Weather Art Contra Grid Mess

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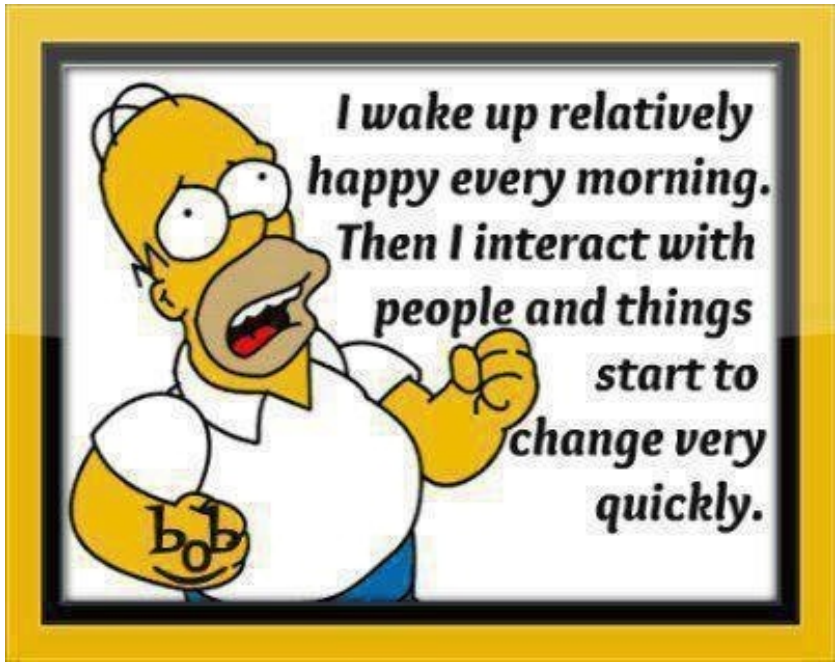
Why This Talk?

Visual Weather

- Sharing frustration about meteorological geospatial products.

- In recent 7+ years of Visual Weather development we have spent much more effort on developing drawing package than on creating new grid visualisation techniques.



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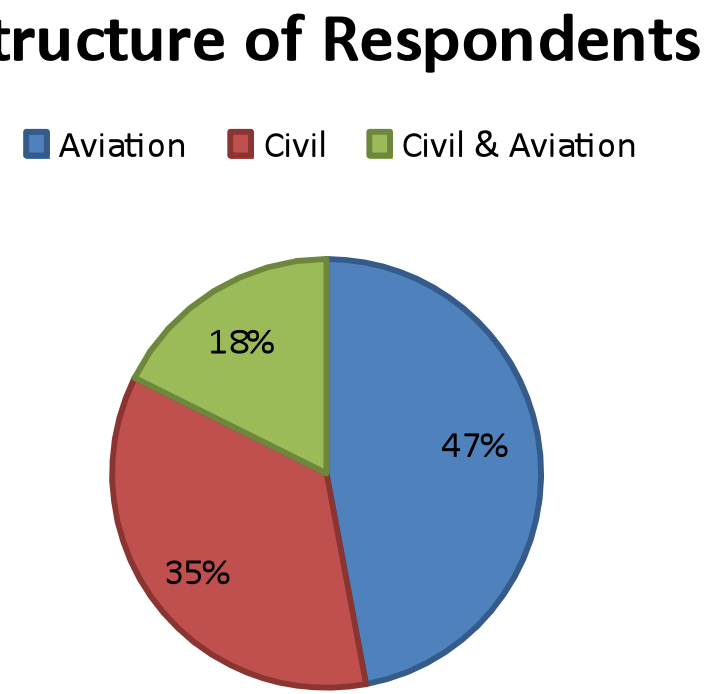
Survey on Vector And Gridded Products

Survey across around 50% of Visual Weather users with:

- 17 respondents,
- 12 countries.



The Weather Art
Making Weather Products Subjective

Painting by artist Carol Schiff

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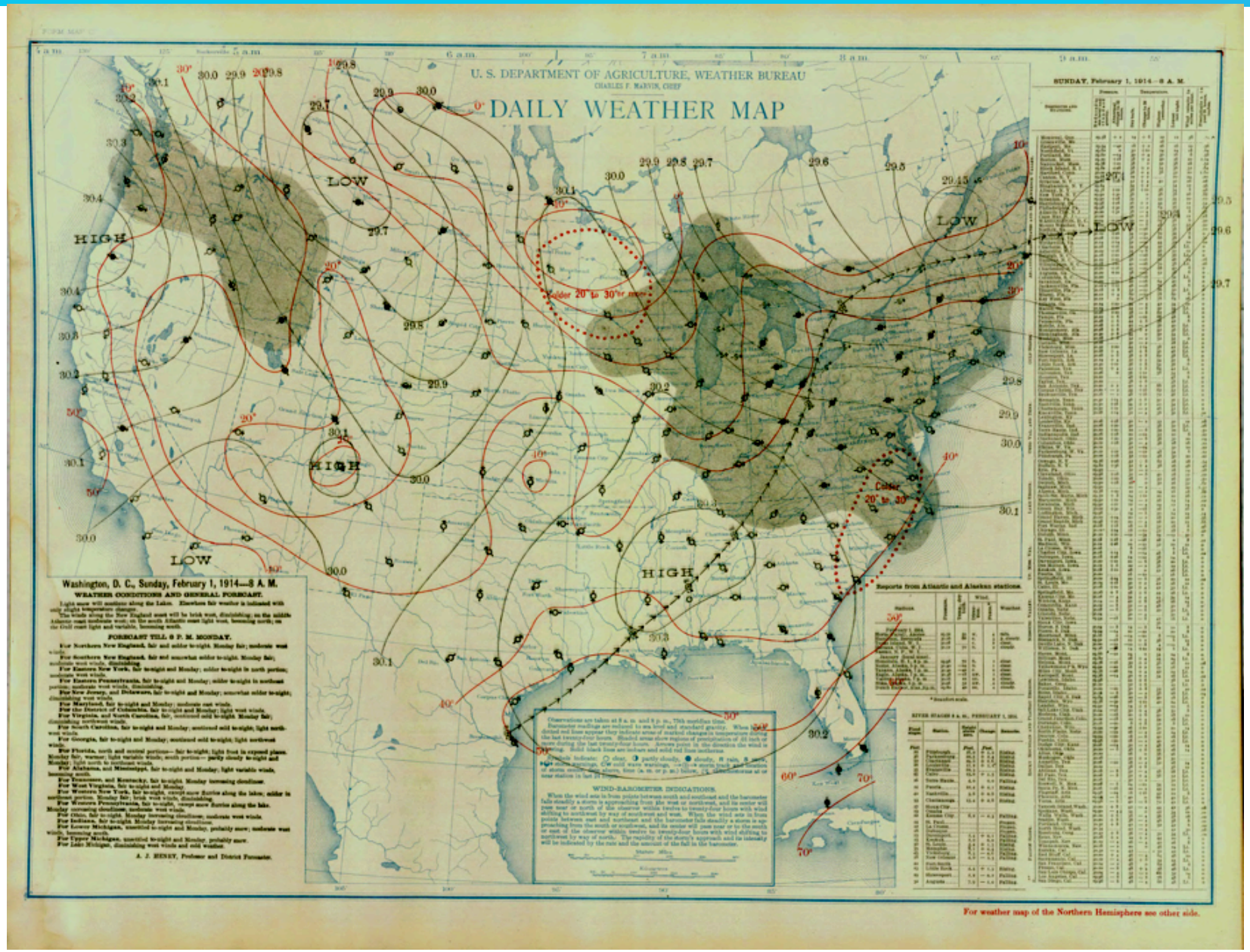
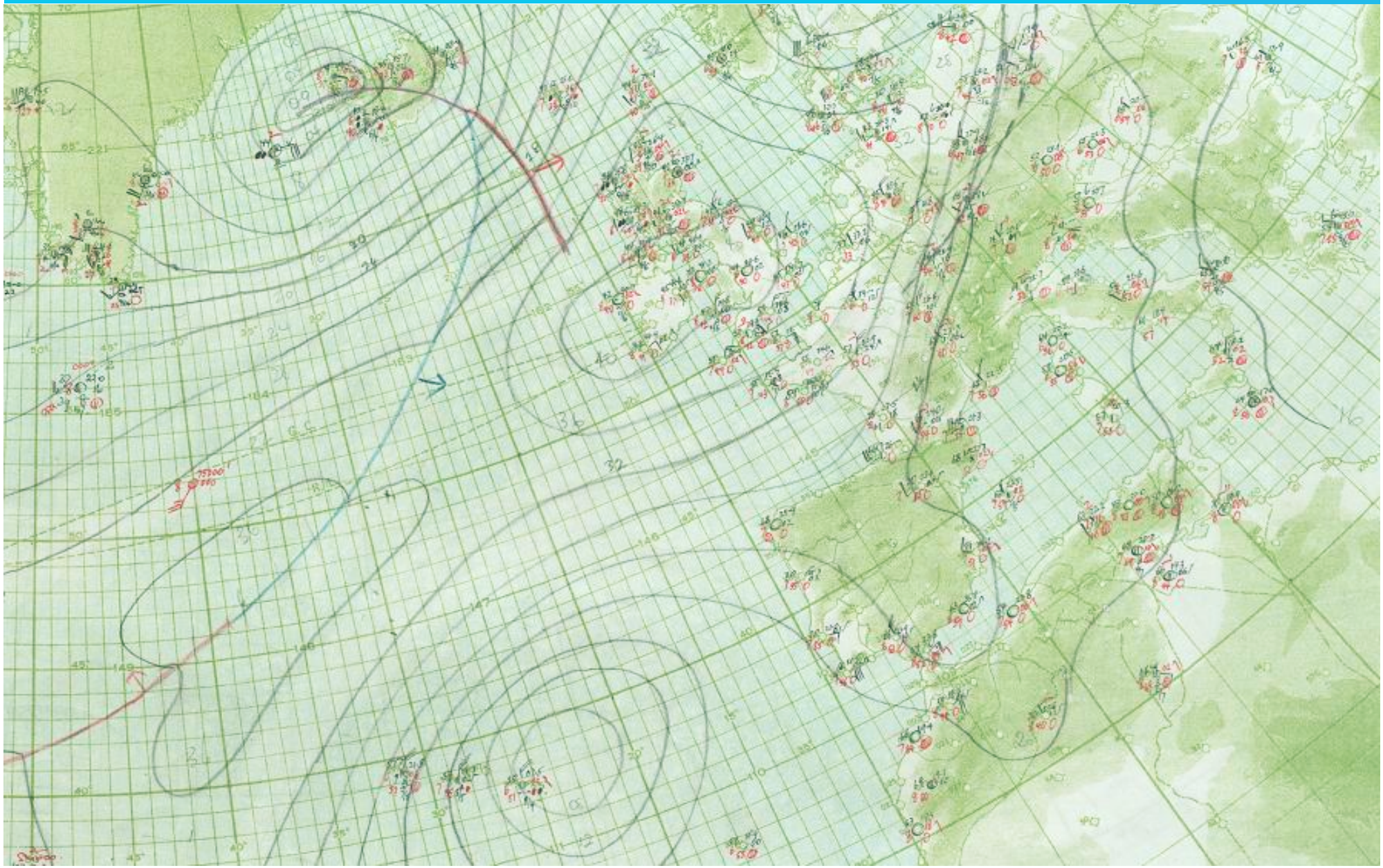
1914 in US

