

A world map showing data points in red, green, and blue, primarily concentrated in the North Atlantic and Indian Ocean regions. A white box with a black border is overlaid on the top left of the map.

A Prototype Database and Web Portal for Comparing Argo Delayed Mode QC with that of Operational Centres

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Blower

Thanks to **Jim Cummings** for QC data from BMRC,
UKMO, MEDS & FNMOC



Outline

- Introduction
- The data sources
- Our database and web portal
- Proportions of different data modes
- Example results
- Further work and conclusions

Introduction

- How does delayed mode argo QC compare to quicker operational QC?
- Potential to use operational QC data more immediately if comparisons with delayed mode QC are ok.
- Where do gaps lie in the delayed mode argo data – when/where might other QC be useful.
- Constructed a prototype database and web portal.
- Contains Argo data 2004 to present. Operational QC 2007,2008 (more coming soon).
- Still a few glitches, not yet publicly available, but already proving useful.



The Data - introduction

Argo data

- Downloaded From Coriolis GDAC
- From 2004 to present

Operational centres data

- Courtesy of Jim Cummings at US Navy
- Available for
 - **BMRC**: Australia's **B**ureau of **M**eteorology **R**esearch **C**entre
 - **FNMOC**: US Navy's **F**leet **N**umerical **M**eteorology and **O**ceanography Center
 - **MEDS**: Canada's **M**arine **E**nvironmental **D**ata **S**ervice
 - **UKMO**: **UK**'s **M**et **O**ffice
- Available for 2004 - 2008 (currently only 2007-8 in our database)



The Data – call sign QC files

- Jim Cummings has created 'call sign' NetCDF files with QC data from BMRC, FNMOC, MEDS & UKMO.
- There is one file for each argo float for each year.
- Files contain original float data, as well as QC flags (accept/reject) for each centre

The Database

- We have harvested profile metadata including QC data from the Argo files, as well as from Jim Cumming's call sign files.
- This data has been put into a PostgreSQL database with PostGIS:
 - id Unique identifier
 - basin Argo ocean basin
 - juld Argo Julian date
 - platform_number Argo platform number
 - cycle_number Argo cycle number
 - inst_type WMO instrument type
 - data_mode Delayed mode, real time, adjusted
 - pressure_qc Argo QC on pressure
 - temp_qc Argo QC on temperature
 - sal_qc Argo QC on salinity
 - location lat, lon
 - ukmo_qc UKMO accept/reject
 - bmrc_qc BMRC accept/reject
 - meds_qc MEDS accept/reject
 - fnmoc_qc FNMOC accept/reject

The Portal

- We have created a test portal to allow users to search the database.
- This is not yet publicly available pending a few small alterations, but should be soon.



The screenshot shows a web interface for filtering profiles. On the left, there is a vertical map strip with a blue plus sign icon. The main content area is titled "Filter profiles by:" and contains several filter options, each preceded by a red arrow:

- ⇒ Temperature Salinity
- ⇒ Delayed mode Real time Adjusted
- ⇒ Atlantic Pacific Indian
- ⇒ Argo Delayed Mode QC
- ⇒ Centre's Accept/Reject

Below the filters is a "Search Database" button and a link: [Click for key to map symbols](#)

The Portal

Filter profiles by:

⇒ Temperature Salinity

⇒ Delayed mode Real time Adjusted

⇒ Atlantic Pacific Indian

⇒ Argo Delayed Mode QC
(P = percentage of good T data):

P = 100

75 ≤ P < 100

50 ≤ P < 75

25 ≤ P < 50

0 < P < 25

P = 0

⇒ Centre's Accept/Reject

BMRC Meds FNMOC UKMO

Centre Accept Reject No data

BMRC

Centre Accept Reject No data

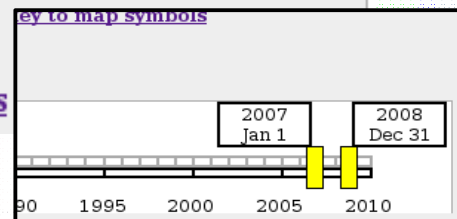
Meds

Search Database

[Click for key to map symbols](#)

• This screenshot (left) shows filtering of results to give user:

- Delayed mode argo data rated as having <50% good temperature data
- From 2007 & 2008
- AND which was accepted by both BMRC and MEDS



The Portal

Filter profiles by:

- ⇒ Temperature Salinity
- ⇒ Delayed mode Real time Adjusted
- ⇒ Atlantic Pacific Indian
- ⇒ Argo Delayed Mode QC
(P = percentage of good T data):
 - P = 100
 - 75 ≤ P < 100
 - 50 ≤ P < 75

