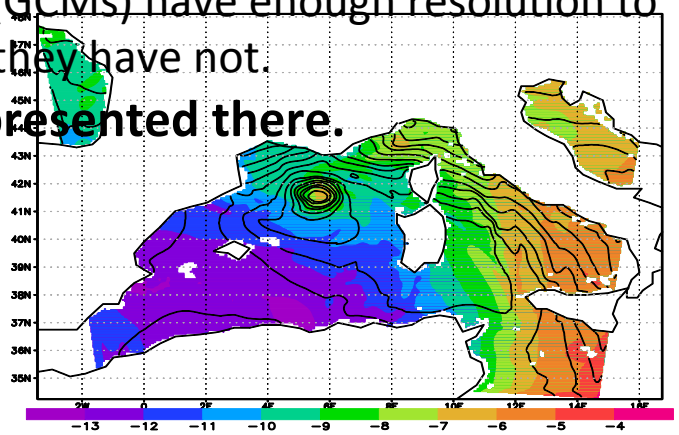


Medicanes development is related with high values of GENPDF

We [illegible] Models (GCMs) have enough resolution to di[illegible]res. But they have not.

[illegible] **o small to be represented there.**

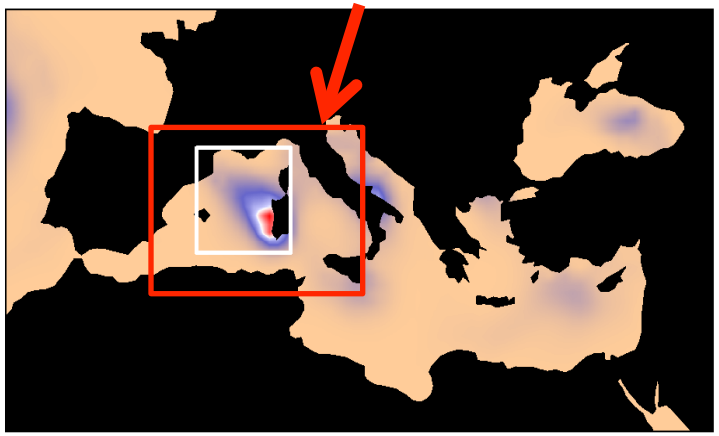


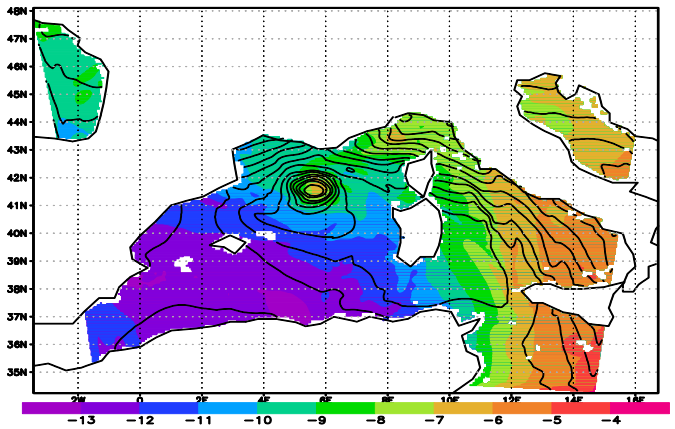


Most The Simpson characters are yellow

…but not all yellow characters are from The Simpsons

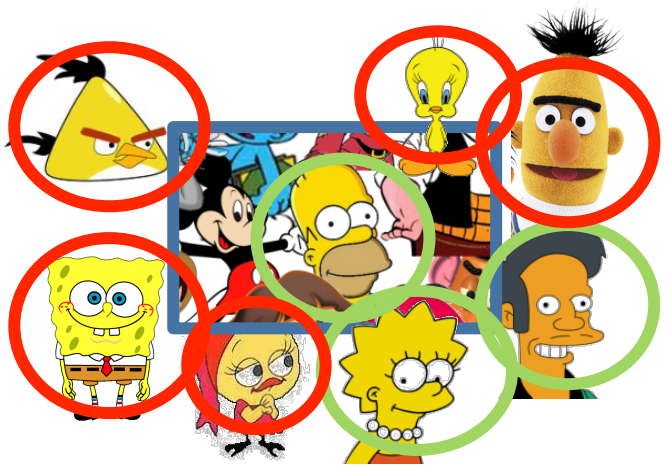
Medicanes development is related with high values of GENPDF