Visual Weather



1943 in UK

Visual Weather



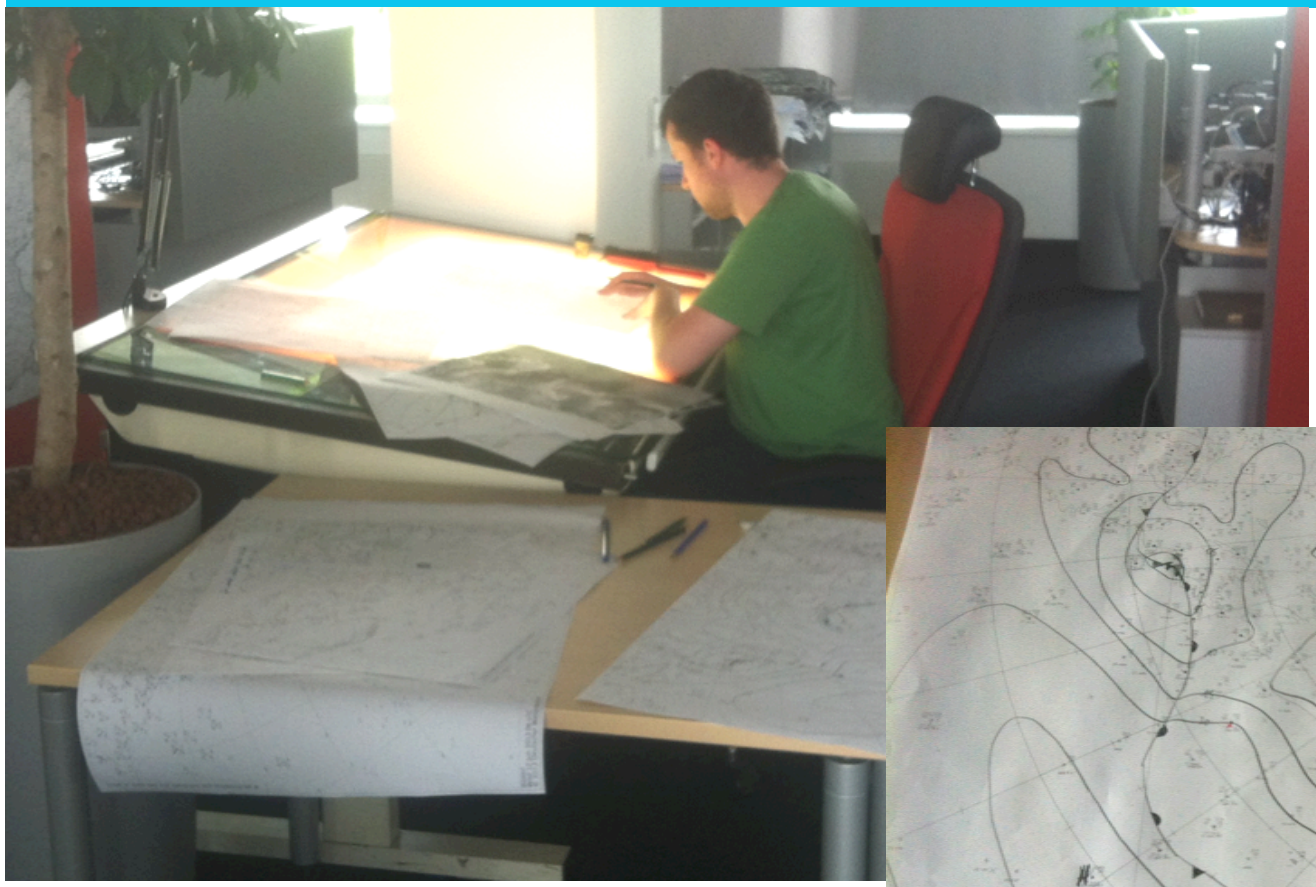
Survey About Drawing of Vector Products

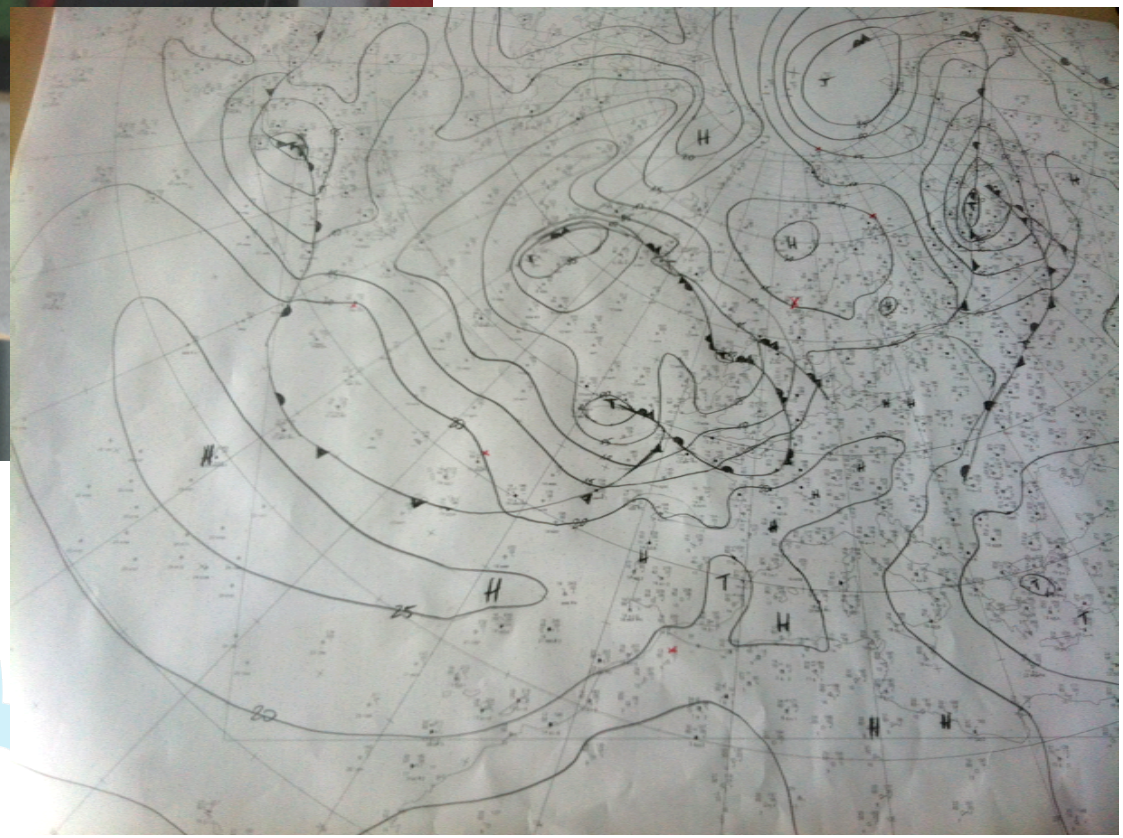
Visual Weather

- 88% of respondents are drawing vector products.
- Reasons for drawing:
  - obligation (65%)
  - commercial usage (53%)
  - public usage (35%)
- Time spent on drawing:
  - around 2h (max 8h) out of 12h working shift (sometime 8h, min 6.5h)
- In 6 countries still hand-drawing:
  - 15m – 3h (average 1.2h)
  - Reasons: mental model (50%), operational req. (30%), tradition (20%)

