High Resolution & Dynamics Experiments at Met Éireann

Colm Clancy

HECTOR e-suite

750m, 800 x 800 x 90L
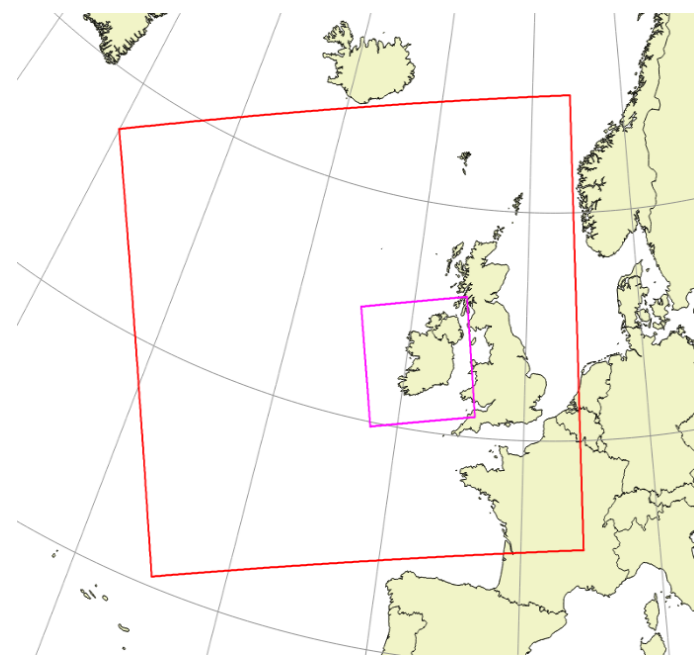Cubic grid, TSTEP = 30s

Horizontal diffusion: RDAMP*=10

Operational IFS boundaries

3DVAR with conventional & satellites, using yesterday's IREPS VARBC coefficients

Running since Jan 2023, 36-hour forecasts at 00 & 12z, 9-hour at intermediate

15-minute output

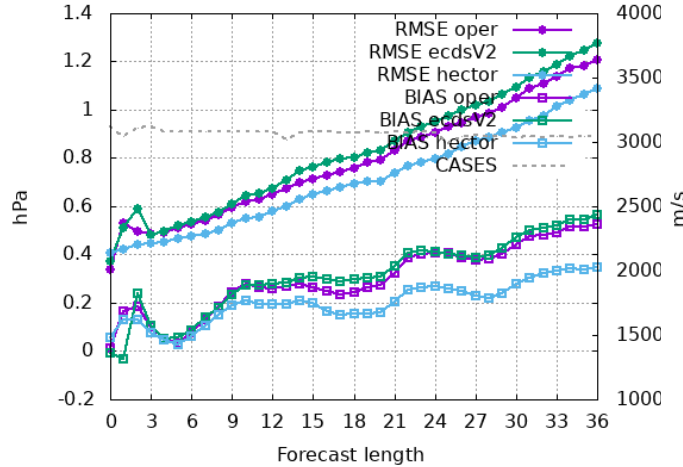To be made fully operational with UWC-W switchover