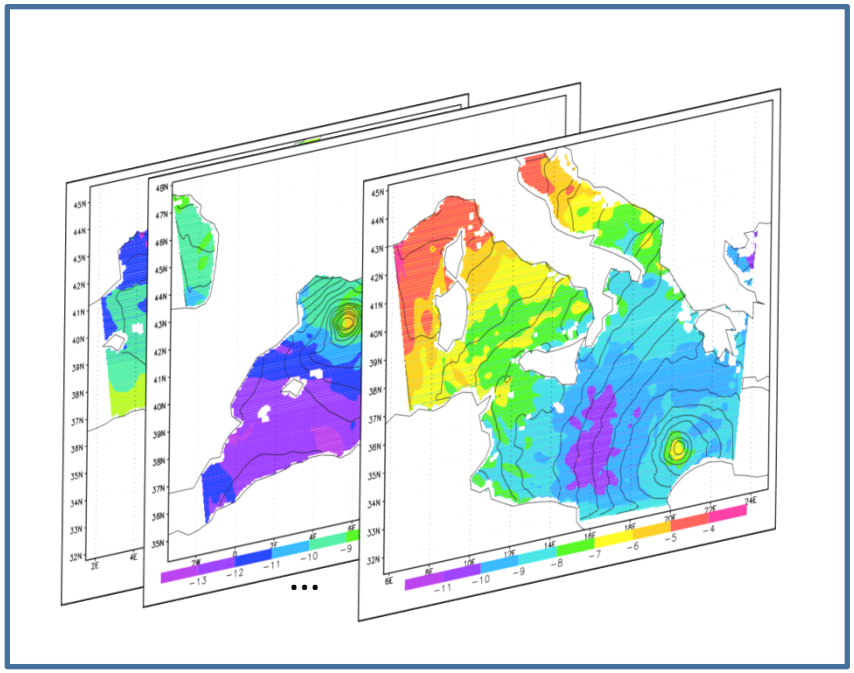


Filtering/
Calibration

Filtering/
Calibration

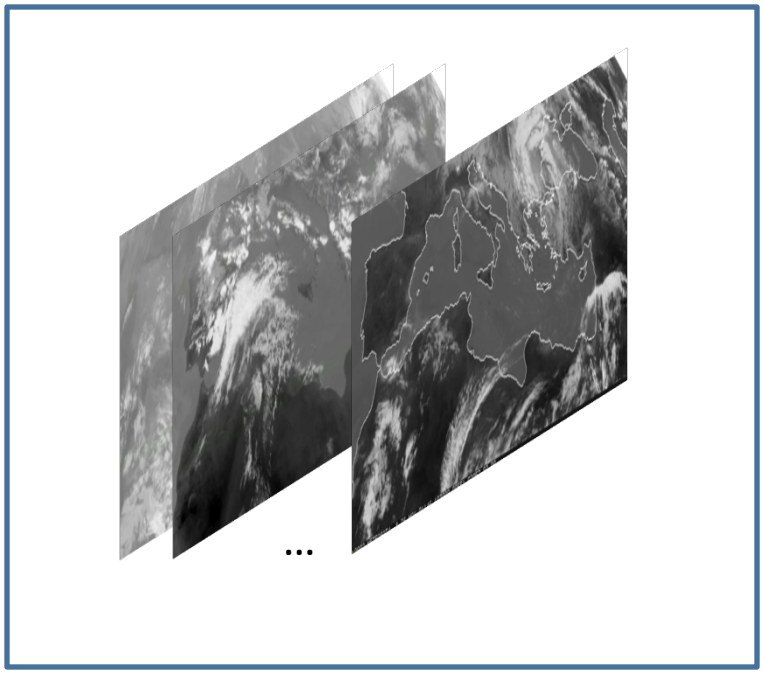


Downscaling simulations using ERA-40 data



vs.

IR Meteosat satellite image



1.- Nested climate simulations

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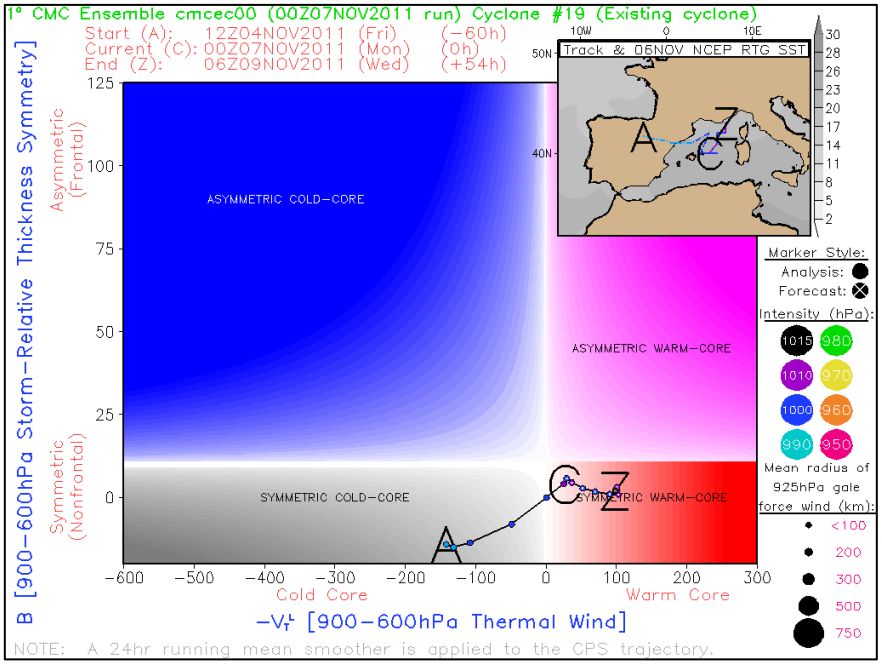
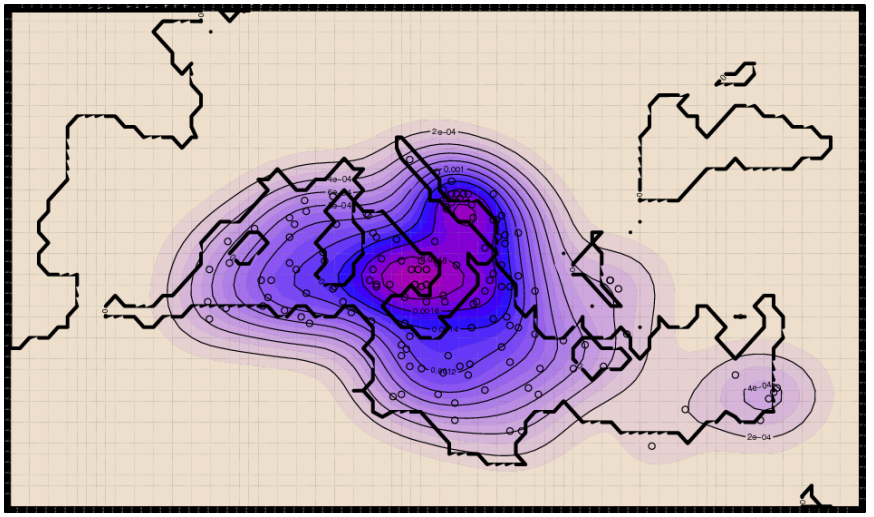
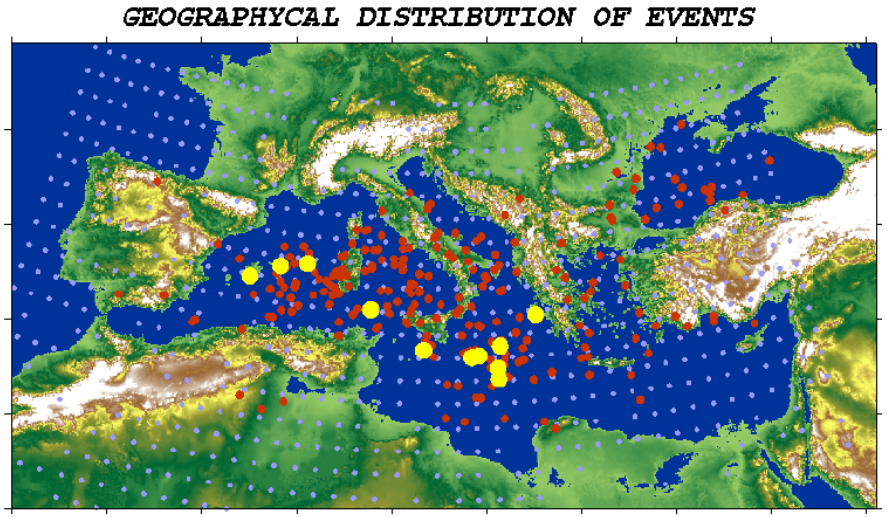