2013 in Germany

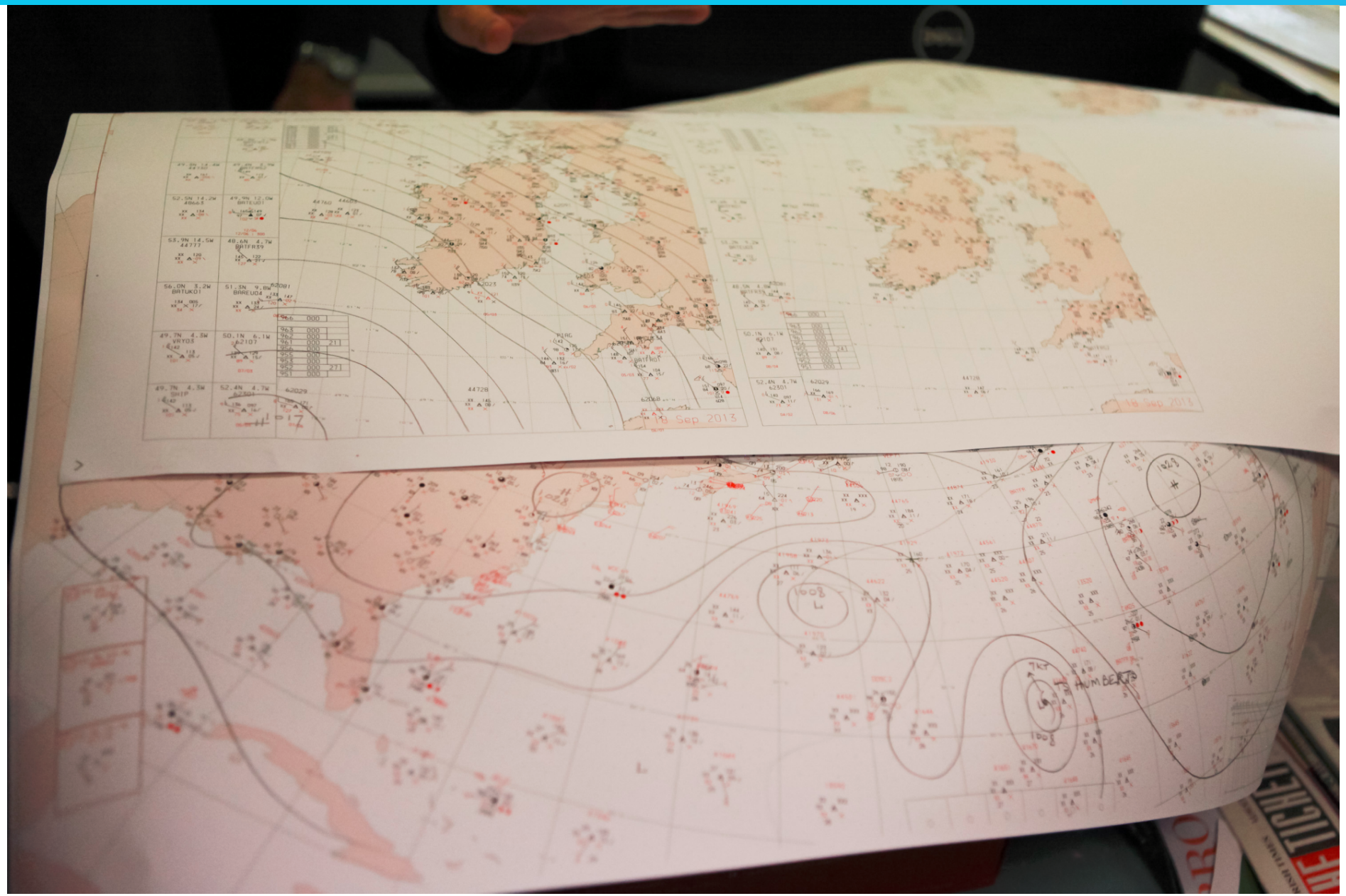
Visual Weather





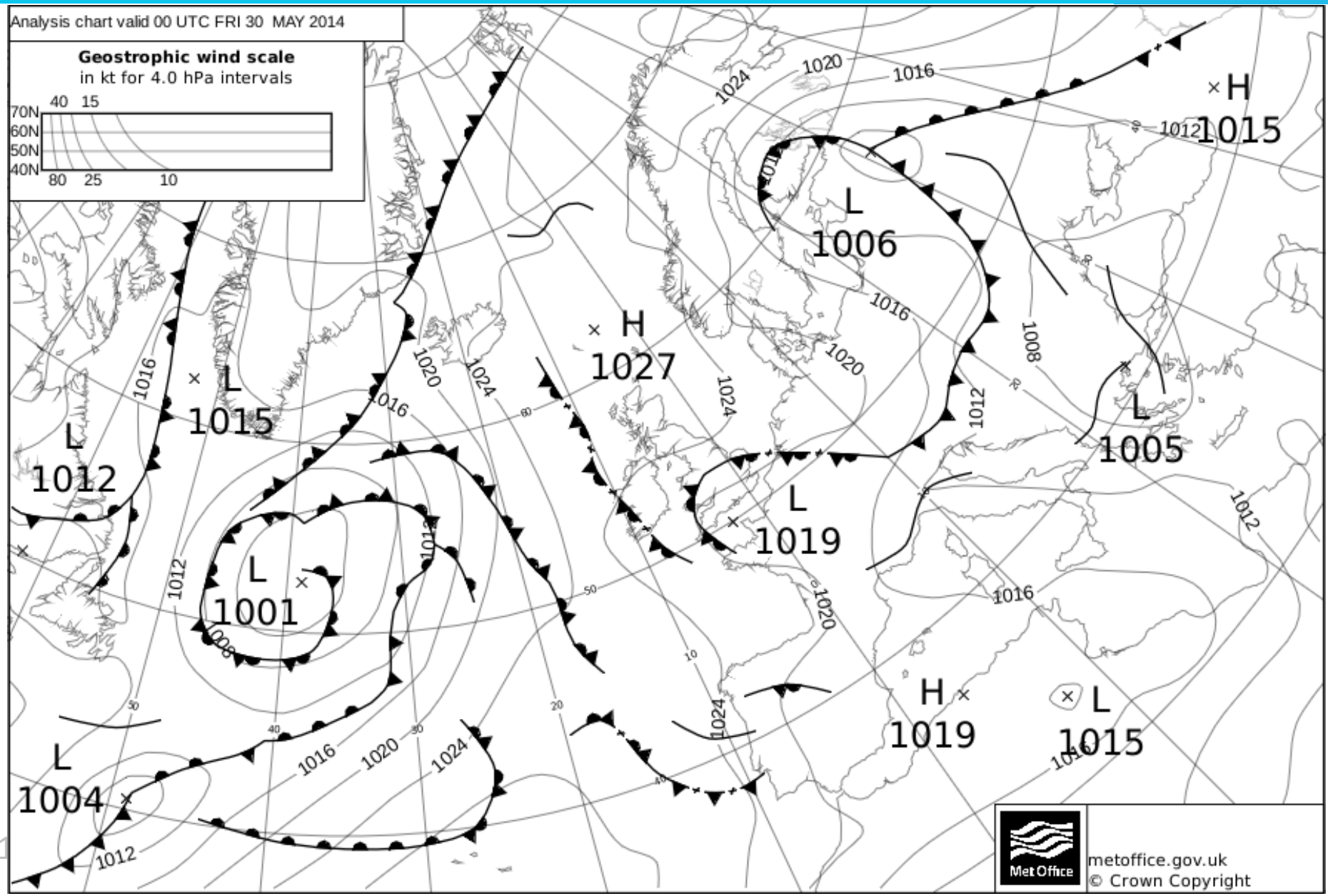
2013 in Ireland

Visual Weather

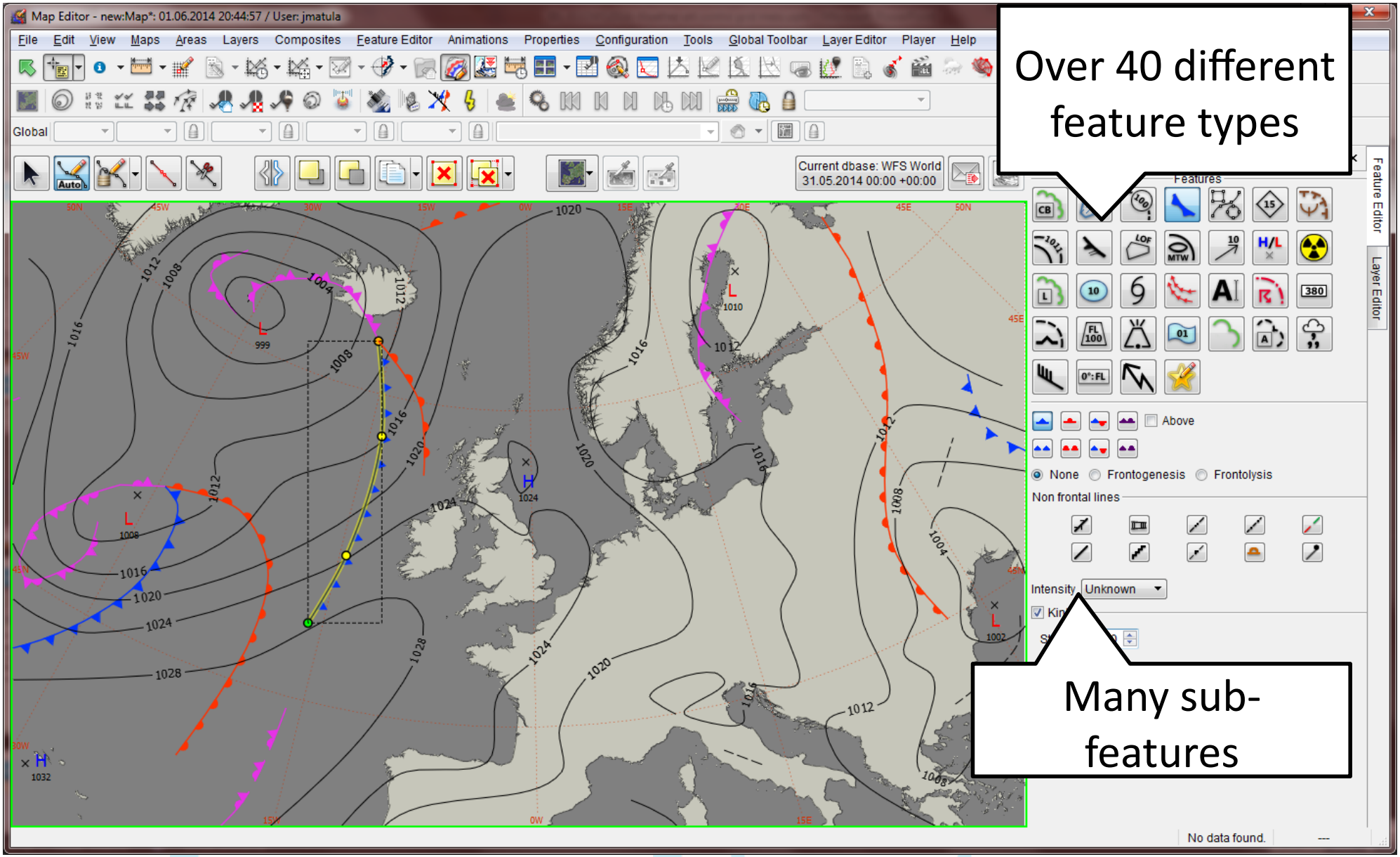


“Today” in UK

Visual Weather

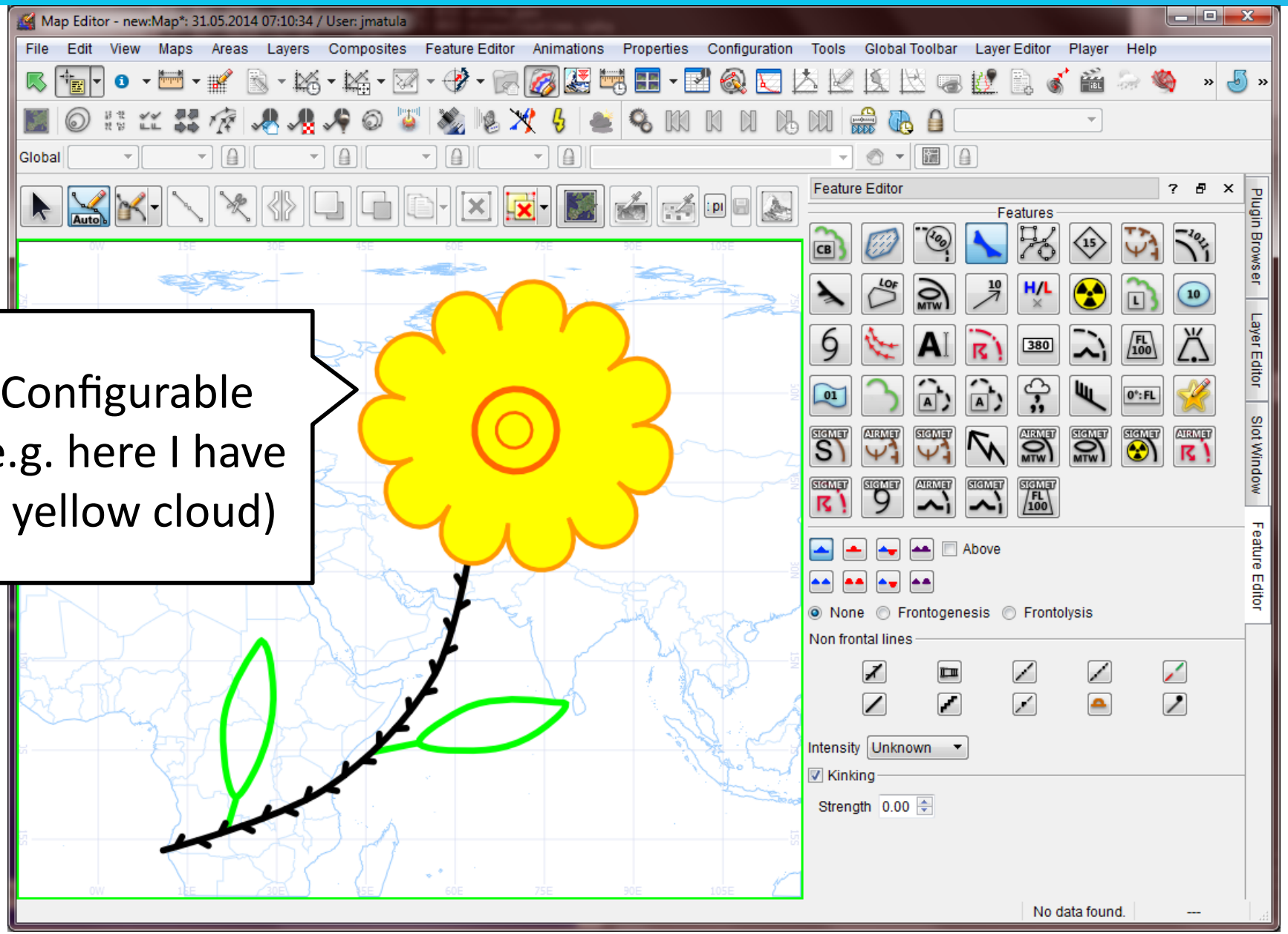


Feature Editor in Visual Weather



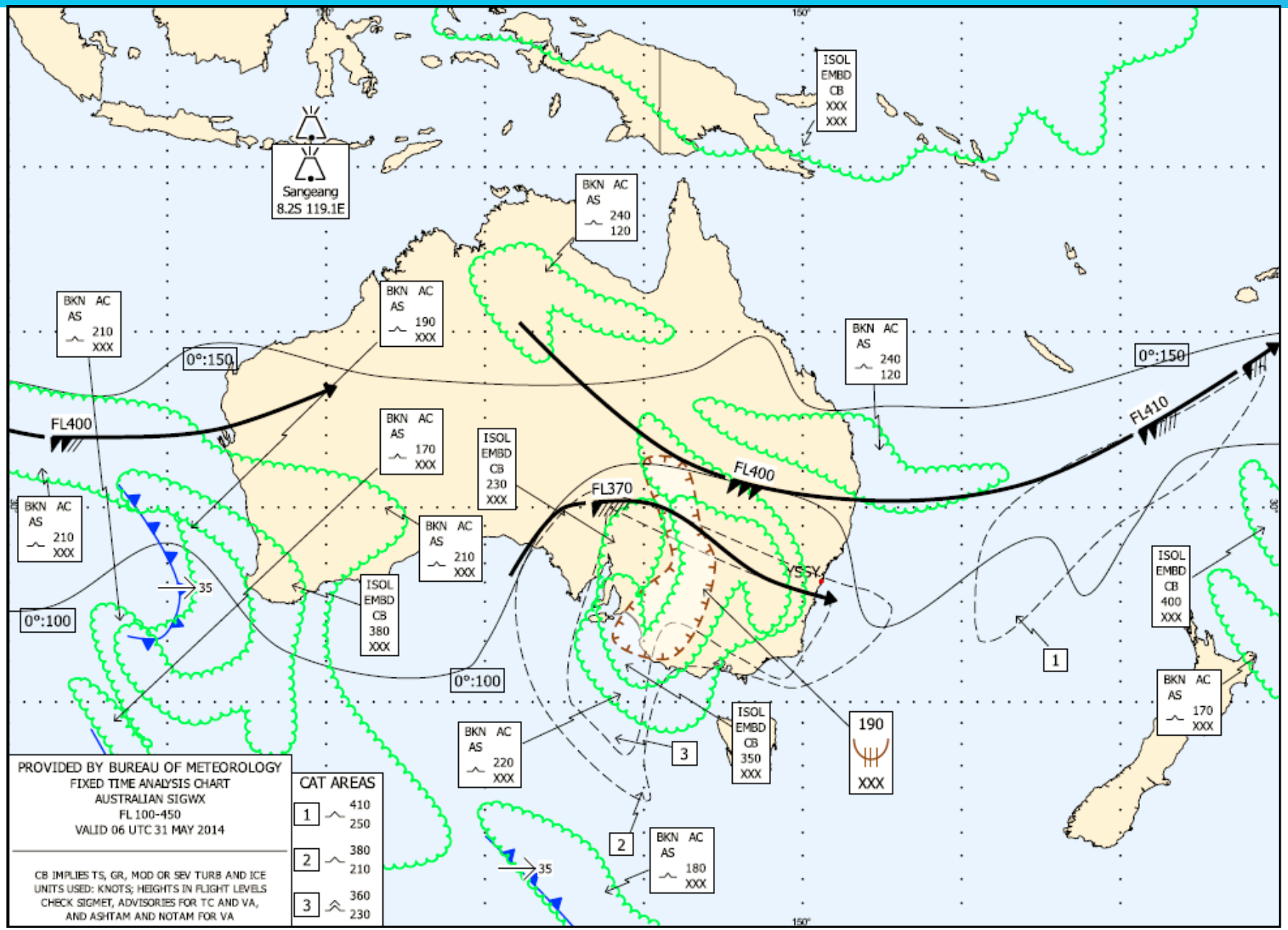
“Today” in IBL Testing Team

Visual Weather



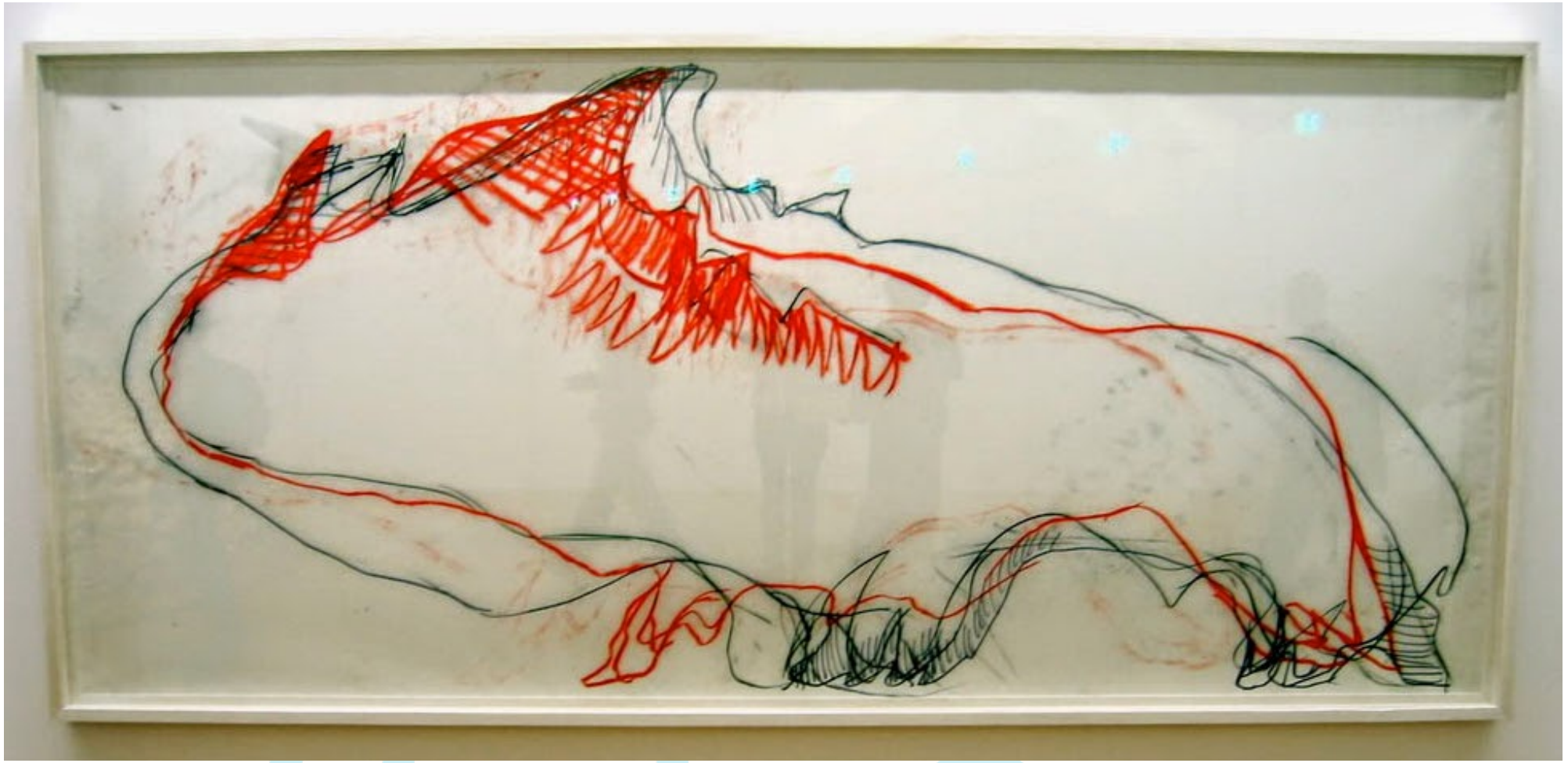