Centre Accept Reject No data
BMRC

Centre Accept Reject No data
Meds

Search Database

[Click for key to map symbols](#)

key to map symbols

2007 Jan 1 2008 Dec 31

90 1995 2000 2005 2010

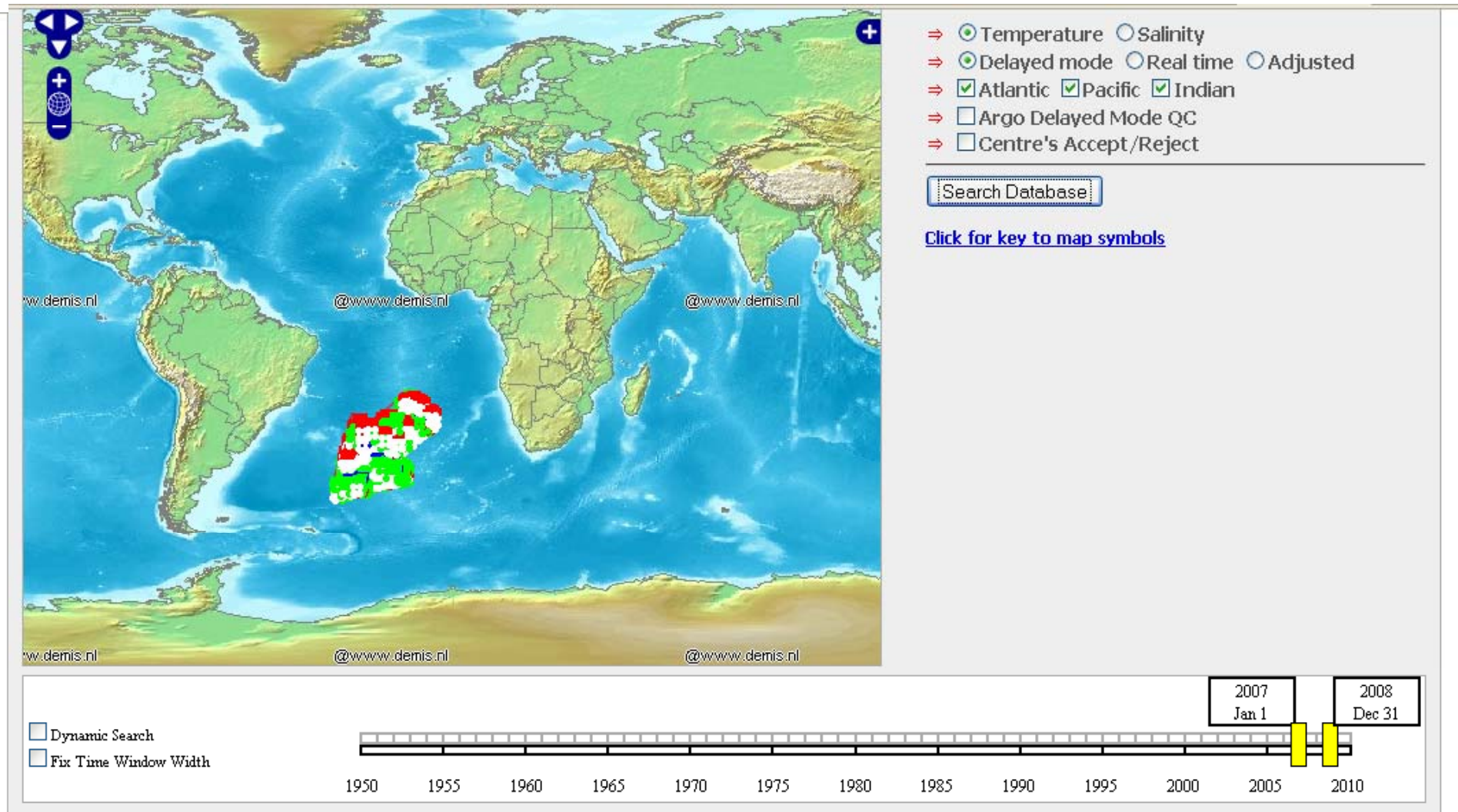
• This screenshot (left) shows filtering of results to give user:

- Delayed mode argo data rated as having <50% good temperature data

```
SELECT * FROM argoqc WHERE data_mode = 'D' AND julcd > 20819.0 AND julcd < 21549.0 AND (basin = 'atlantic' OR basin = 'pacific' OR basin = 'indian' ) AND (temp_qc = 'D' OR temp_qc = 'E' OR temp_qc = 'F' ) AND (bmrc_qc = '0' OR bmrc_qc = '2') AND (meds_qc = '0' OR meds_qc = '2');
```