General

Operations
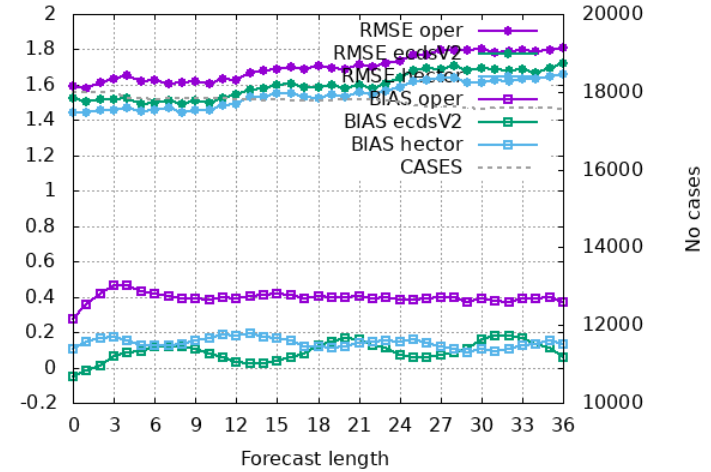**2.5km 65l**

UWC-W ECDSv2
2.0km 90l

HECTOR
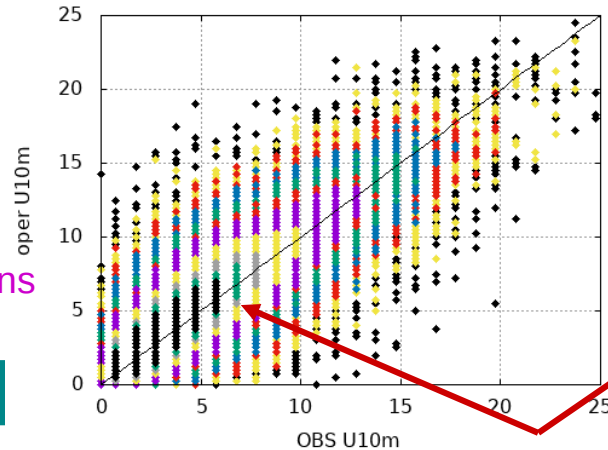**750m 90l**

Operations

Selection: ALL using 40 stations
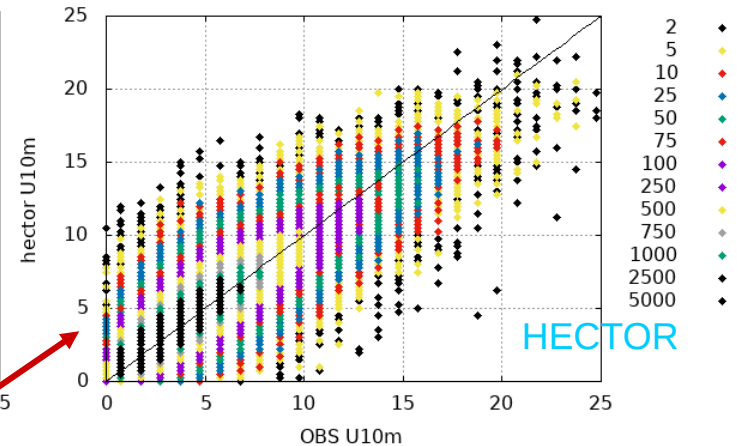Mslp Period: 20230101-20240229
Hours: 00,12

Selection: IrelandSynop using 23 stations
U10m Period: 20230101-20240229
Hours: 00,12

Scatterplot for 23 stations Selection: IrelandSynop
U10m [m/s]
Period: 20230101-20240229
Used 00,12 + 03 06 ... 36

Scatterplot for 23 stations Selection: IrelandSynop
U10m [m/s]
Period: 20230101-20240229
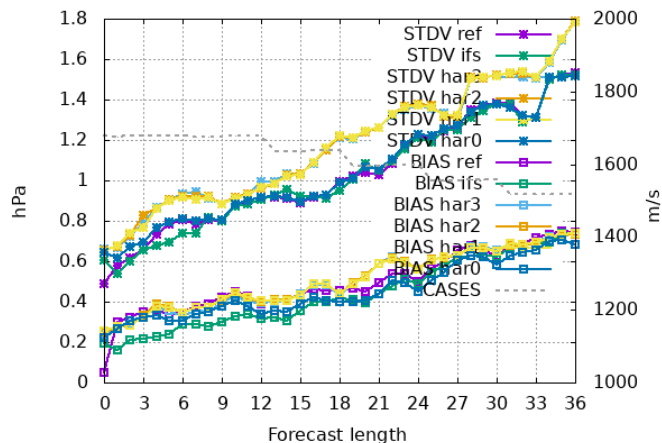Used 00,12 + 03 06 ... 36

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Which boundaries to use?

- IFSHRES the simplest, and gave best scores

- More nesting options with UWC-West hourly DINI

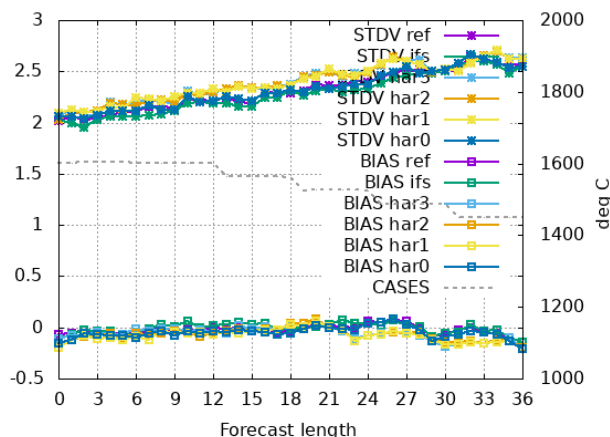- "same_forecast" option not practical

Which boundaries to use?