“Today” in Australia

Visual Weather



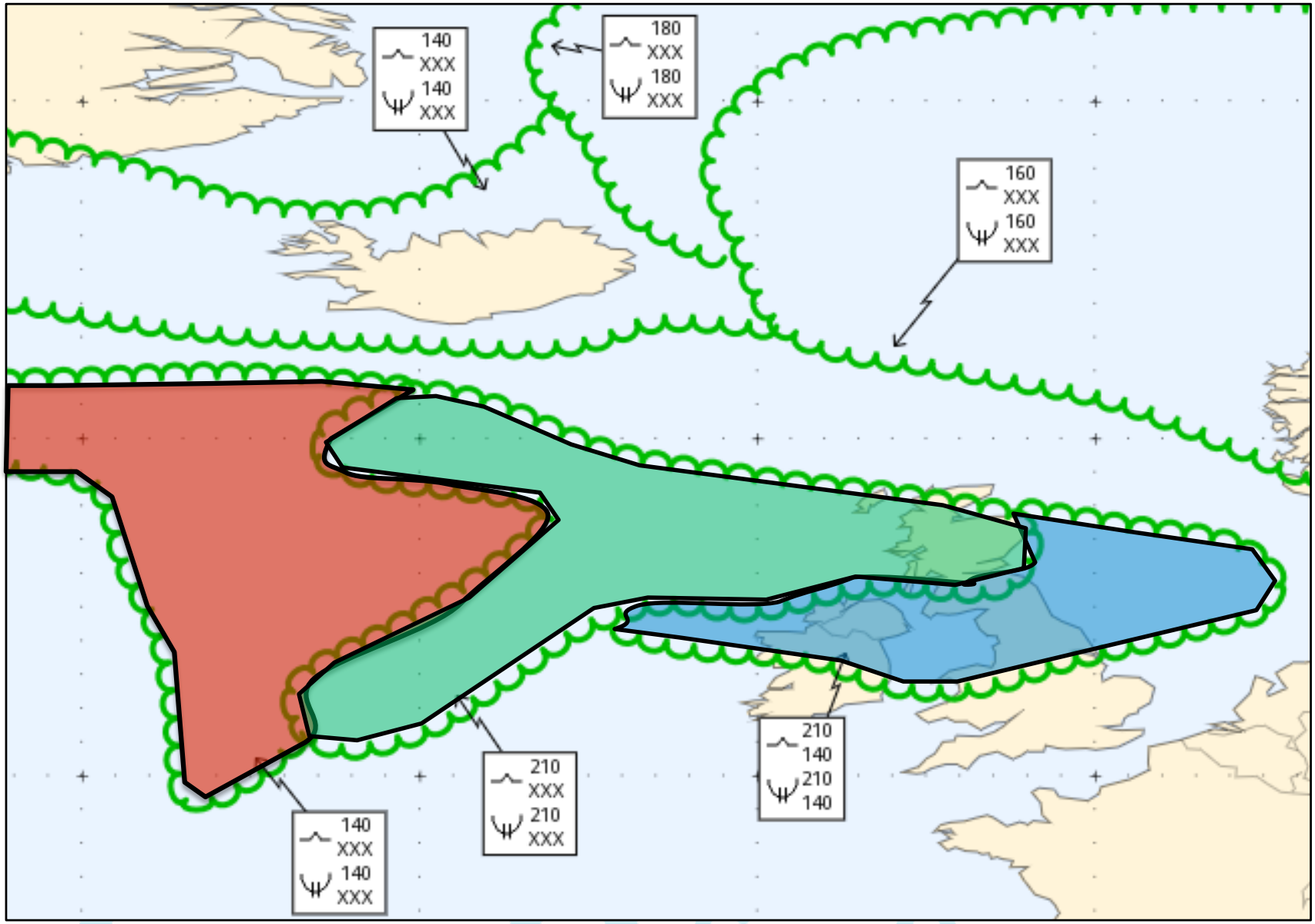
“Today” in Paris, Centre Pompidou Gallery

Visual Weather



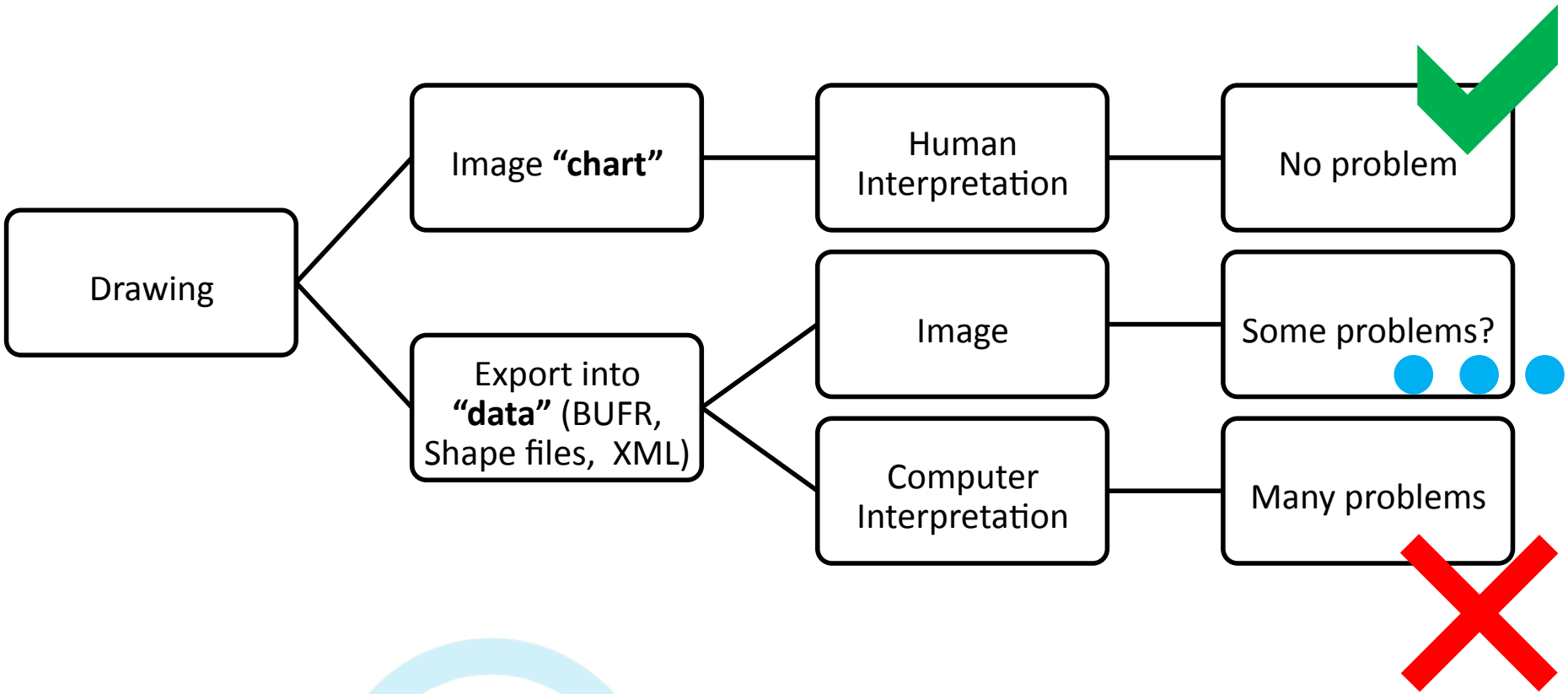
Human Interpretation

Visual Weather



Draw -> Encode -> Interpret

Visual Weather



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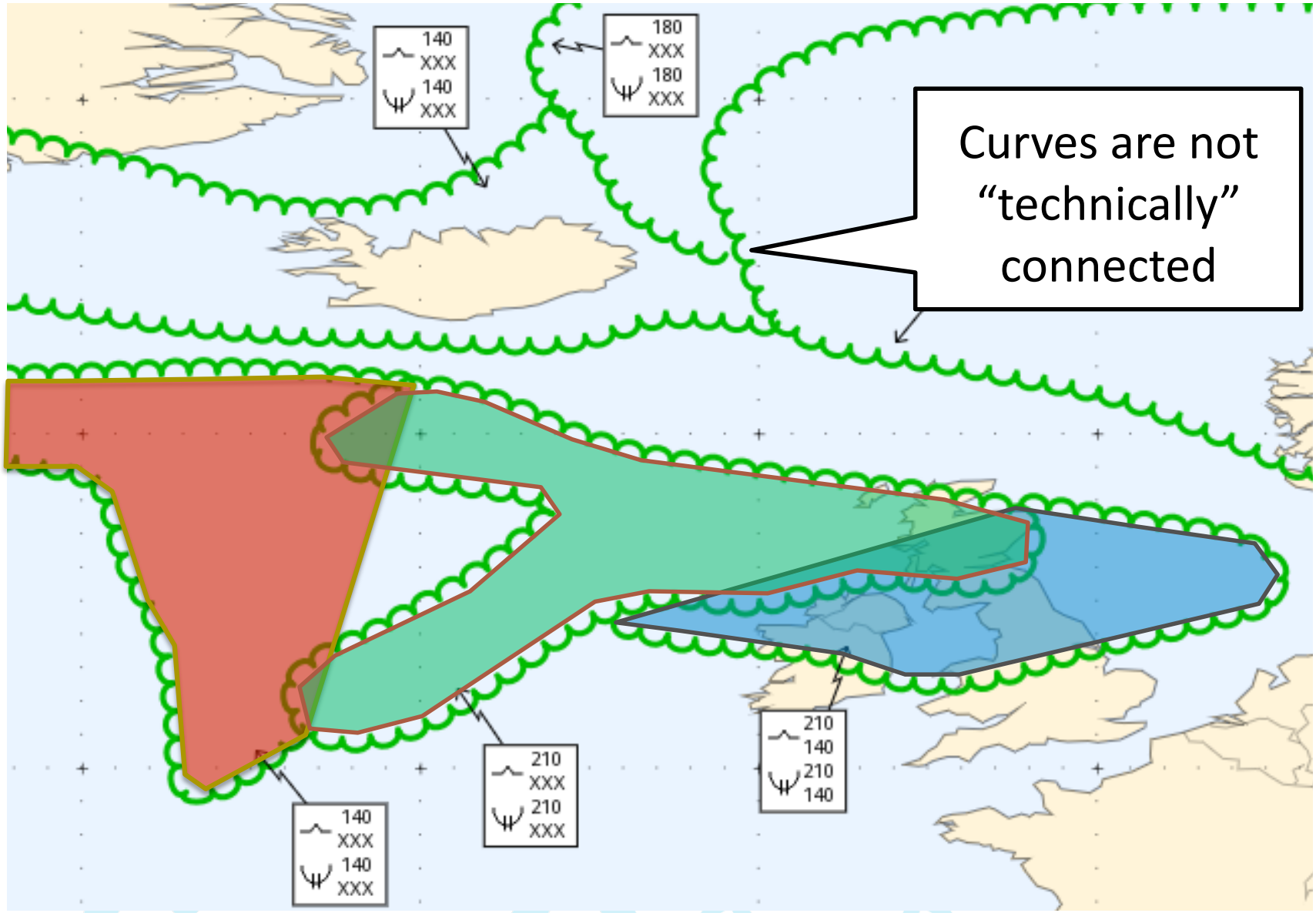
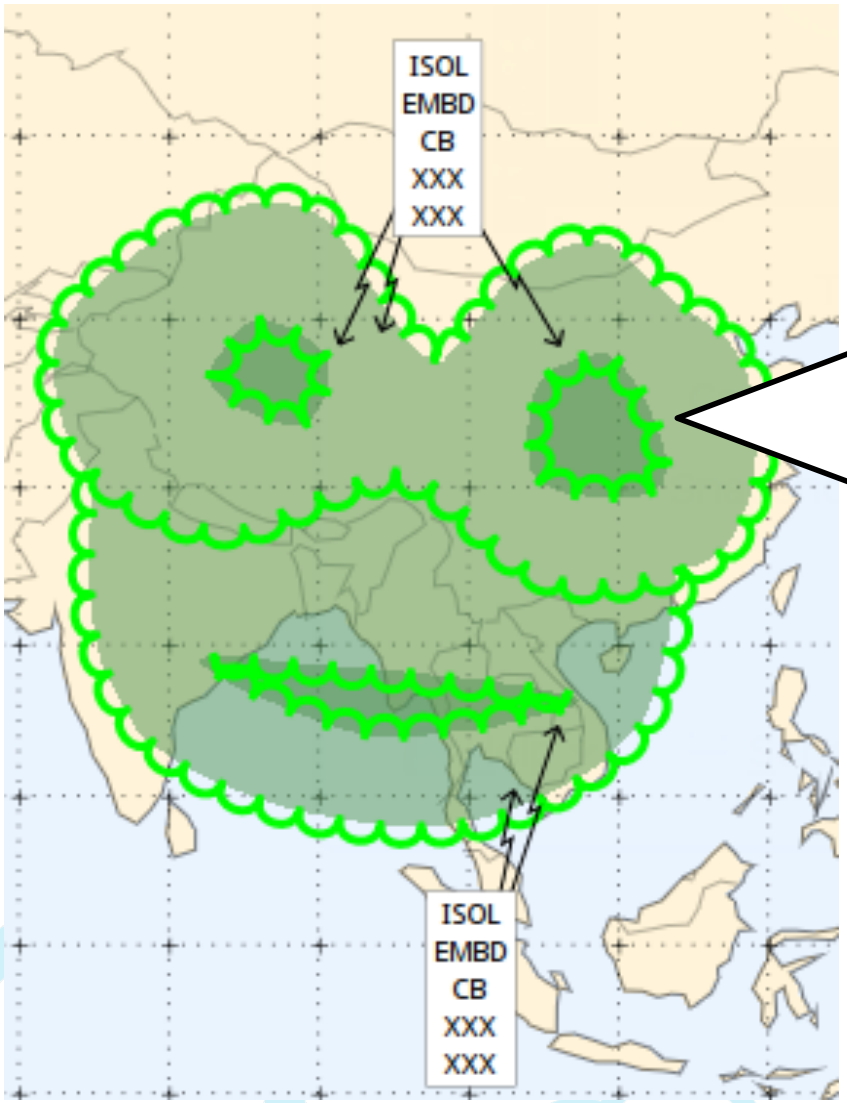
Case 1 - Computer Interpretation