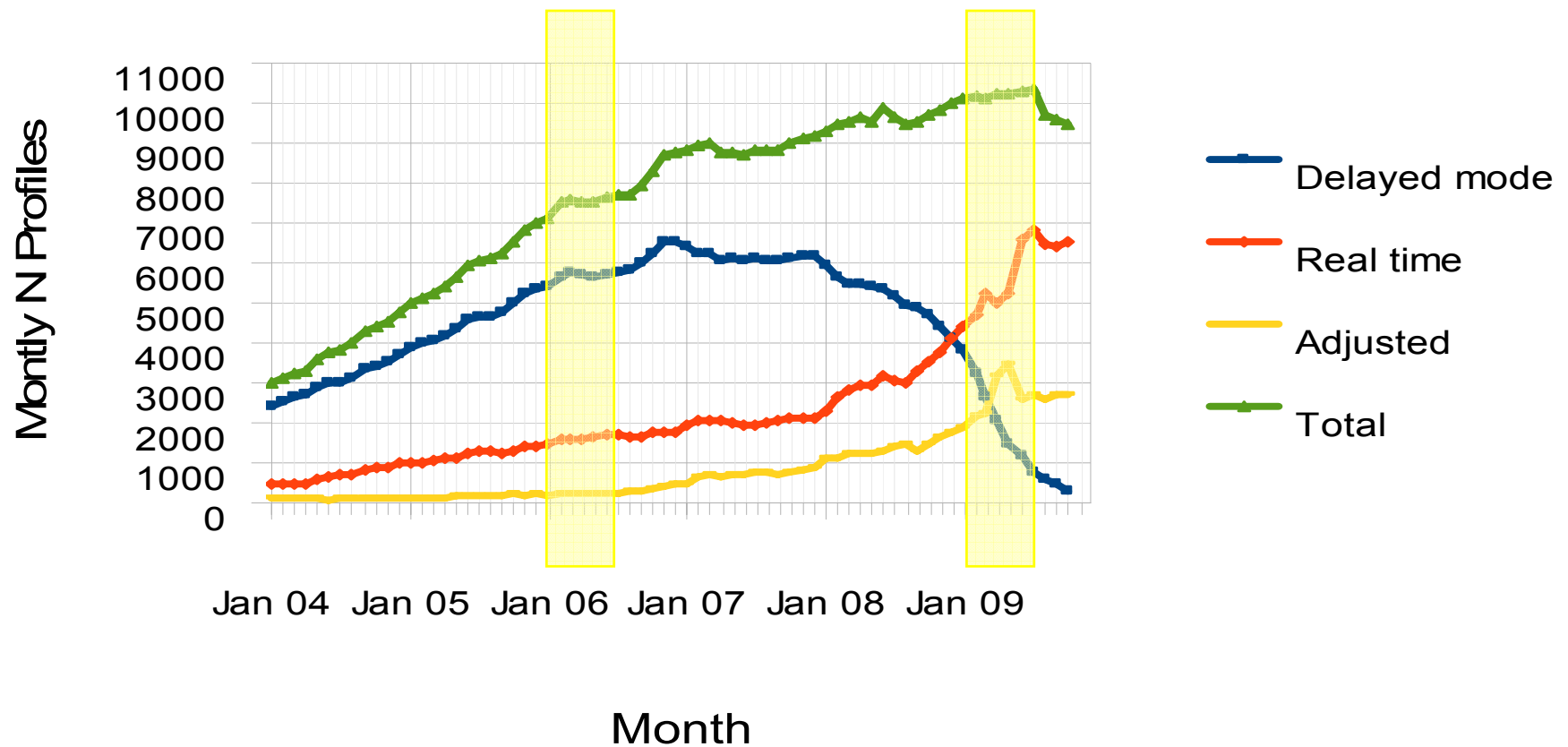
- From 2007 & 2008
- AND which was accepted by both BMRC and MEDS

Search by customisable geographic area



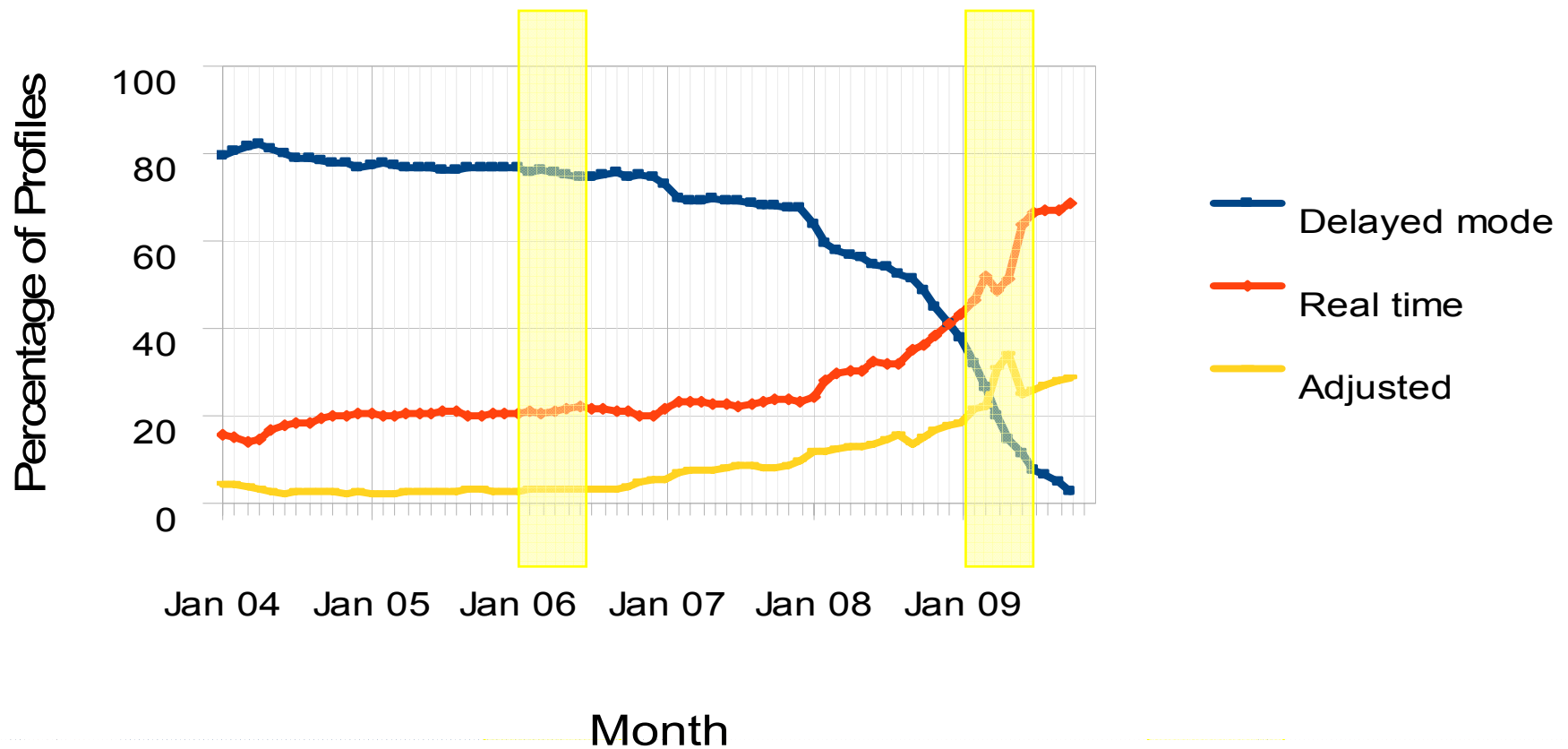
Variation in argo data mode 2004 - present