2.- Statistical-deterministic approach

To grow the database

ONE order the magnitude increased:

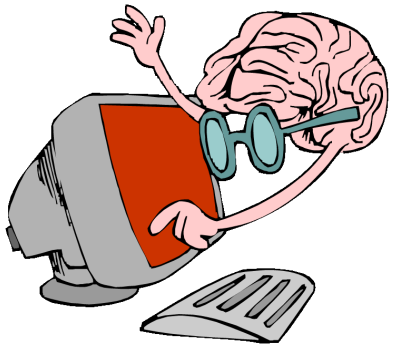
# Events	# Years
~20	15
~200	150

1.- Natural process:

Past: no measurements
Future: no patient

2.- Created by ourselves:

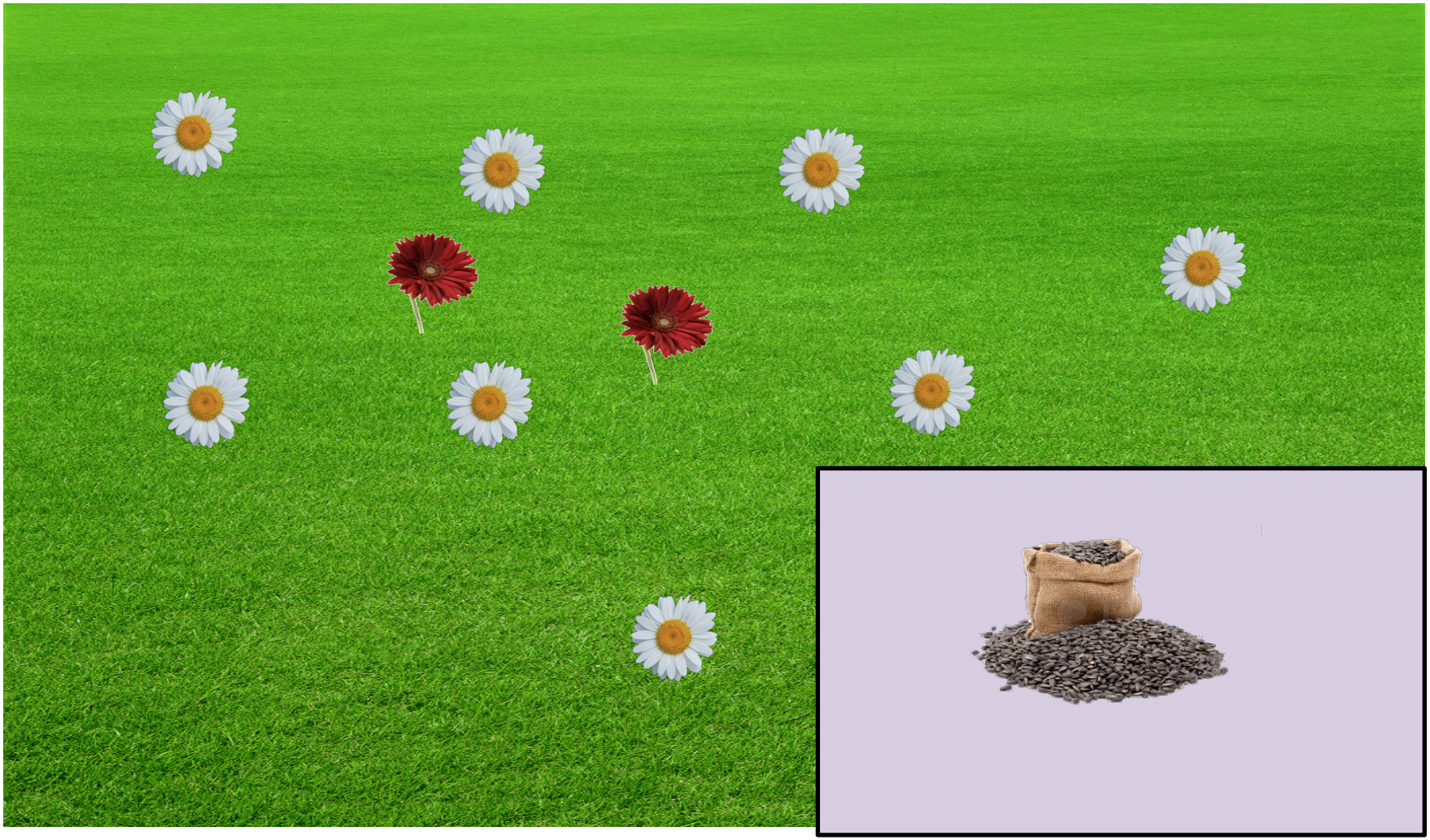
Machines or rain dancing



Other machines (computers) + brains

2.- Statistical-deterministic approach

Developed by K.Emanuel and his team in the context of the long-term wind risk associated with tropical cyclones