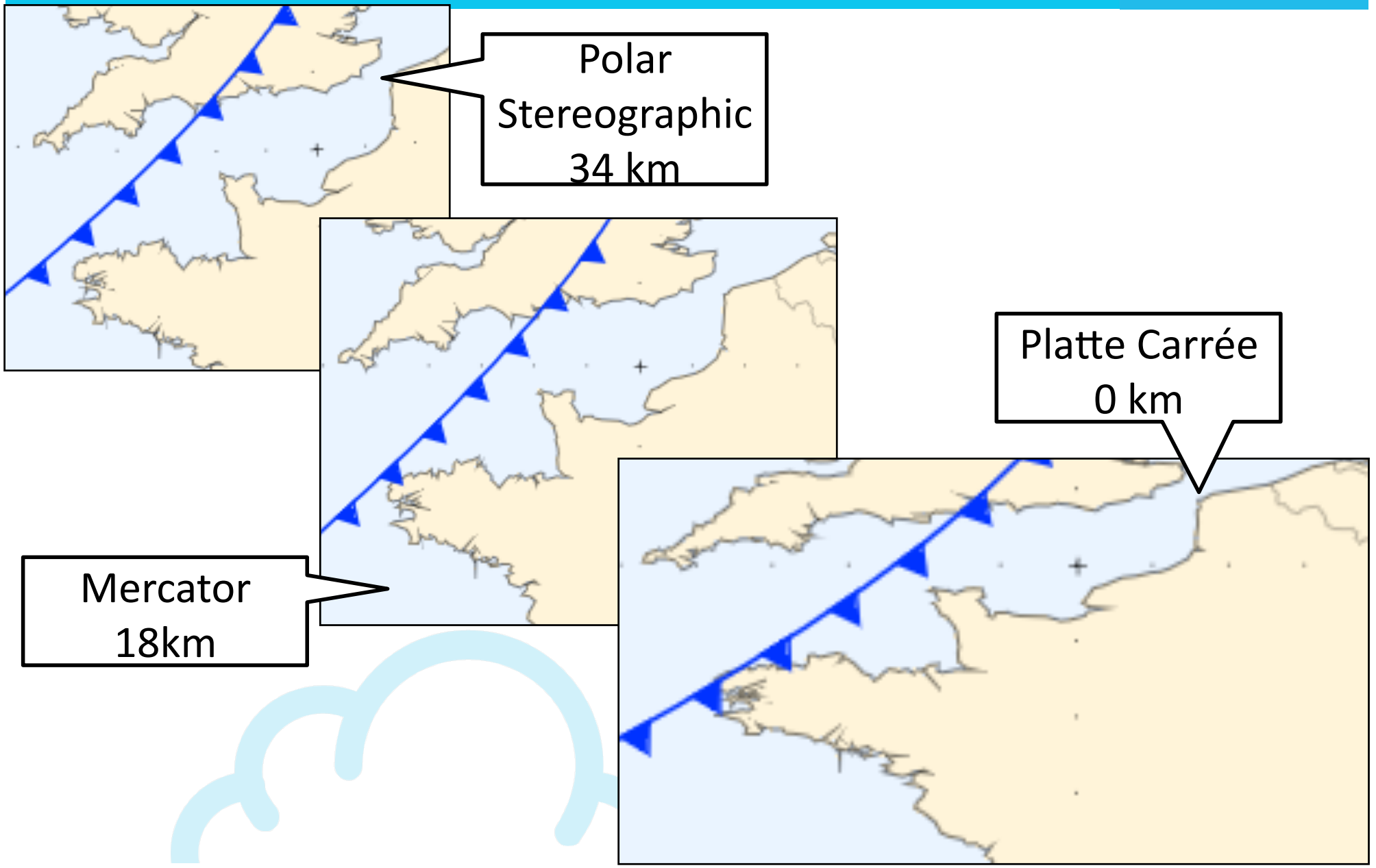
Case 1 - Human Interpretation



Reversed scalloping creates so called "Donut" cloud – a clouds with a with hole

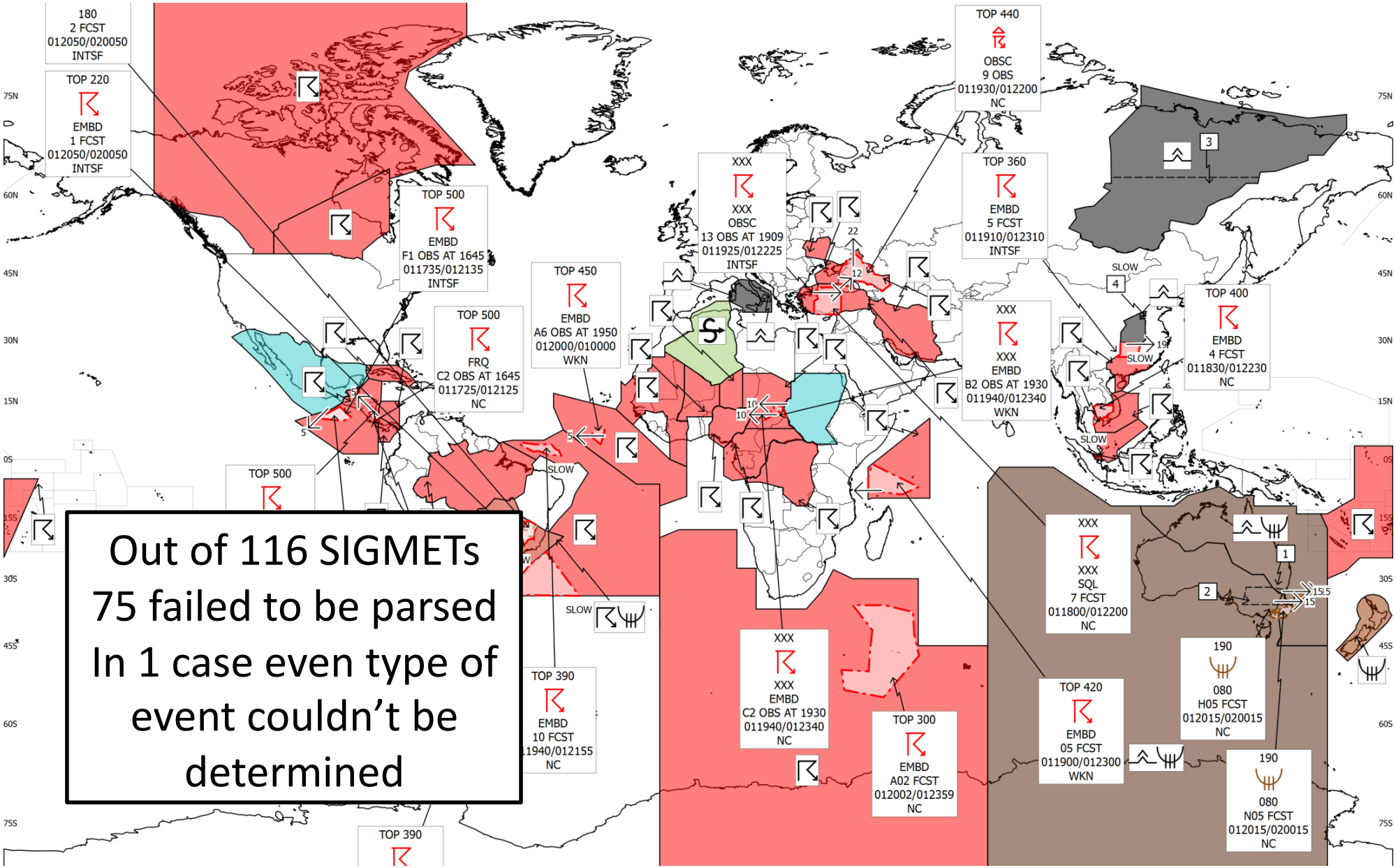
Case 2 - How Far Is This Front From France?

Visual Weather



Case 3 – SIGMET Fail Rate

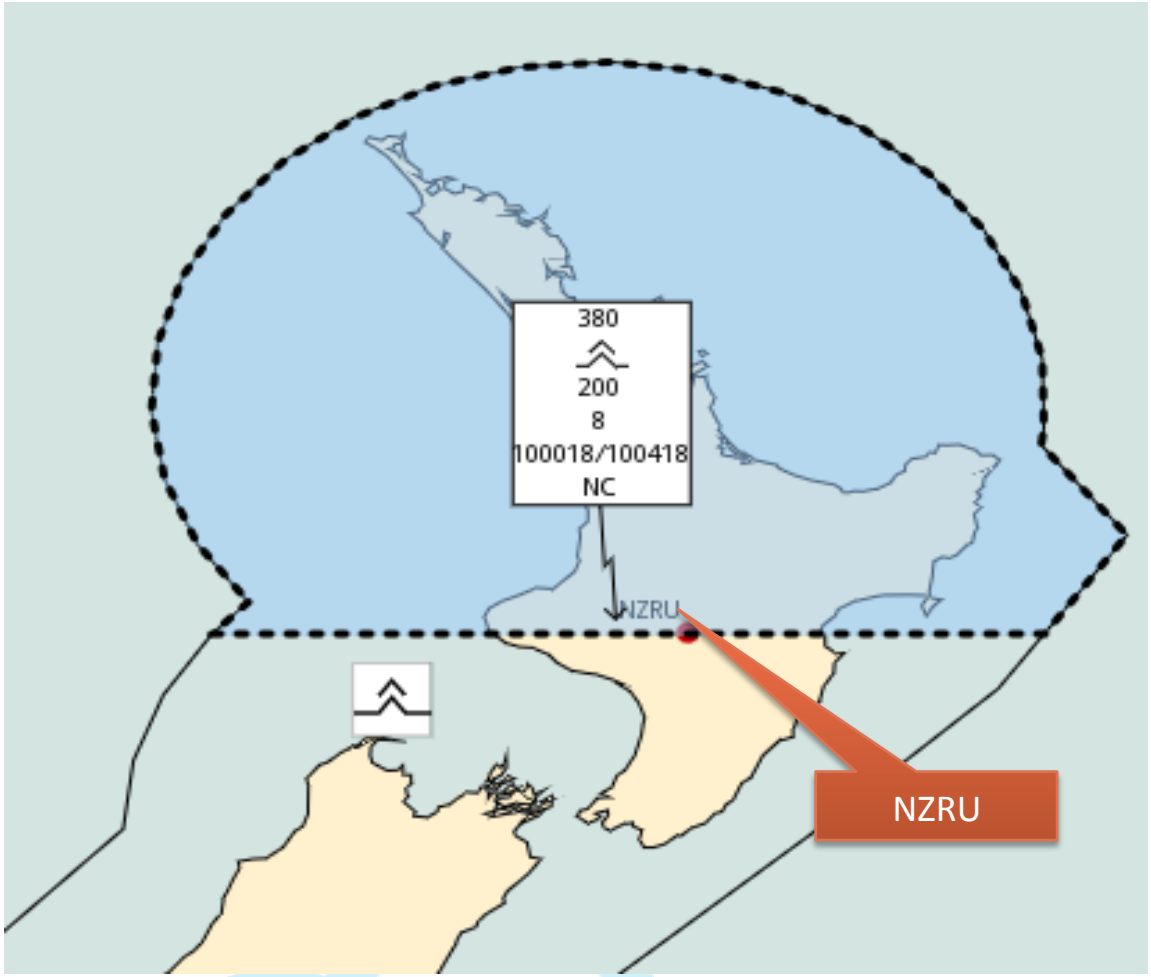
Visual Weather



Out of 116 SIGMETs
75 failed to be parsed
In 1 case even type of event couldn't be determined

Case 3 - The Weather Art of Writing

Visual Weather



380

200

8

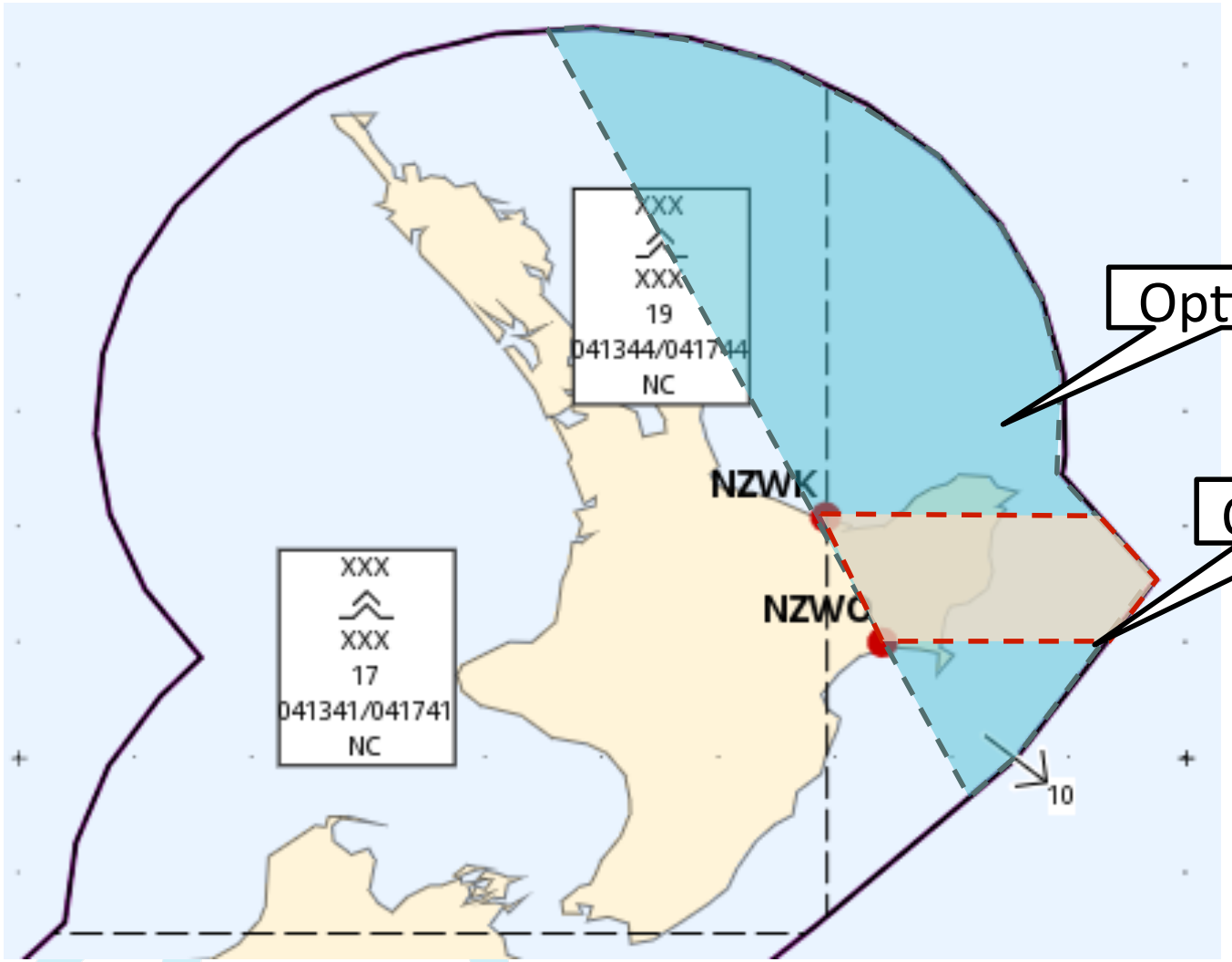
100018/100418

NC

NZZC SIGMET 8 VALID 100018/100418 NZKL-
NZZC NEW ZEALAND FIR SEV TURB FCST N OF NZRU FL200/380 STNR NC=

Case 3 – SIGMET Ambiguity

Visual Weather




```
NZZC SIGMET 19 VALID 041344/041744 NZKL-
NZZC NEW ZEALAND FIR SEV TURB FCST E OF NZWK/NZWO FL200/280 MOV SE
10KT NC=
```

Survey About Usage of Vector Products

Visual Weather

Why end-users use vector products?