Monthly Argo Profiles By Data Mode

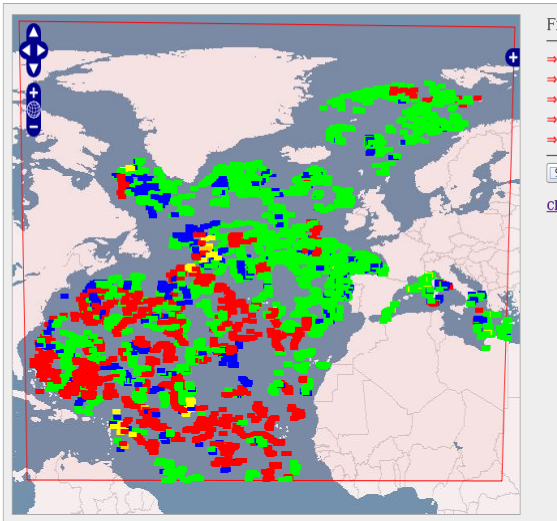


Variation in argo data mode 2004 - present

Monthly Percentages of Argo Profiles by Data Mode

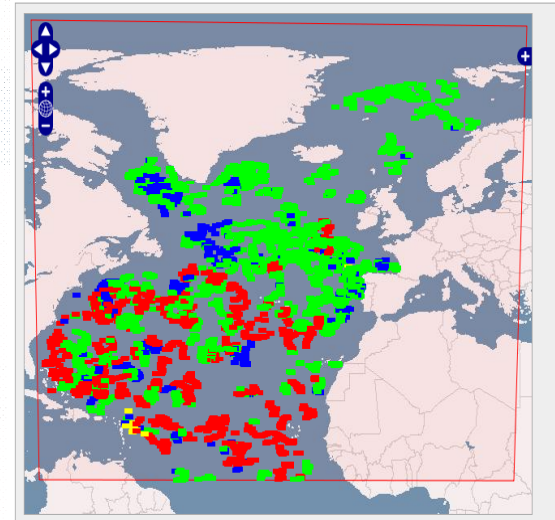


Variation in N Atlantic data mode Jan - Jul 2006



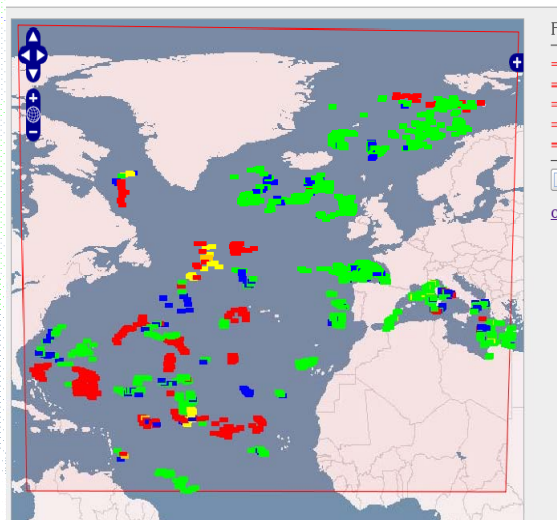
ALL PROFILES (5773)

QC percentages all relate to Temperature data



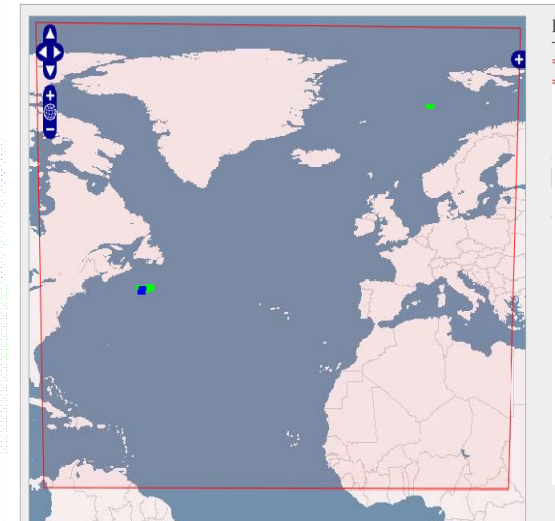
DELAYED MODE (3976)

QC Range	Count
100%	2307
75% - 100%	435
50% - 75%	11
25% - 50%	0
0% - 25%	0
0%	1223
TOTAL	3976



REAL TIME (1786)