MSLP

U10m

T2m

Reference 2.5km
750m: IFSHRES,
750m nested: 3-hour, 2-hour, 1-hour, same

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Which boundaries to use?

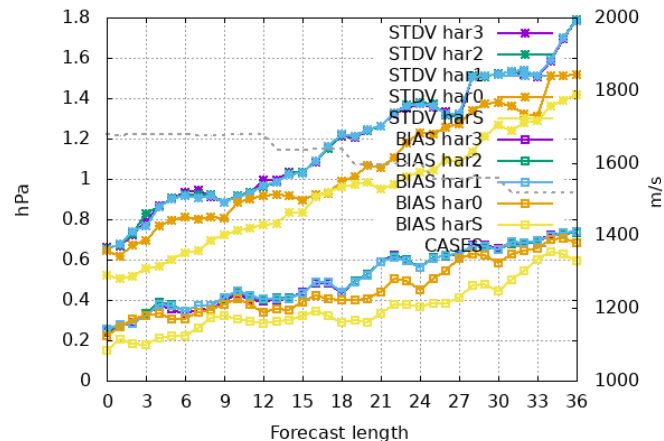- Need to consider the "age" of the global boundaries
  ("same_forecast" option not practical)

Name	Host	LBC age	HARM used by 12z	IFSHRES used by HARM host
ifs	IFSHRES	6-hour old	-	0600 UTC
har3	HARM	3-hour old	0900 UTC	0000 UTC
har2	HARM	2-hour old	1000 UTC	0000 UTC
har1	HARM	1-hour old	1100 UTC	0000 UTC
har0	HARM	same forecast	1200 UTC	0600 UTC
harS	HARM	same forecast	1200 UTC	1200 UTC

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Age of Boundaries

750m experiments with LBC from 2.5km HARMONIE host
3-hour, 2-hour, 1-hour old
same_forecast with standard host
same_forecast with same_forecast host

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Rainfall analysis: focus on the "heaviest"

Mean and STD FSS over 2022-02-10-00 to 2022-02-20-06 using 1km gridded rainfall
Days where 75th percentile 24hr rain >=10 mm

spiecla2feb2022har0 spiecla2feb2022har2 spiecla2feb2022ifs1
spiecla2feb2022har1 spiecla2feb2022har3 spiecla2feb2022ref0
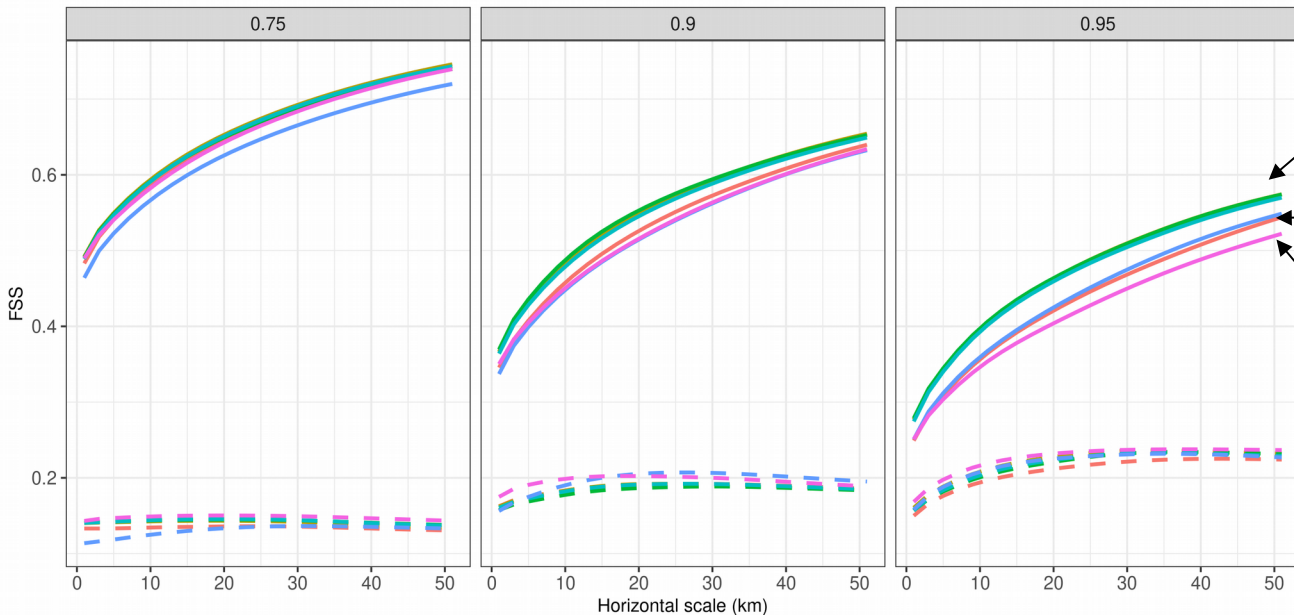
HARM 1-, 2-, 3-hour old