- Are easily readable (75%)
- Are tailored for user thresholds and needs (69%)
- Forecaster adds value (69%)
- Users do not have facility to process raw meteorological gridded products (38%)

WE HAVE MADE THE SEMANTICS OF VECTOR (OR TEXT ENCODED) FORECASTS THAT COMPLICATED THAT ONLY HUMANS **PRETEND** TO UNDERSTAND IT.

Visual Weather

Grid Mess
Making Weather Products
Objective?

Picture by Dor Garbash

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Visual Weather

Grids are perfect!

You can interpolate (in space and in time)!

You have a lot of parameters!

Information is detailed (in space and in time)!

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Survey About Usage of Gridded Products

Visual Weather

- 76% of respondents said that methods we use are mostly sufficient, **but some innovation is needed in the future.**
- 30% plan to automate production of vector products**.**
- 24% plan to reduce production of vector products.
- 12% plan to **replace vector products by equivalent gridded products.**

BUT WHERE THE INOVATION SHALL GO?

CAN REALLY GRID PRODUCTS VECTOR REPLACE VECTORS?

GRIDS ARE SO DENSE THAT WE REMOVE INFORMATION TO ALLOW OUR BRAINS TO UNDERSTAND IT.

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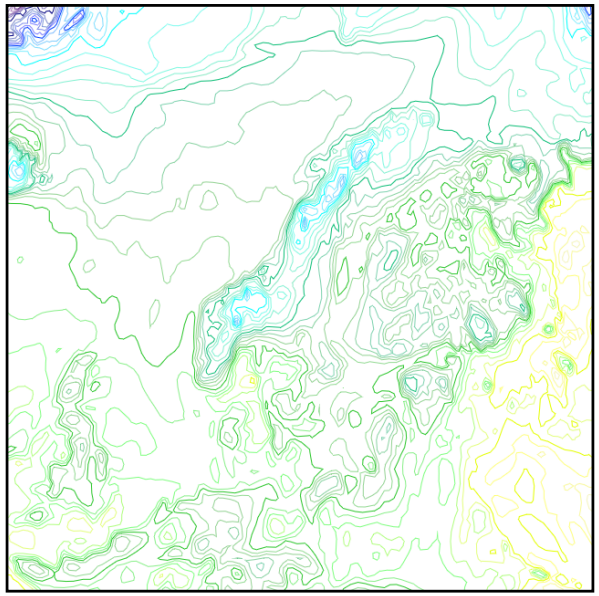
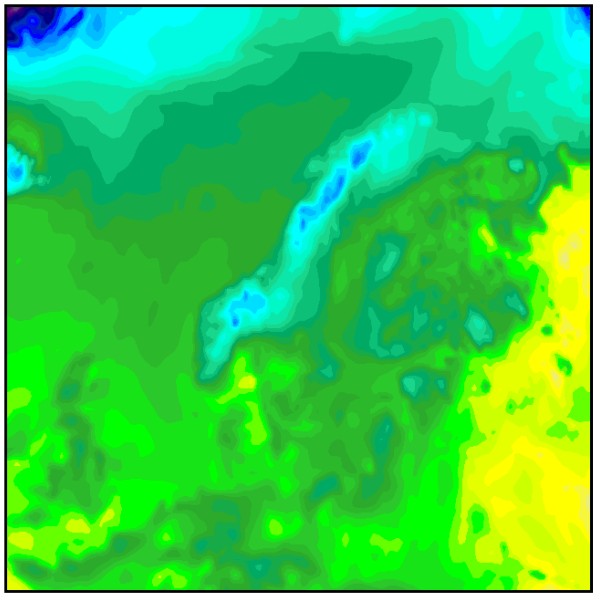
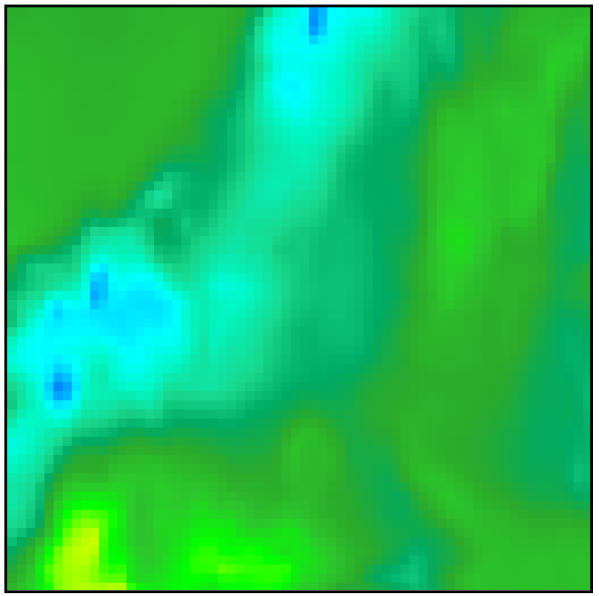
Core Grid Visualisation Techniques

Visual Weather







-16	-11	-2	-1	-0	1	1	1	2	4	4	4	4	5	5	4	3	4	4	3	3	4	8
-6	-5	-2	-1	0	1	2	2	5	5	6	6	6	6	6	5	5	5	4	4	4	12	14
-0	0	1	2	1	1	2	4	6	6	7	7	7	7	4	5	5	5	6	5	7	7	13
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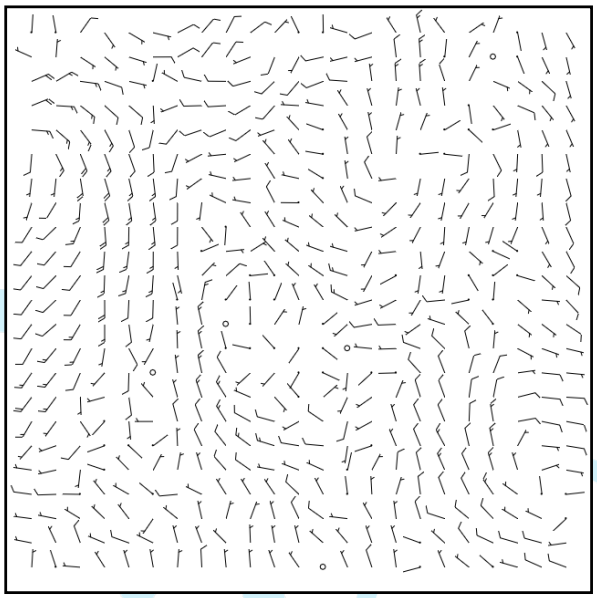
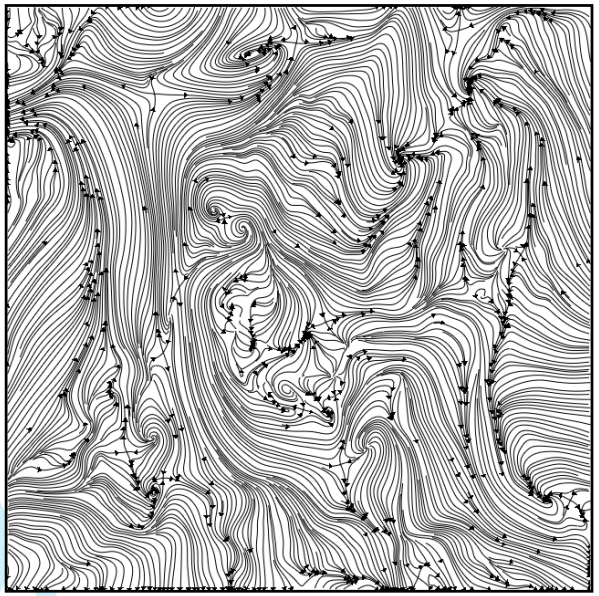
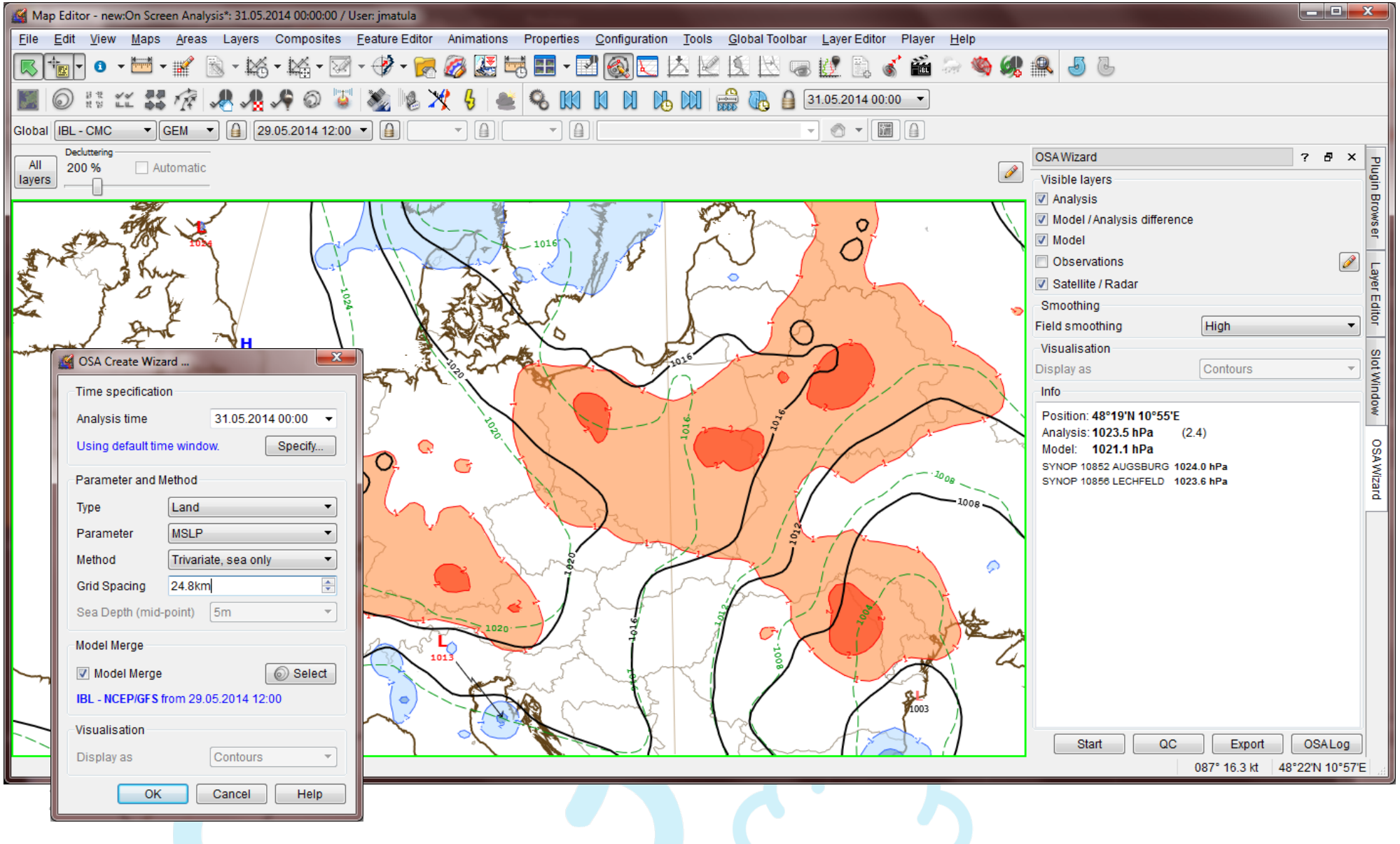