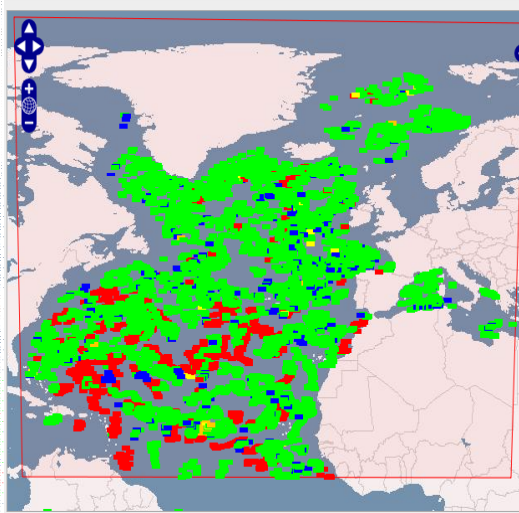
QC Range	Count
100%	1170
75% - 100%	271
50% - 75%	47
25% - 50%	6
0% - 25%	0
0%	292
TOTAL	1786



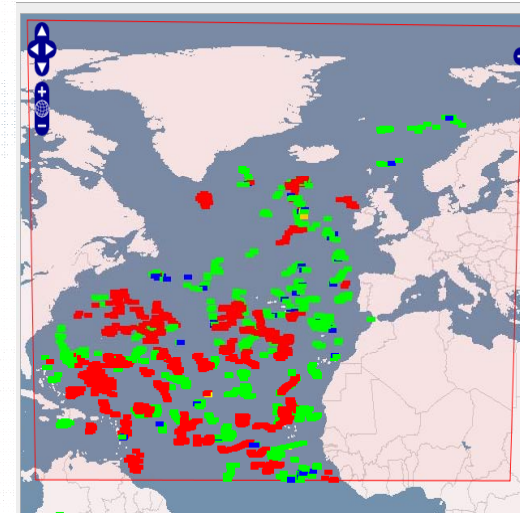
ADJUSTED (11)

QC Range	Count
100%	8
75% - 100%	3
50% - 75%	0
25% - 50%	0
0% - 25%	0
0%	0
TOTAL	11

Y d u l d w l r q # l q # Q # D w o l q w l f # g d w d # p r g h # M l q # 0 M x g # 5 3 3 <



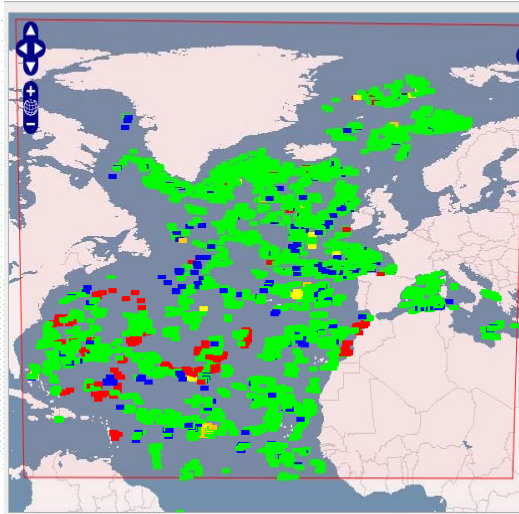
T F #
 s h u f h q w d j h v †
 d o # h o d w h # r #
W h p s h u d w x u h
 g d w d



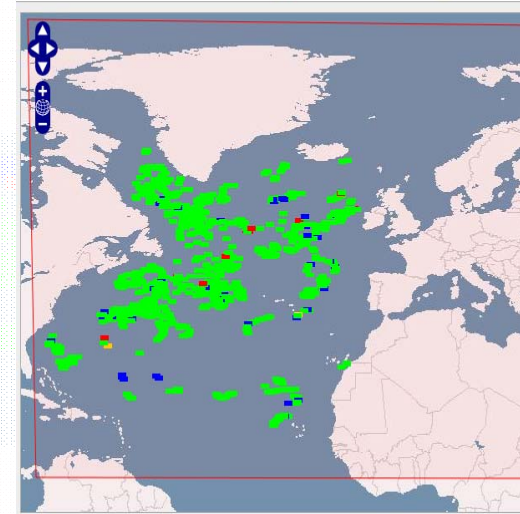
100%	810
75% - 100%	65
50% - 75%	3
25% - 50%	1
0% - 25%	0
0%	1085
TOTAL	1964