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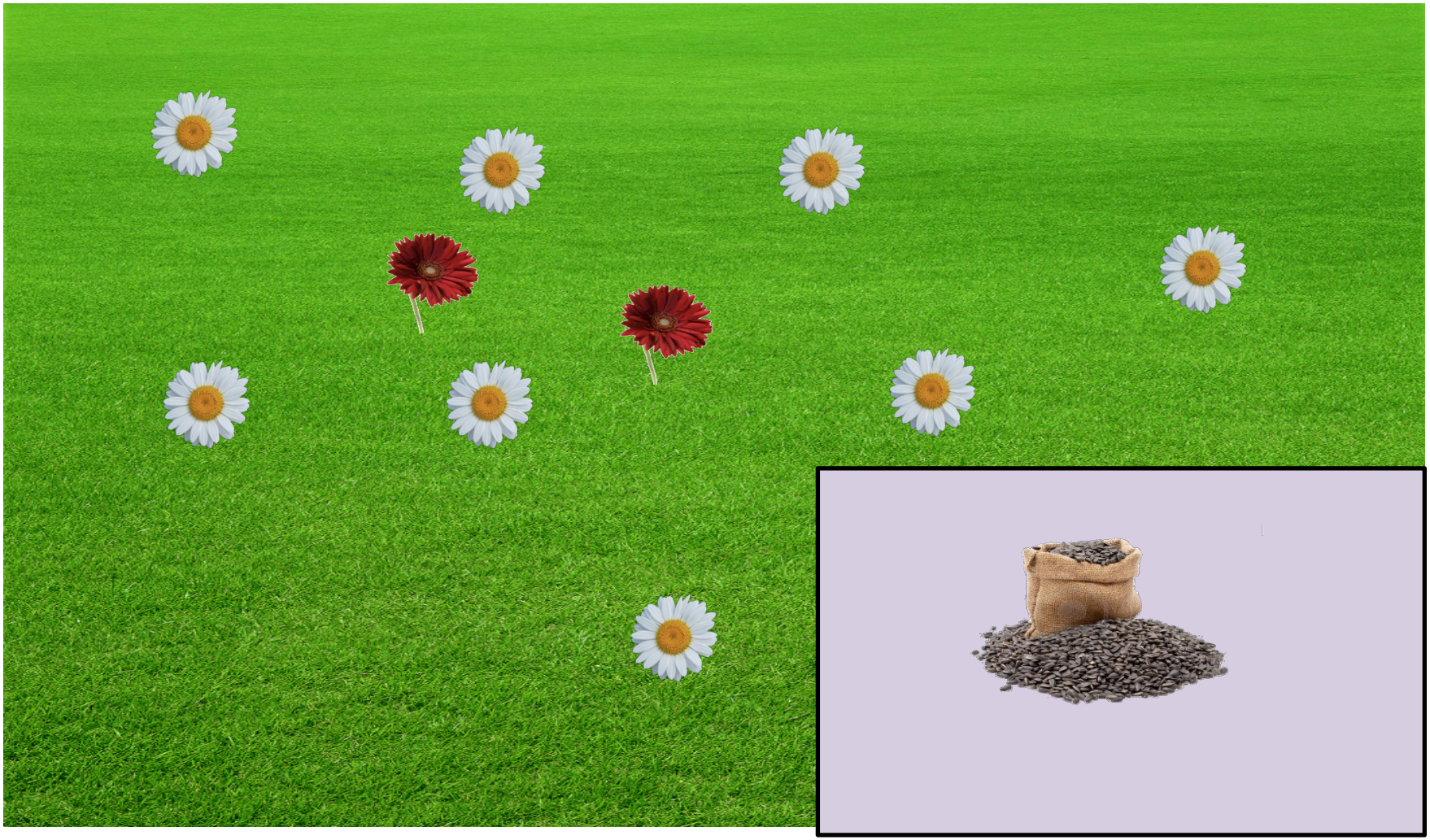

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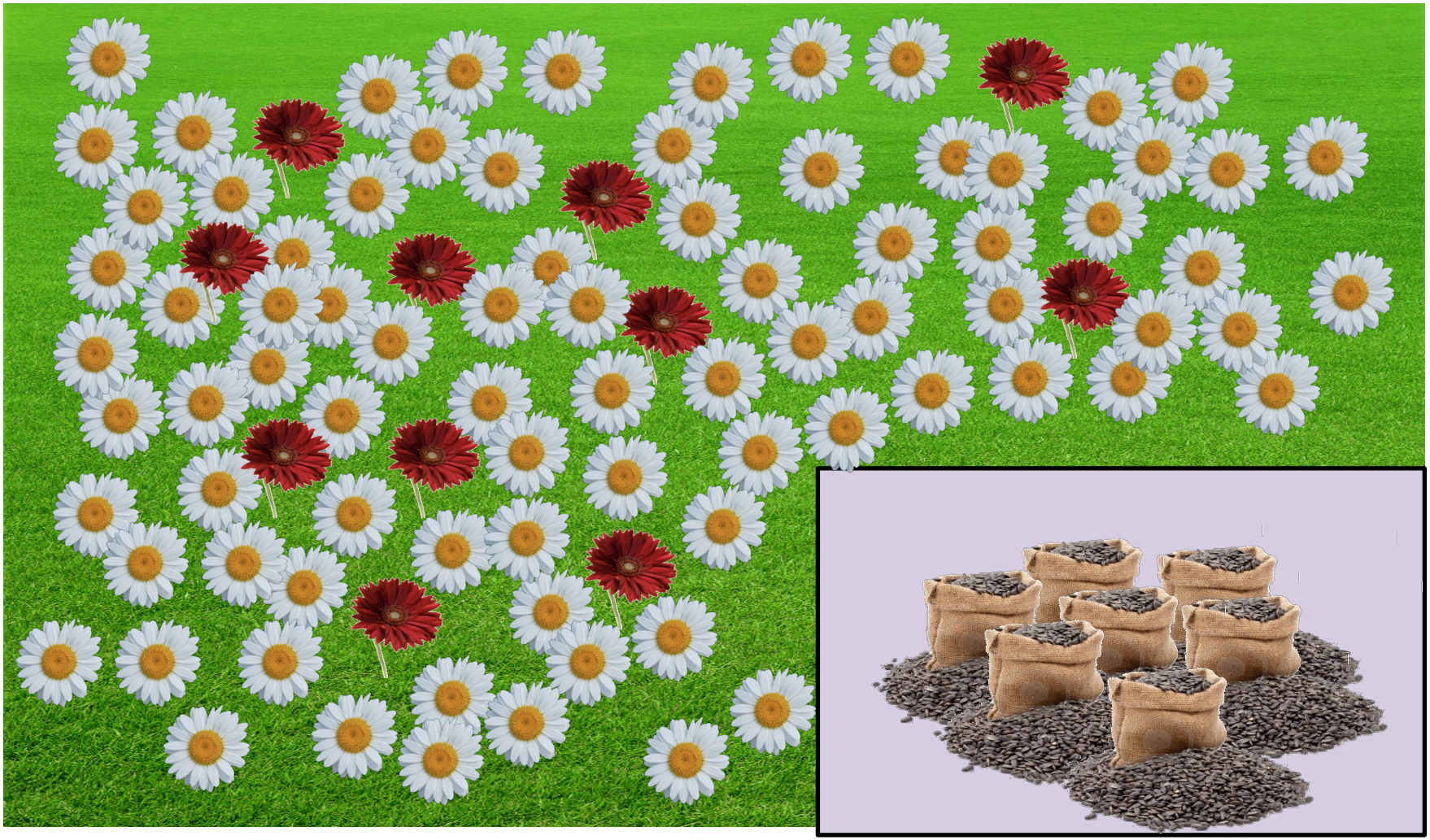