HARM same, IFSHRES

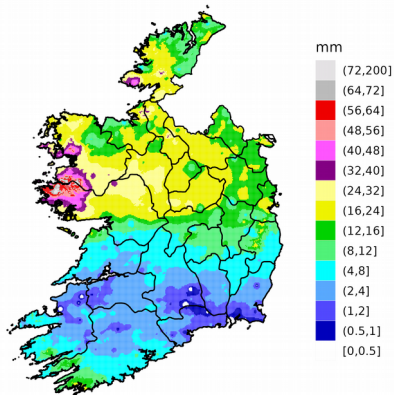Reference 2.5km

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(James Fannon)

Flooding case

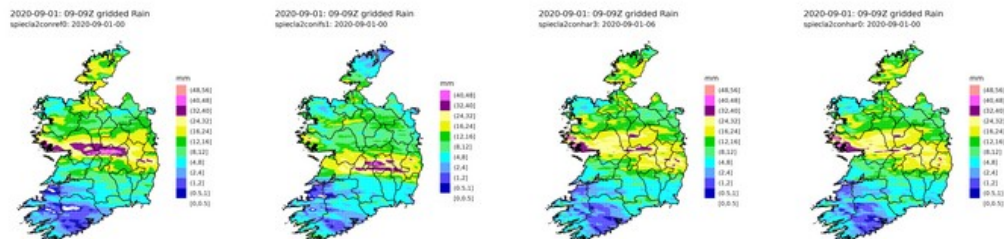Each row shows experiments which ultimately begin with the same IFSHRES boundaries.

Observations:
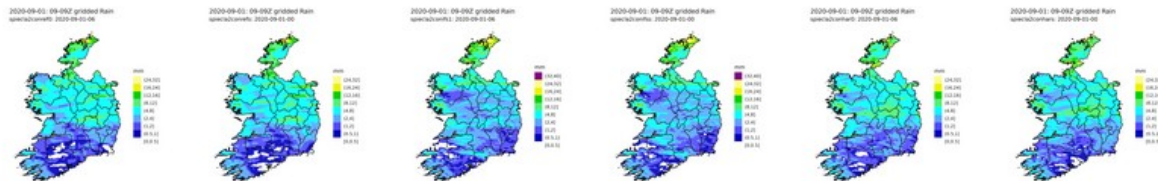

2020-09-01: 09-09Z gridded Rain
Observed

IFS 18Z on 31st

- Left to right: ref0 00Z, ifs1 00Z, har3 06Z (using ref0 03Z, hence IFS 18Z), and har0 00Z:
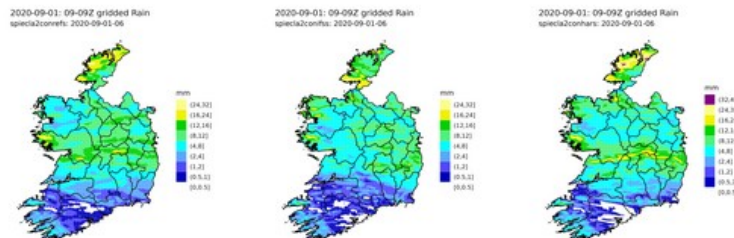

IFS 00Z on 1st

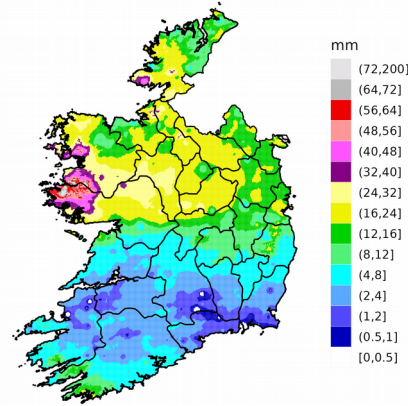- Left to right: ref0 06Z, refs 00Z, ifs1 06Z, ifss 00Z, har0 06Z, and hars 00Z:

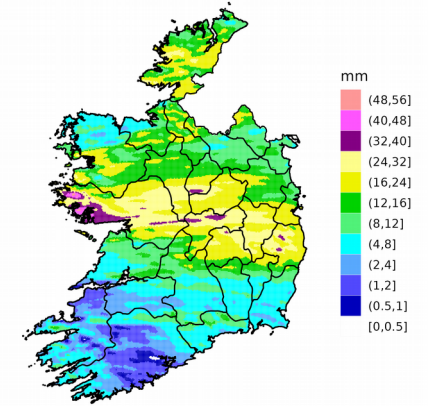## IFS 06Z on 1st

- Left to right: refs 06Z, ifss 06Z, hars06Z

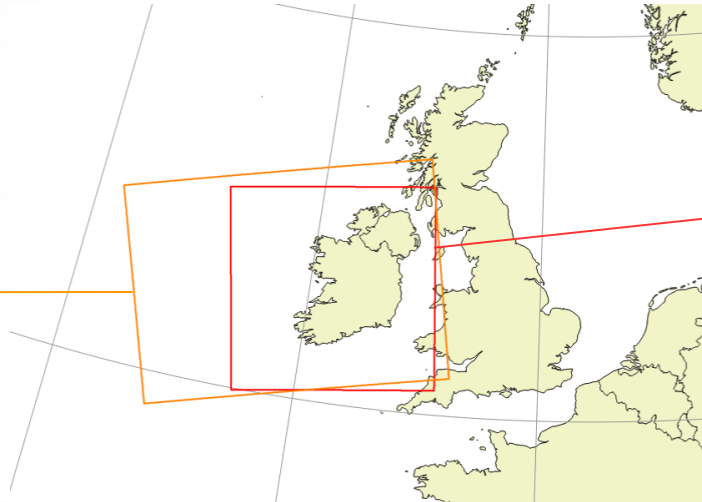# Increase domain size?
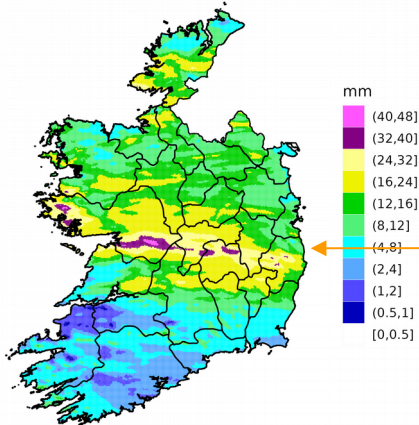

2020-09-01: 09-09Z gridded Rain
Observed

2020-09-01: 09-09Z gridded Rain
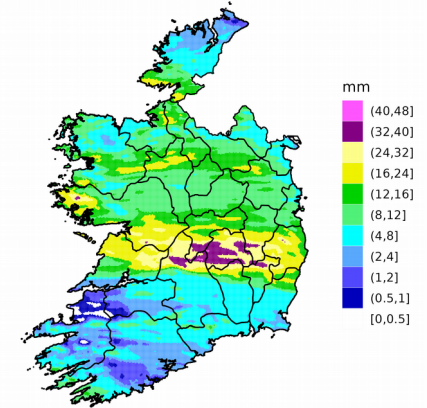spiecla2conhar0: 2020-09-01-00