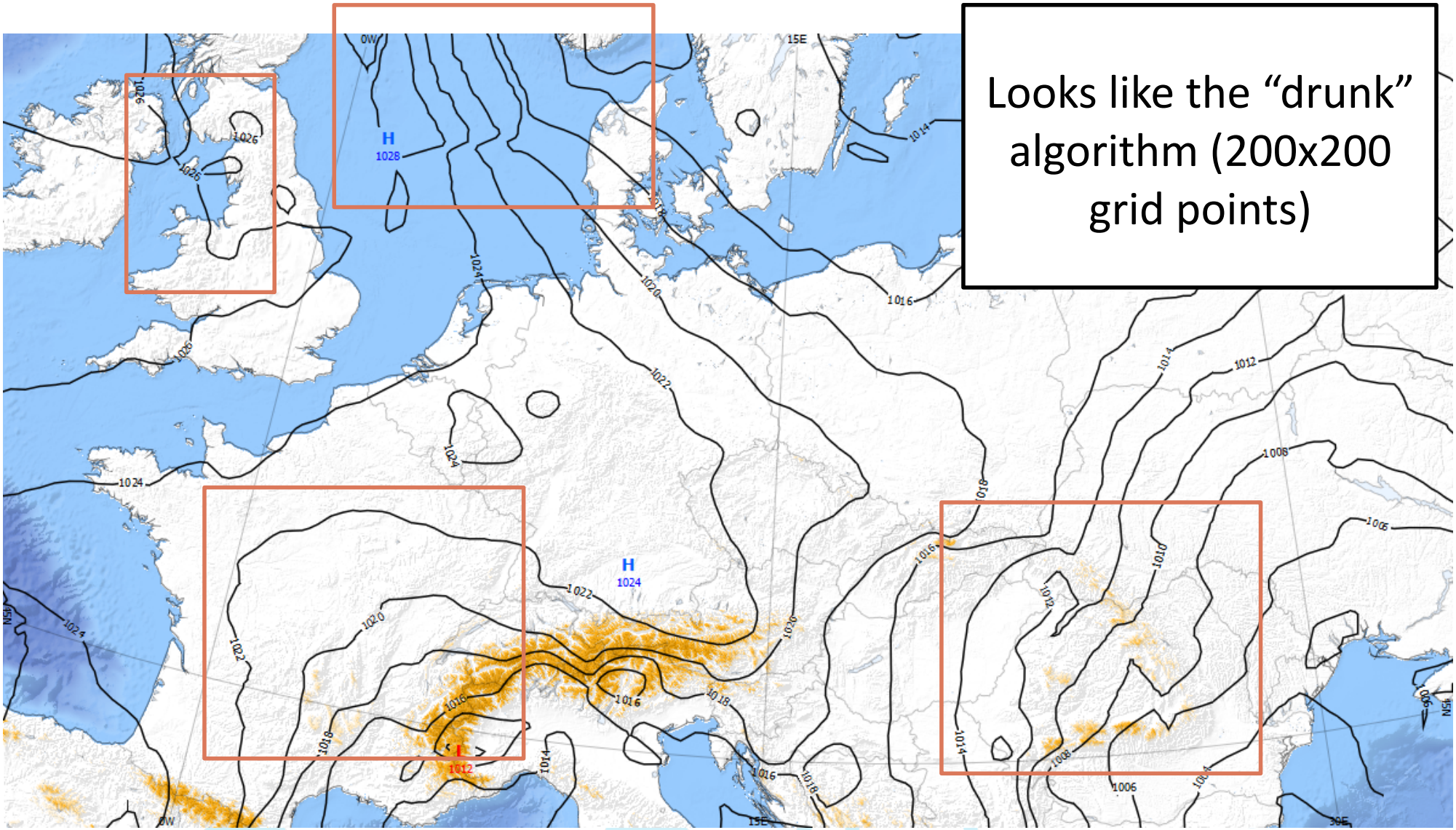
On Screen “Objective” Analysis in VW

Visual Weather



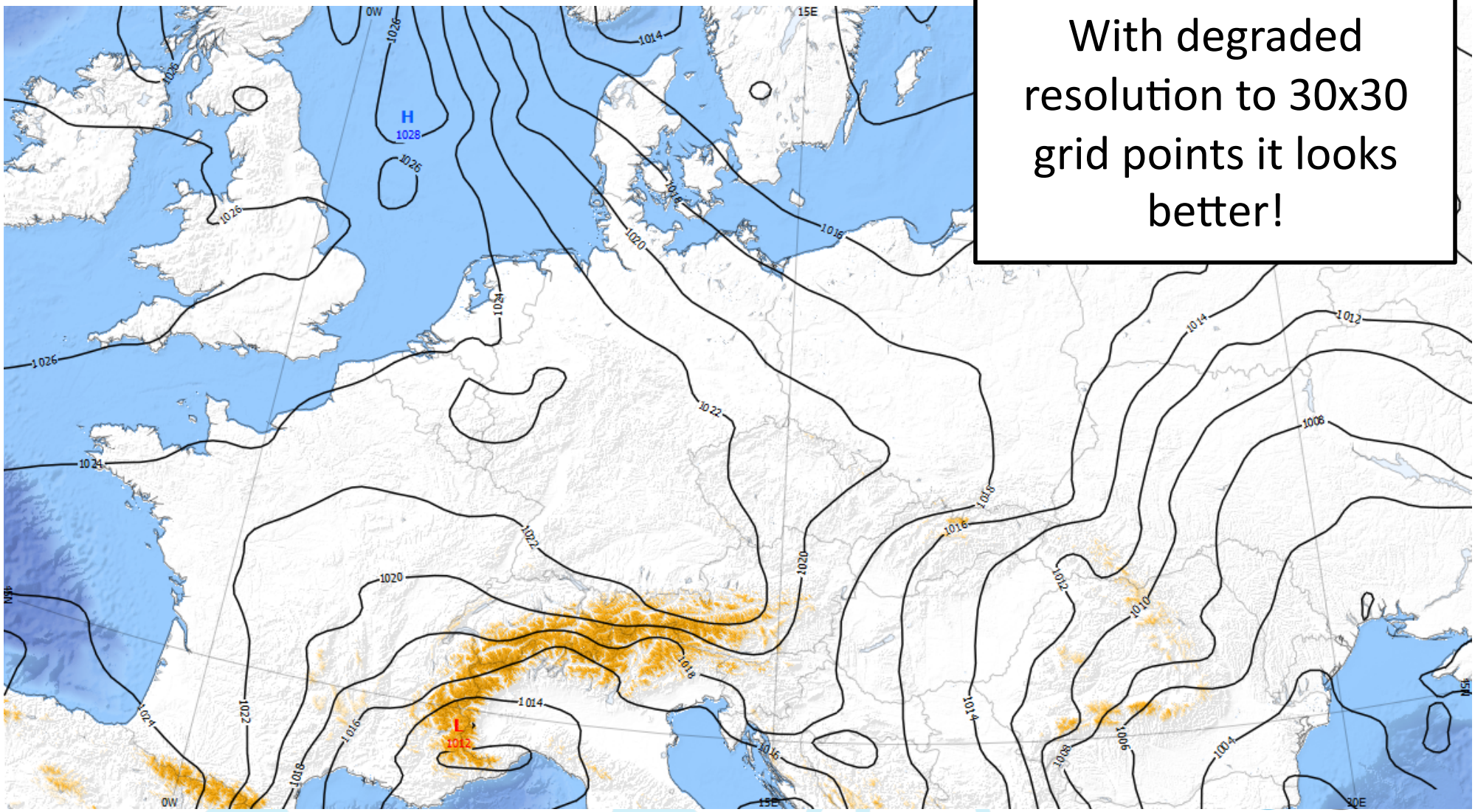
Case 1 - Objective Analysis (Obs. to Grid)

Visual Weather



Case 1 - Objective Analysis Improved

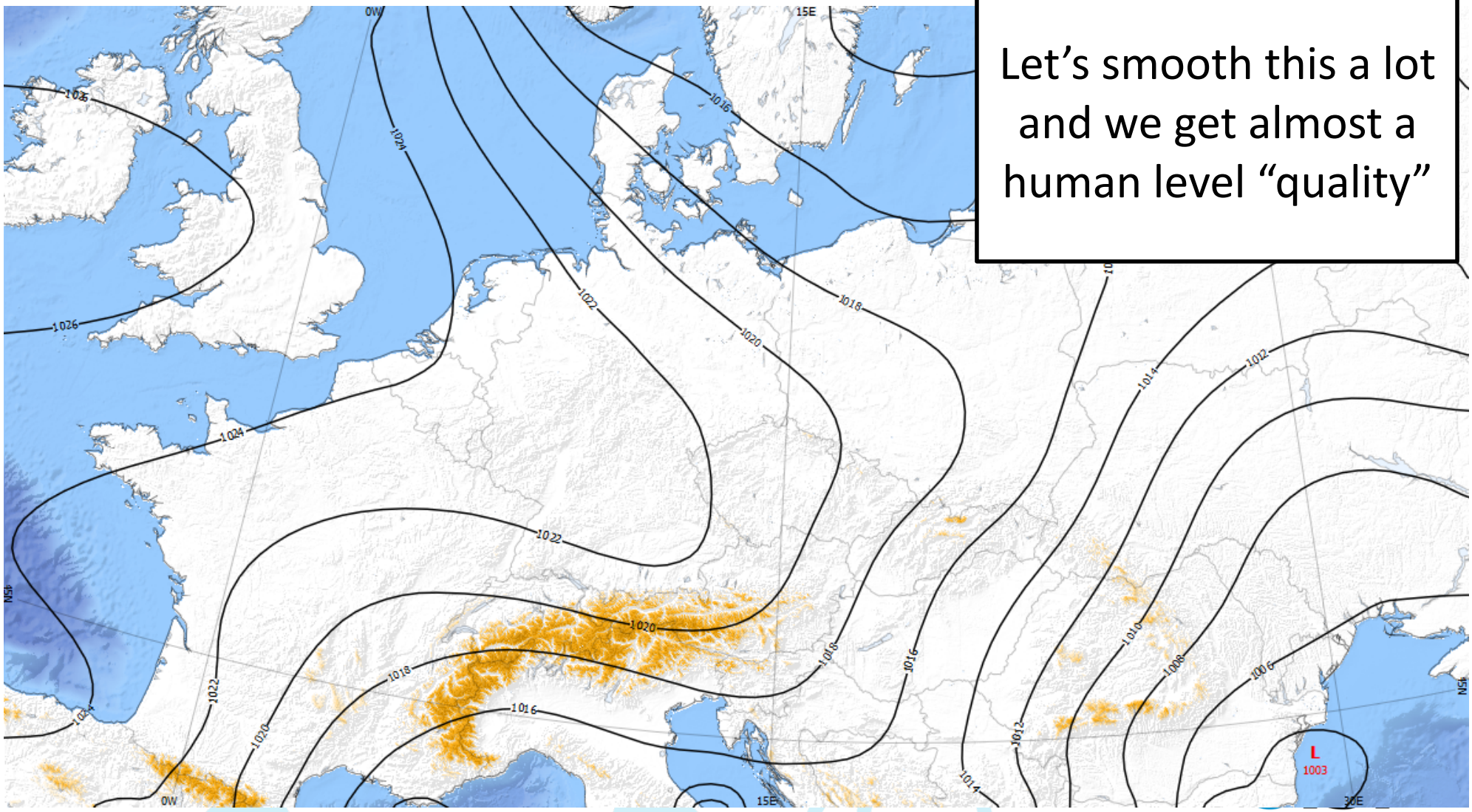
Visual Weather



With degraded resolution to 30x30 grid points it looks better!

Case 1 - Objective Analysis Made Subjective

Visual Weather

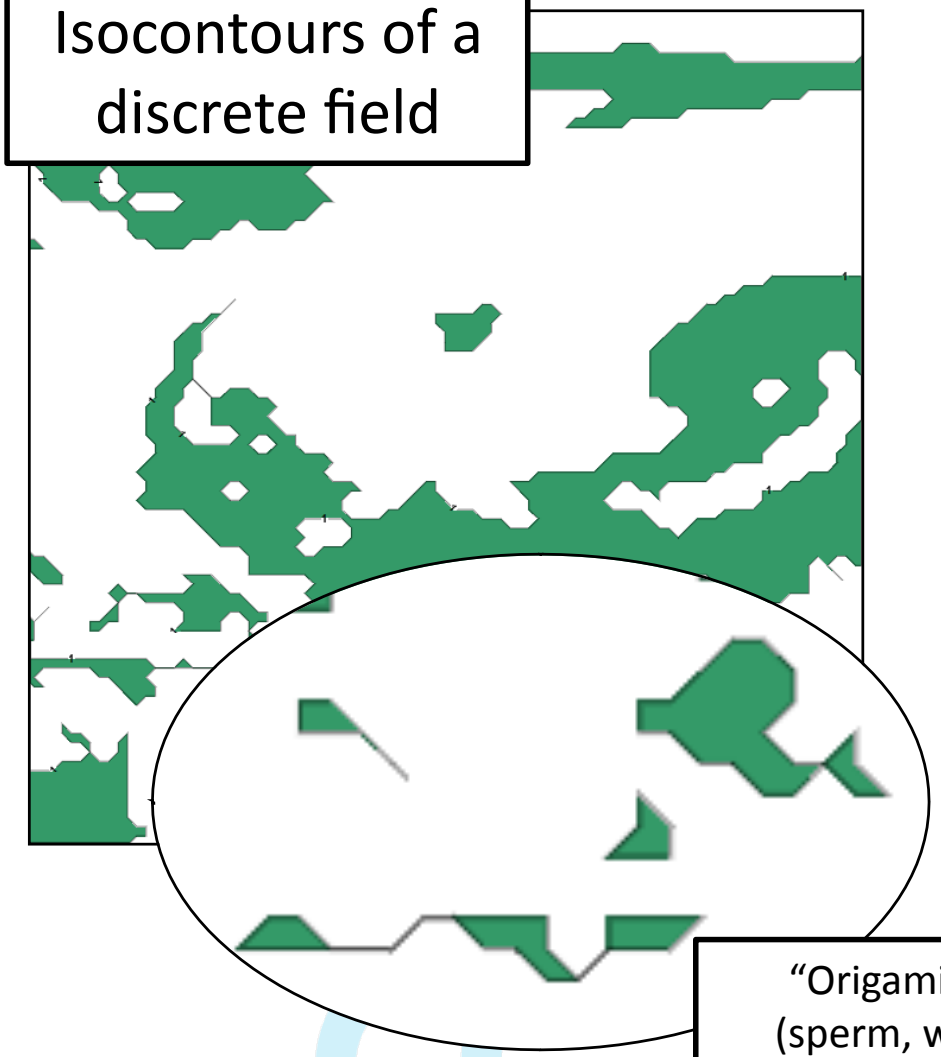


Let's smooth this a lot and we get almost a human level "quality"