2.- Statistical-deterministic approach

GENESIS: Random draws from observed PDF or Random seeding

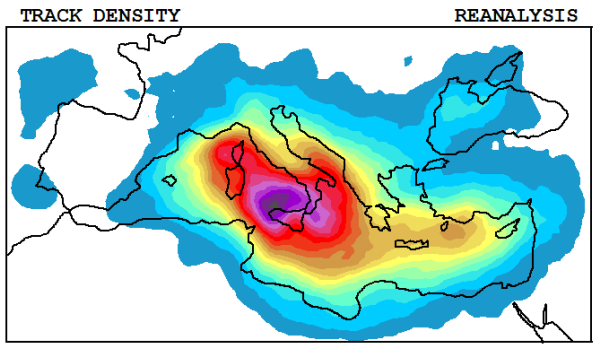
TRACK: Randomly varying synthetic winds (respecting climatology)

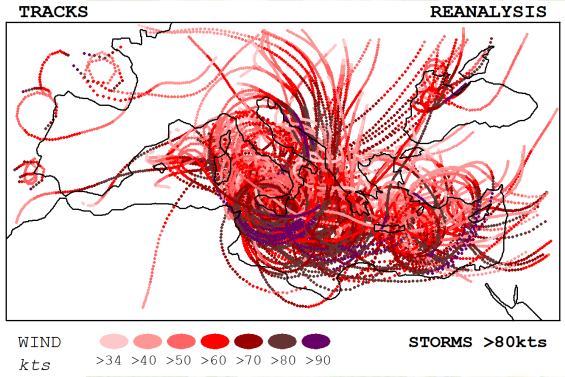
ENVIRONMENT: Previous winds + monthly-mean thermodynamic fields

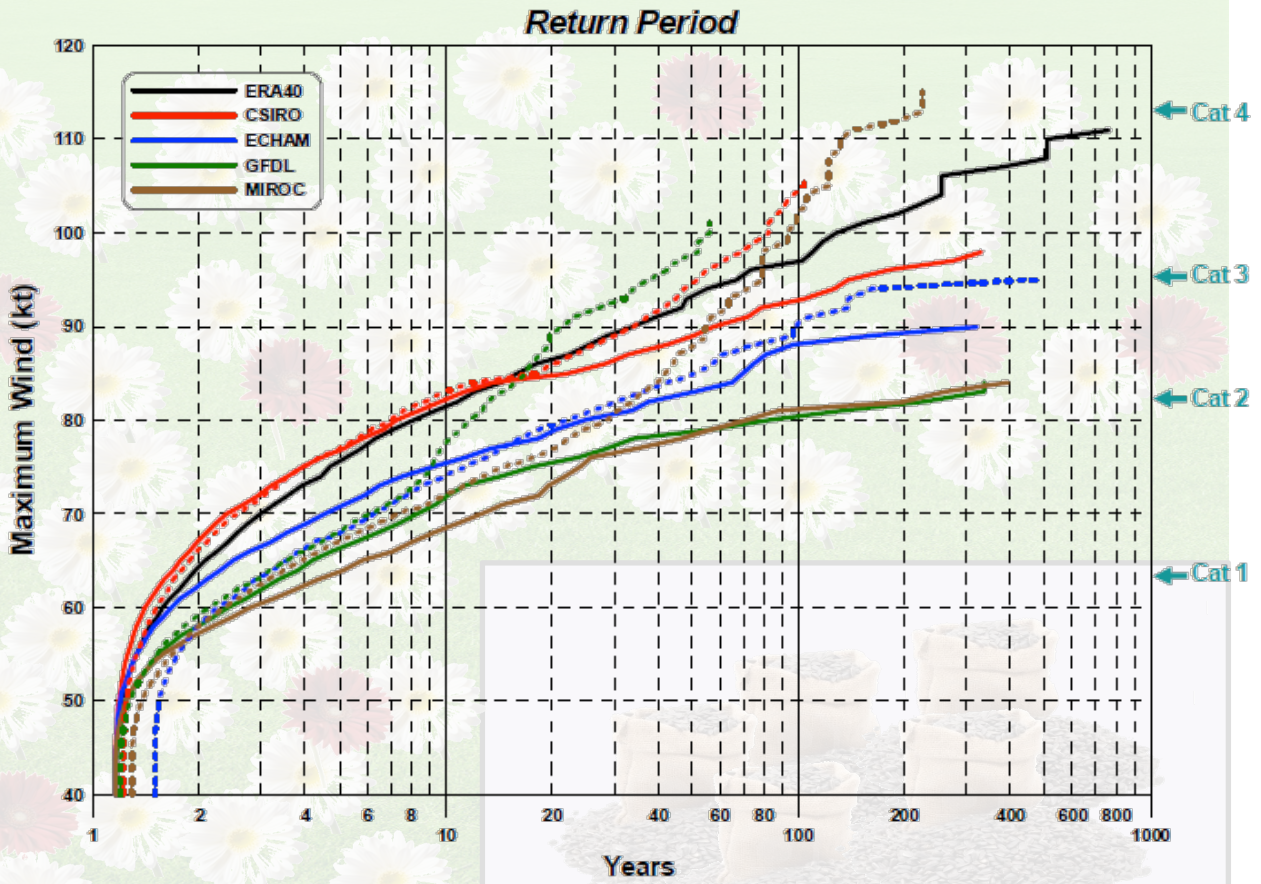
INTENSITY and RADIAL DISTIBUTION of WINDS: **CHIPS model**