DOO#SUR IIOHV#: 935 ,

GHOD\HG #P RGH#4 < 97 ,



100%	3956
75% - 100%	320
50% - 75%	29
25% - 50%	21
0% - 25%	0
0%	241
TOTAL	4567

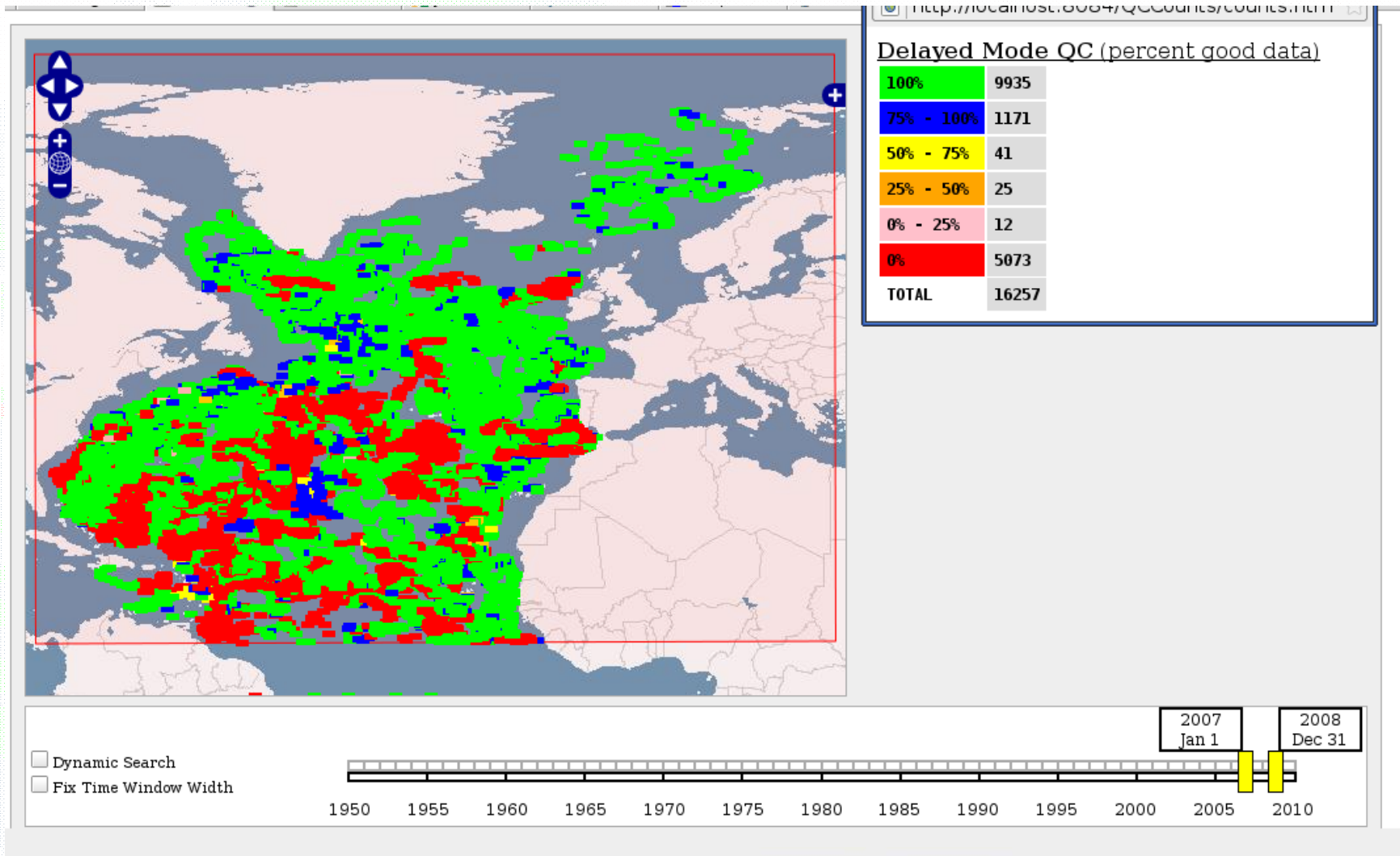


100%	1017
75% - 100%	41
50% - 75%	1
25% - 50%	1
0% - 25%	0
0%	11
TOTAL	1071

UHDO#WIP H#789 : ,

DGMXVWHG #43 : 4 ,

N Atl 07-08: Delayed Mode Data

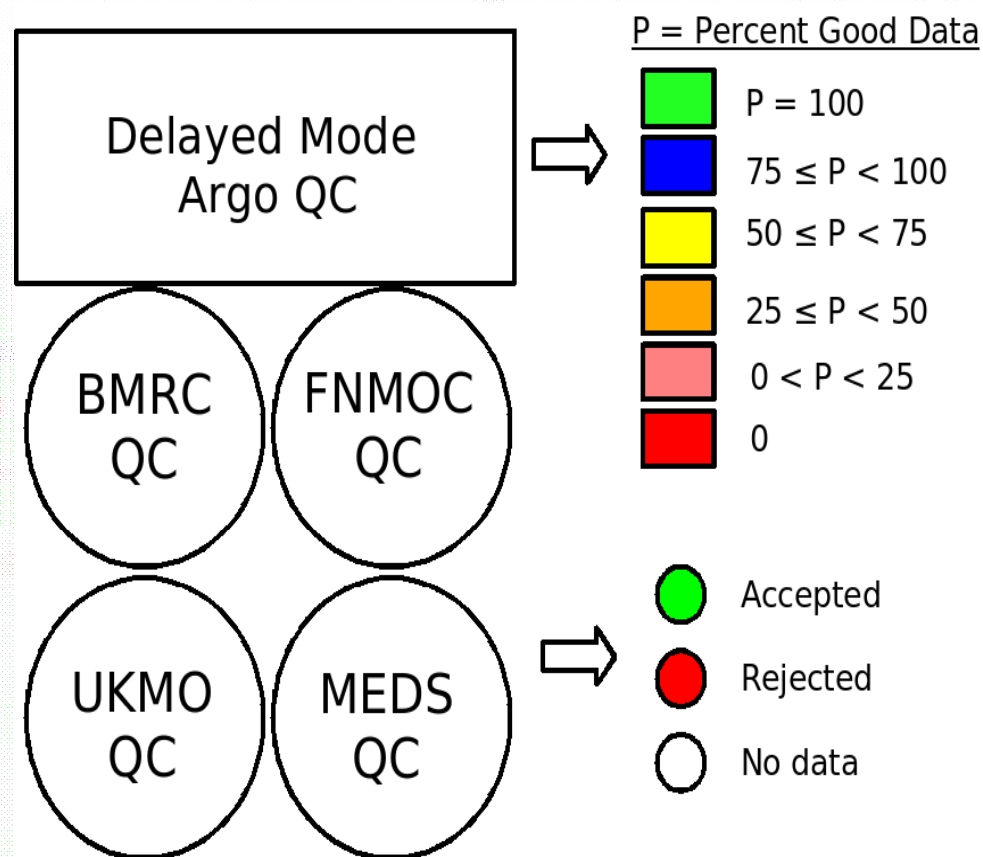


Displaying results