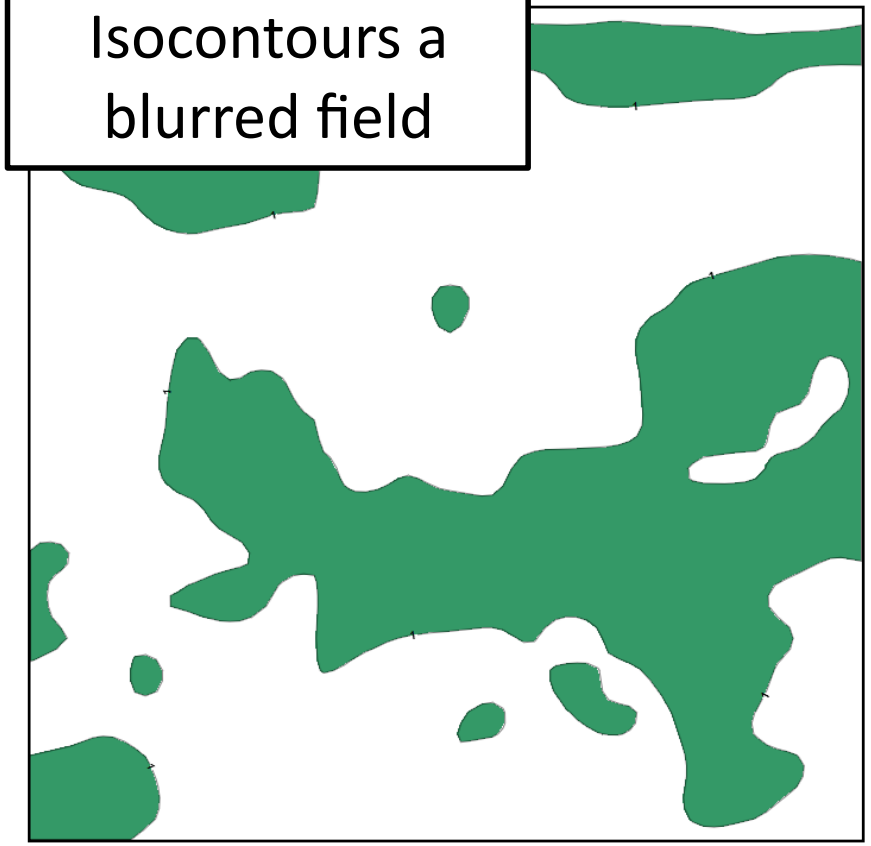
Case 2 - Isocontour Incompatible Grids

Visual Weather

Isocontours of a discrete field



Isocontours a blurred field



"Origami" art (sperm, whale, butterfly, snake) ☺

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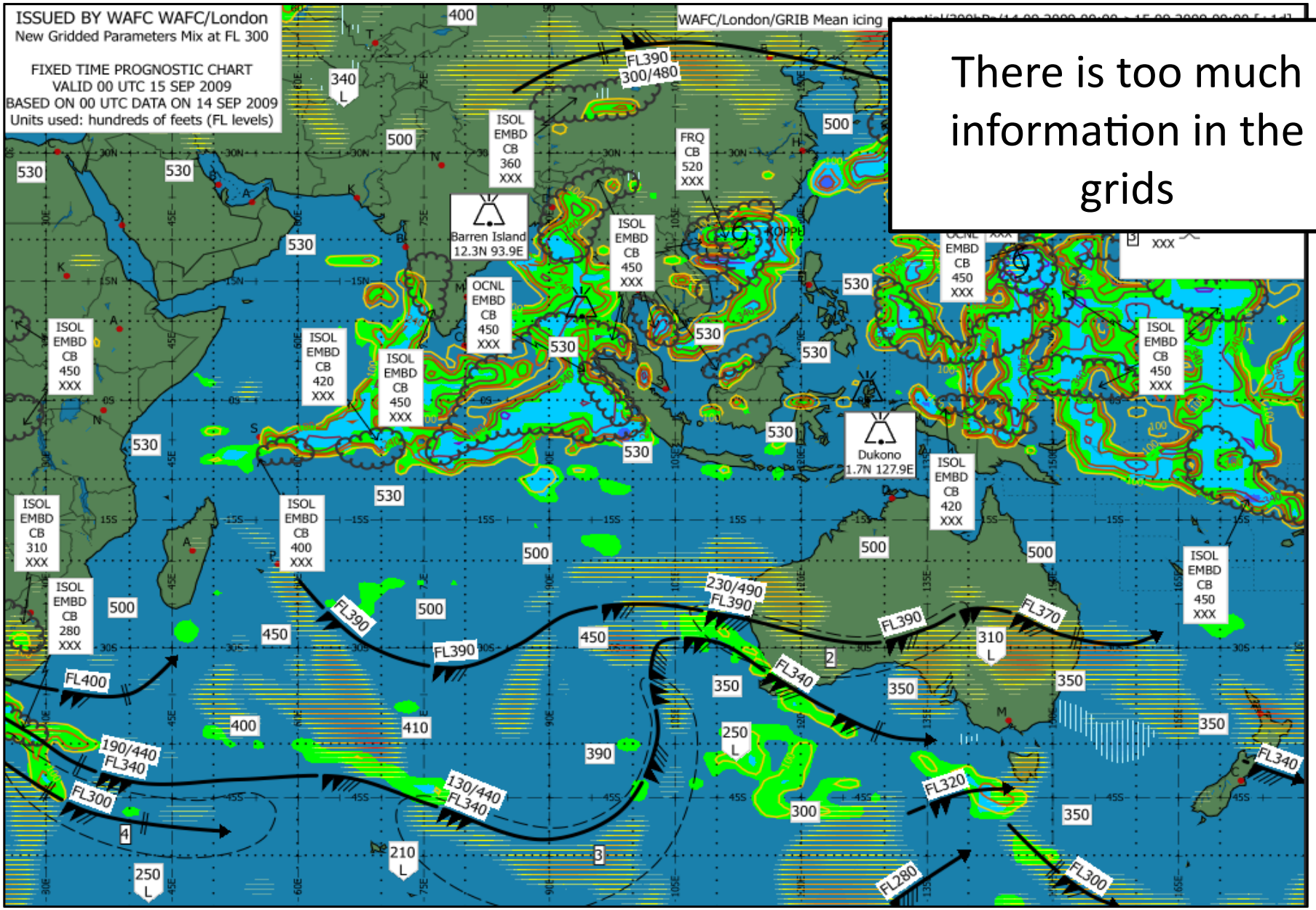
Case 3 - Replacing Vectors with Grids

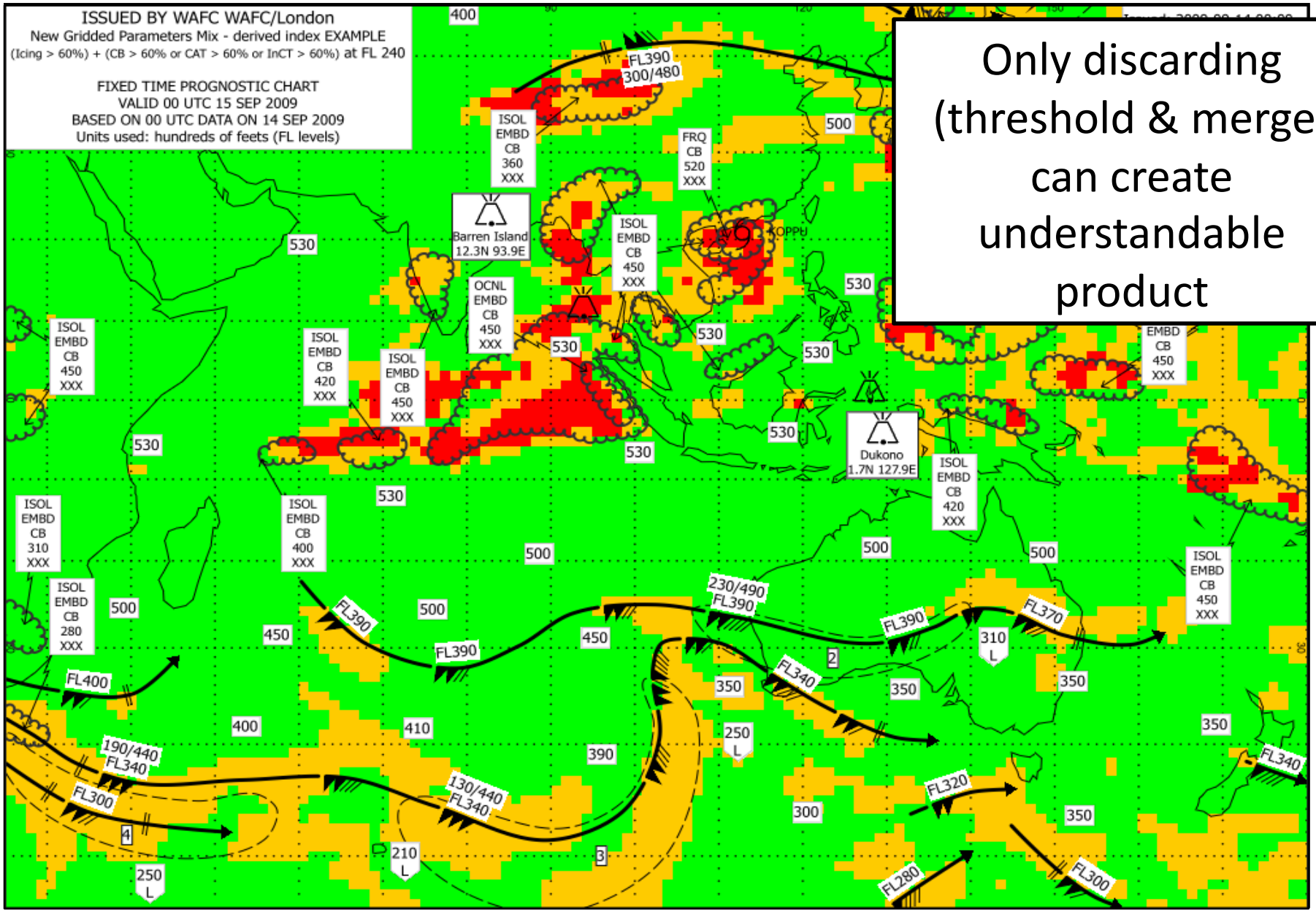
Visual Weather



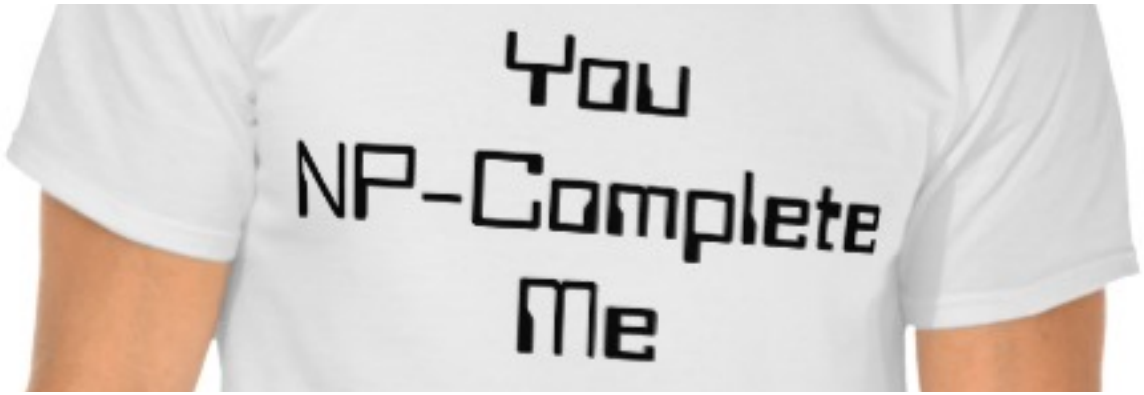
There is too much information in the grids

Case 3 - Go/No-Go "Military Style"

Visual Weather



Only discarding (threshold & merge) can create understandable product



Visual Weather

Conclusions?
Solutions?
Ways ahead?

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Presence

Visual Weather

- Forecasters draw vectors products typically by surrounding “features of interest” over a gridded guidance.
  - Are easily readable by end-users.
  - Forecaster adds value.
  - Forecaster tailors product for the user.
- Gridded product are given to end-users mostly as:
  - Images (charts)
  - Point extractions
- End-users do not want gridded data or do not have ability to process it.
- Gridded products are rarely manipulated by forecasters.

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Presence – Summary IMHO Wrong Things

Visual Weather

- Forecasters should not encode features as free text.
  - Let them draw product and let computers to create “text” or data form.
- Avoid redundant semantics.
  - Use only polygons instead of relative specifications.
- Avoid using named catalogues as reference points.
  - Use only number coordinates.
- When encoding a vector feature always encode/provide information about projection/CRS or if points are connected using Great Arc.

- Forecasters should not hand-draw.

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Future of Drawing and Grids

Visual Weather

- Forecasters draw vector products typically by surrounding "features of interest" over a gridded guidance.
  - Are easily readable by end-users.
  - Forecaster tailors the product for the end-user.
  - Forecaster can still add value.

- Interest in using gridded data by end-users will increase.
  - But only if we provide it in reasonable form OR,
  - Only if we provide it through **reasonable interface**.

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Future of Intervention & Automation

Visual Weather

- Automation or semi-automation (e.g. first guess) of vector products will be more and more essential in future drawing tools.
  - Mainly due to time/cost reduction.
- High resolution grids will require new strategies for visualisation (this is not a new information).
  - Both for forecasters.
  - As well as for end-users.
- Model grid intervention/modification is still a valid requirement.
  - Due to obvious advantages of having the data in grids.

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This image is one of the test cases drawn on a flip chart when we tried to develop algorithm for interpreting the curves as weather areas.