For each month, descomposition through **PCA** of 10-days synoptic evolutions of **z250, z850, T600, and P.I**. into the new space of independent PCs.

2.- Statistical-deterministic approach



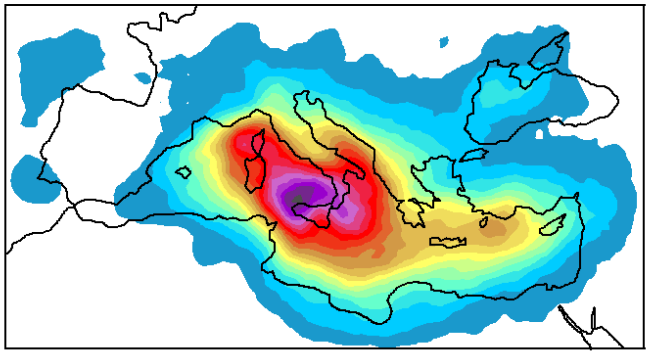




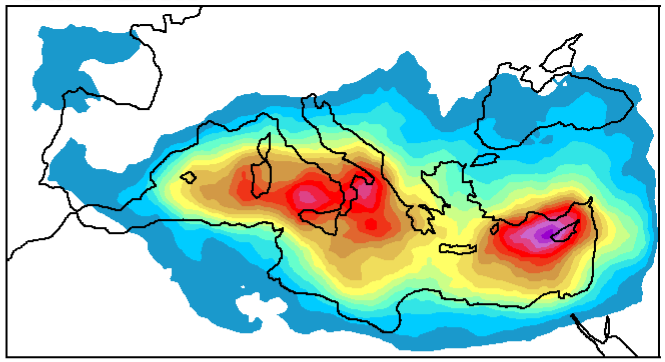
Comparing methodologies

2.CHIPS

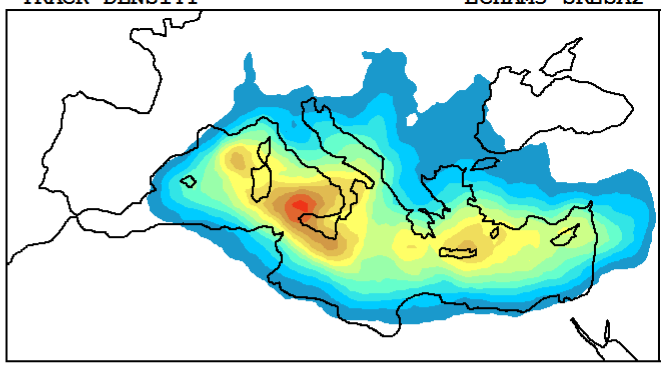
TRACK DENSITY REANALYSIS



TRACK DENSITY ECHAM5-20C3M

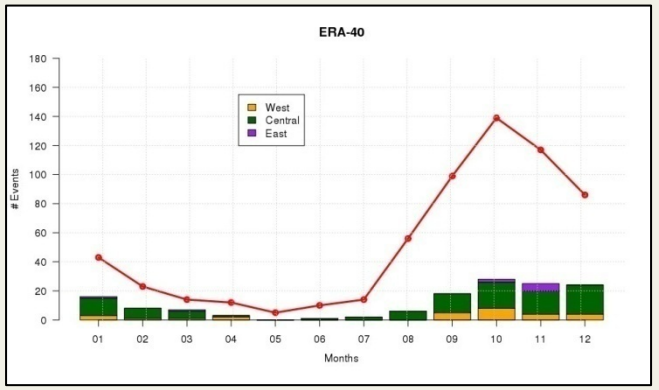