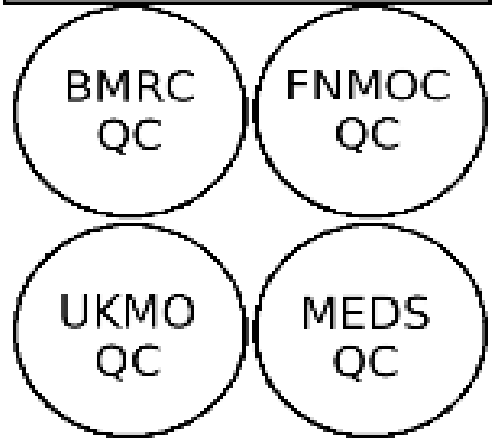
- Need to show user for each argo profile:

- Location
- Delayed mode QC
- BMRC QC
- FNMOC QC
- MEDS QC
- UKMO QC

- Plot each profile on map using a composite symbol (see right)



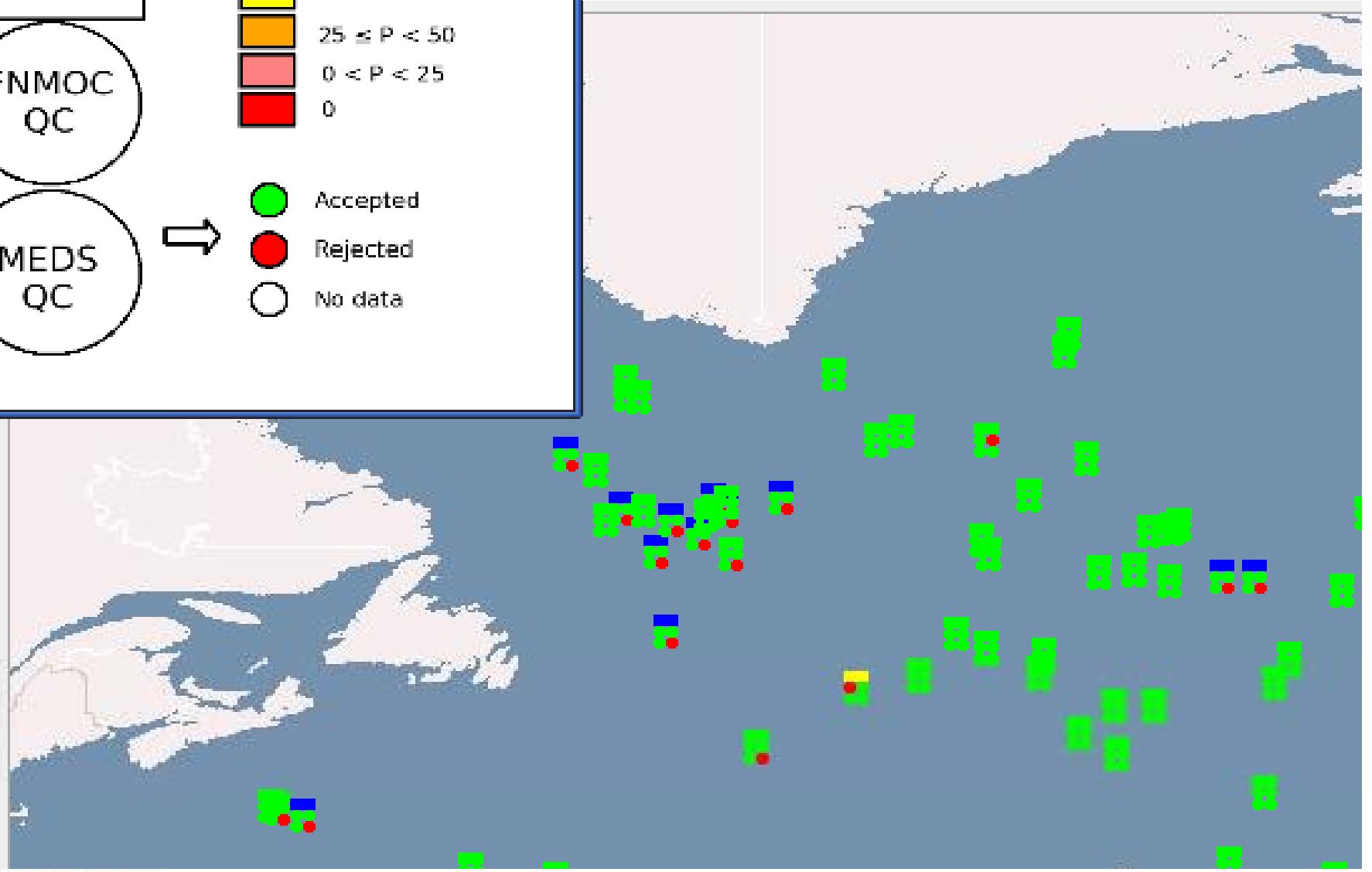
Delayed Mode
Argo QC



P = Percent Good Data

- P = 100
- $75 \leq P < 100$
- $50 \leq P < 75$
- $25 \leq P < 50$
- $0 < P < 25$
- 0