Observed

HARM nested

IFSHRES LBC: drier boundary regions

2020-09-01: 09-09Z gridded Rain
spiecla2conifs1l: 2020-09-01-00

2020-09-01: 09-09Z gridded Rain
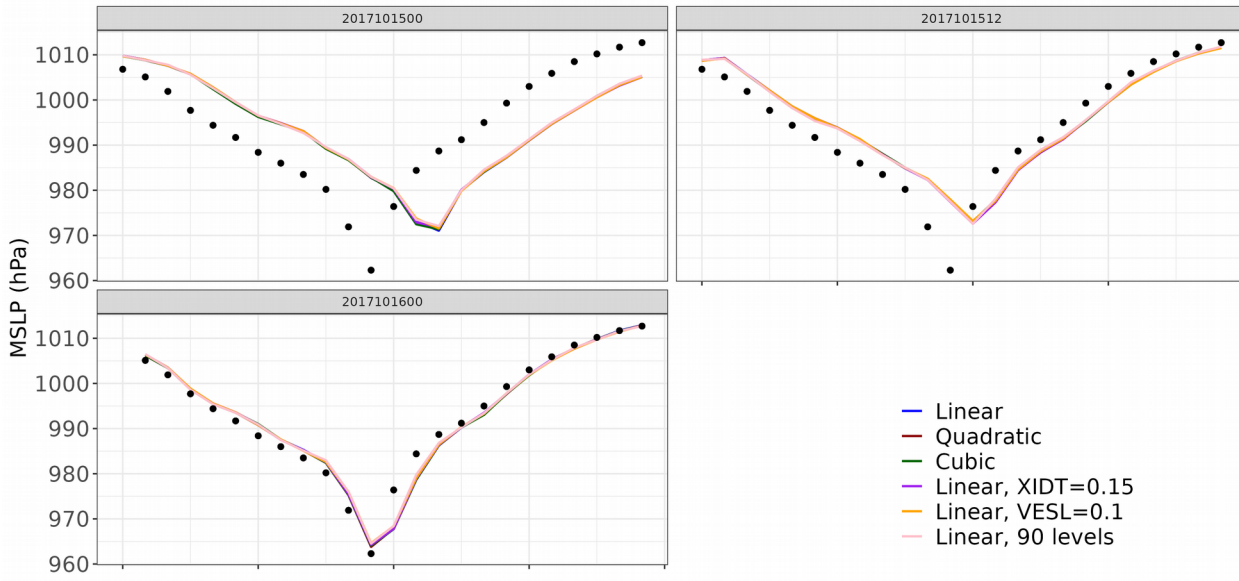spiecla2conifs1n: 2020-09-01-00
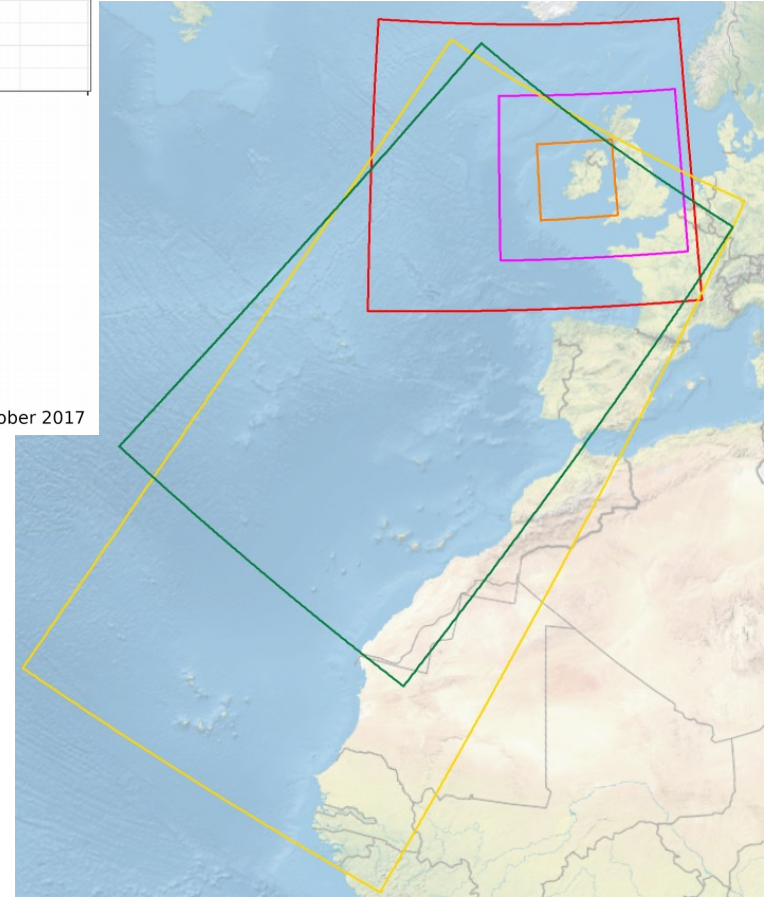
Summary of Boundaries

- Scores alone would suggest simply IFSHRES

- Rainfall analysis suggests dry boundary regions dominating

- Could keep increasing domain size...

- Nesting within HARMONIE cheaper

- Age of boundaries worth keeping in mind when verifying

Other dynamics options and testing

- Stability at 200m.
    Some extreme parameter choices needed

- Truncation
    Linear atmosphere with non-linear orography?
    Accuracy benefit: 750m linear versus 500m quadratic?

Storm Ophelia experiments

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(Tatjana Kokina)