TRACK DENSITY ECHAM5-SRESA2

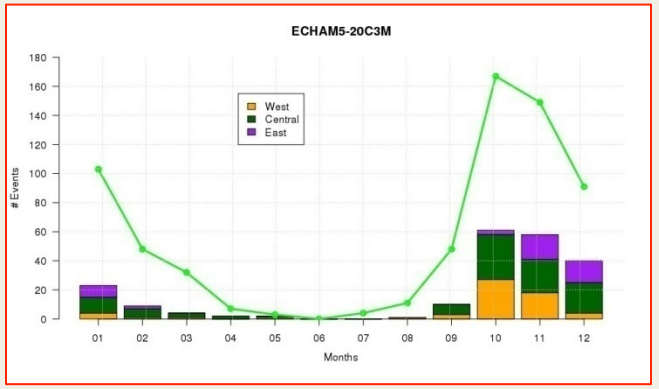


#/100km century 4 8 12 16 20 24 28 32 36 40

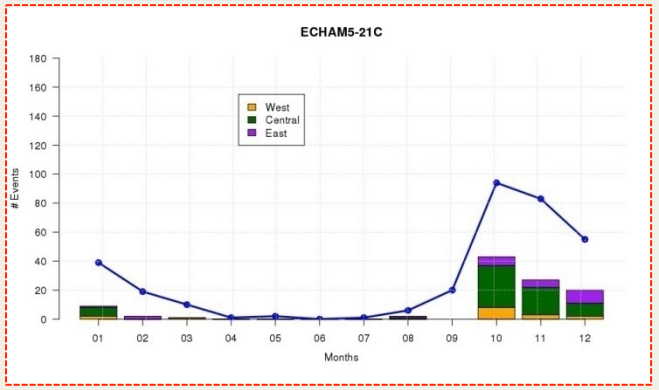
1. Nested



28
101
9



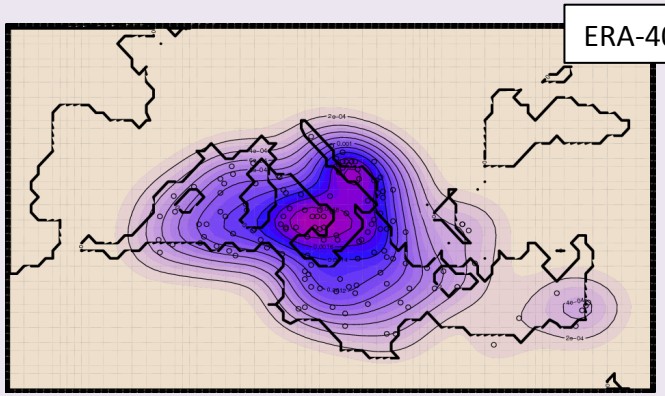
60
105
45

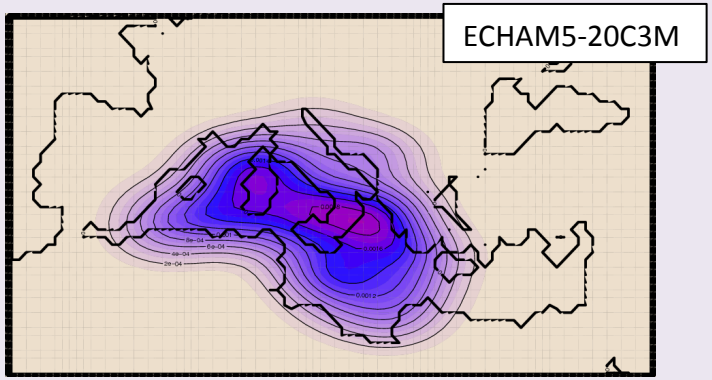


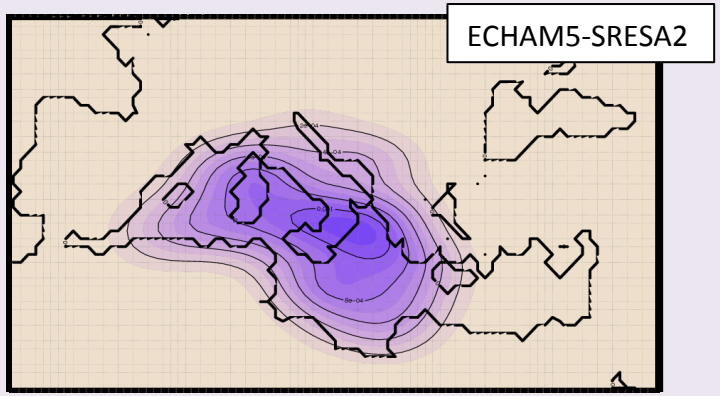
16
64
23

Comparing methodologies

1. Nested







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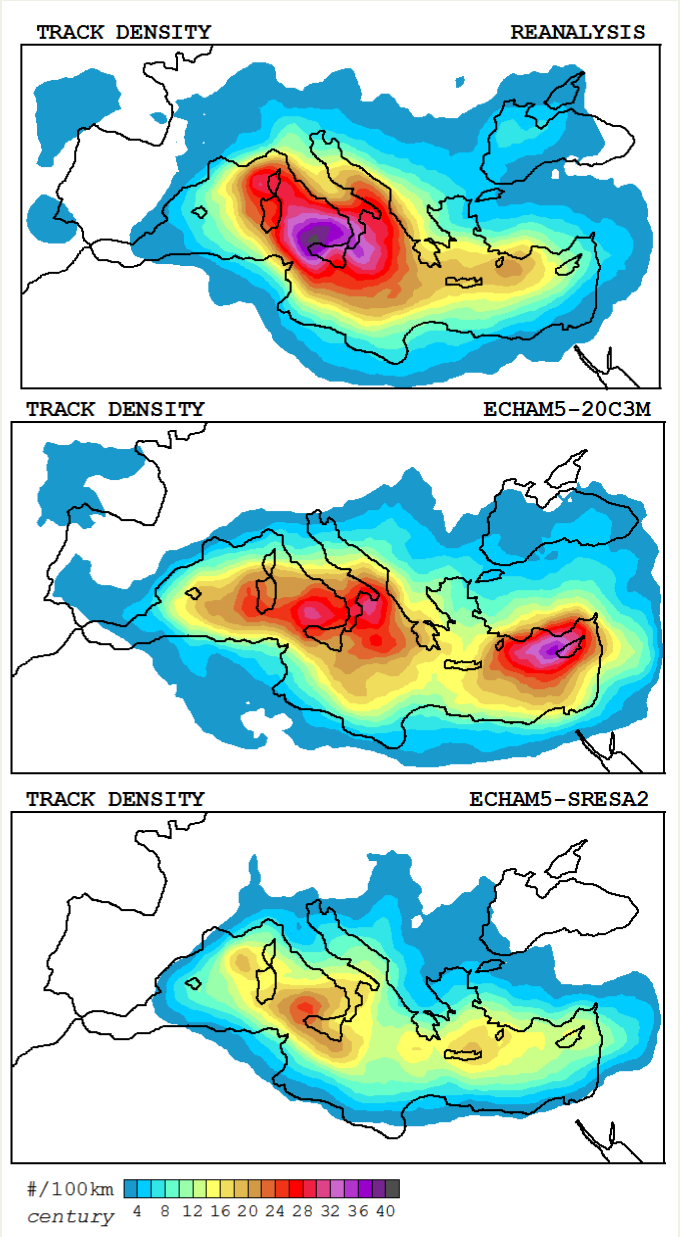
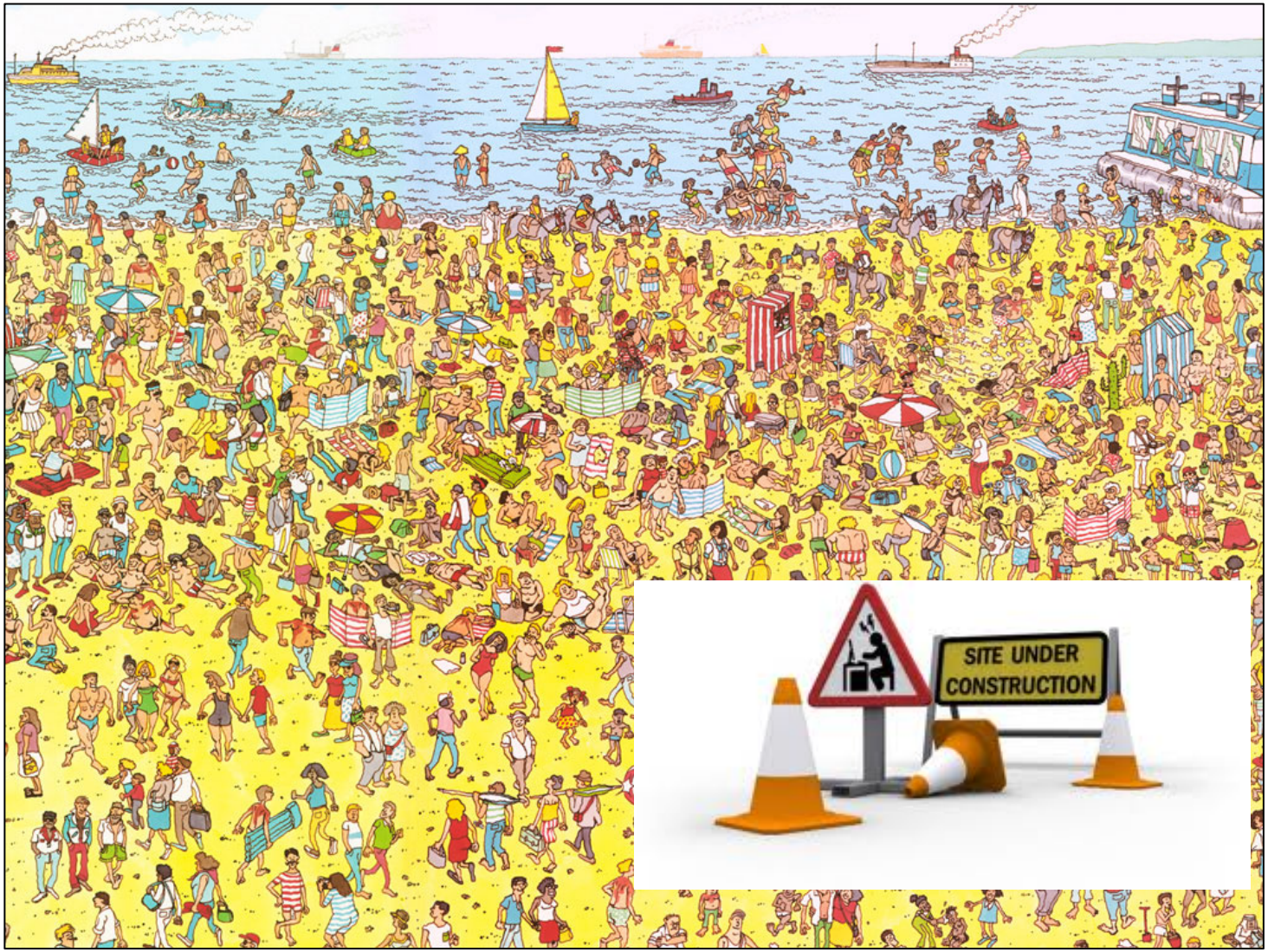
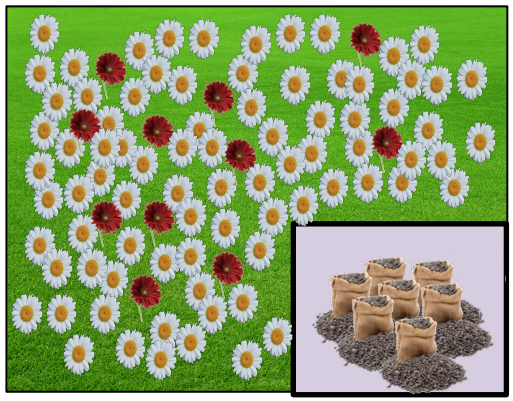
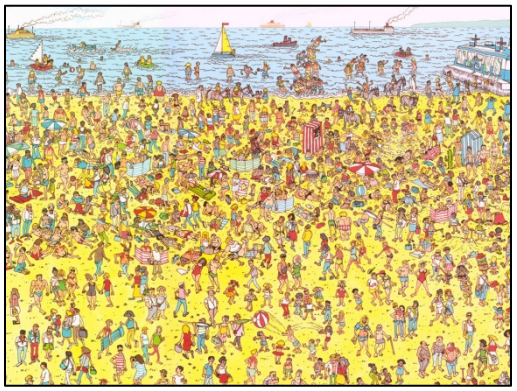


3.- Very high resolution climate model







	1. Nested simulations	2. Statistical-deterministic	3. Very high resolution
PROS	•Callibration •Realistic	•A lot of events (statistical robust) •Cheap computational cost	•Direct tecnique
CONTRAS	•Few events •High computational cost	•Synthetic	•Just one model

All for one… !!!