- Accepted
- Rejected
- No data



TEMPERATURE Profiles 2007-08:

Profiles which were accepted by centres but had
delayed mode QC $\leq 50\%$

Profiles which were rejected by centres but had
delayed mode QC $\geq 50\%$

2007-08: Temperature Delayed mode QC (global)

Delayed Mode QC (percent good data)

100%	0
75% - 100%	0
50% - 75%	0
25% - 50%	0
0% - 25%	0
0%	14376
TOTAL	14376

Profiles with **0% good data** according to delayed mode QC

Decision of Centres

BMRC	Accept:	923	FNMOC	Accept:	1081
	Reject:	1579		Reject:	477
	No data:	11220		No data:	12164
UKMO	Accept:	17	MEDS	Accept:	1301
	Reject:	1		Reject:	263
	No data:	13704		No data:	12158

(#1) **BMRC: 36.9%** accepted (ignoring no data profiles)

(#3) **FNMOC: 69.3%** accepted (ignoring no data profiles)

(#2) **MEDS: 83.1%** accepted (ignoring no data profiles)

(#4) **UKMO: 94.4%** accepted (ignoring no data profiles)

2007-08: Temperature Delayed mode QC (global)

Delayed Mode QC (percent good data)

100%	0
75% - 100%	0
50% - 75%	0
25% - 50%	122
0% - 25%	42
0%	13722
TOTAL	13886

Profiles with **0% - 50% good data** according to delayed mode QC

Decision of Centres

BMRC	Accept:	1035
	Reject:	1622
	No data:	11229

FNMOC	Accept:	1175
	Reject:	488
	No data:	12223

UKMO	Accept:	17
	Reject:	1
	No data:	13868

MEDS	Accept:	1374
	Reject:	297
	No data:	12215

(#1) **BMRC: 39.0%** accepted (ignoring no data profiles)

(#2) **FNMOC: 70.7%** accepted (ignoring no data profiles)

(#3) **MEDS: 82.2%** accepted (ignoring no data profiles)

(#4) **UKMO: 94.4%** accepted (ignoring no data profiles)

2007-08: Temperature Delayed mode QC (global)

Delayed Mode QC (percent good data)

100%	116259
75% - 100%	6829
50% - 75%	195
25% - 50%	0
0% - 25%	0
0%	0
TOTAL	123283

Profiles with **50% - 100% good data** according to delayed mode QC

(#1) BMRC: 99.4% accepted (ignoring no data profiles)

(#3) FNMOC: 96.6% accepted (ignoring no data profiles)

(#4) MEDS: 96.0% accepted (ignoring no data profiles)

(#2) UKMO: 98.9% accepted (ignoring no data profiles)

Decision of Centres

BMRC	Accept:	117012	FNMOC	Accept:	98685
	Reject:	729		Reject:	3501
	No data:	5542		No data:	21097
UKMO	Accept:	1563	MEDS	Accept:	97964
	Reject:	18		Reject:	3082
	No data:	121702		No data:	22237

2007-08: Temperature Delayed mode QC (global)

Delayed Mode QC (percent good data)

100%	116259
75% - 100%	0
50% - 75%	0
25% - 50%	0
0% - 25%	0
0%	0
TOTAL	116259

Profiles with **100% good data** according to delayed mode QC

(#1) **BMRC: 99.6%** accepted (ignoring no data profiles)

(#4) **FNMOc: 96.7%** accepted (ignoring no data profiles)

Decision of Centres

BMRC	Accept:	110631	FNMOc	Accept:	93038
	Reject:	417		Reject:	3129
	No data:	5211		No data:	20092
UKMO	Accept:	1472	MEDS	Accept:	93345
	Reject:	17		Reject:	1694
	No data:	114770		No data:	21220

(#3) **MEDS: 98.2%** accepted (ignoring no data profiles)

(#2) **UKMO: 98.9%** accepted (ignoring no data profiles)

SALINITY Profiles 2007-08:

Profiles which were accepted by centres but had
delayed mode QC < 50%

Profiles which were rejected by centres but had
delayed mode QC > 50%

2007-08: Salinity Delayed mode QC (global)

Delayed Mode QC (percent good data)

100%	0
75% - 100%	0
50% - 75%	0
25% - 50%	0
0% - 25%	0
0%	14708
TOTAL	14708

Profiles with **0% good data** according to delayed mode QC

(#1) BMRC: 37.7% accepted (ignoring no data profiles)

(2) FNMOC: 71.4% accepted (ignoring no data profiles)

(3) MEDS: 85.3% accepted (ignoring no data profiles)

(4) UKMO: 95.2% accepted (ignoring no data profiles)

Decision of Centres

BMRC	Accept:	1320
	Reject:	2180
	No data:	11208

FNMOC	Accept:	1764
	Reject:	705
	No data:	12239

UKMO	Accept:	20
	Reject:	1
	No data:	14687

MEDS	Accept:	2081
	Reject:	360
	No data:	12267

2007-08: Salinity Delayed mode QC (global)

Delayed Mode QC (percent good data)

100%	0
75% - 100%	0
50% - 75%	0
25% - 50%	211
0% - 25%	103
0%	15416
TOTAL	15730

Profiles with **0% - 50% good data** according to delayed mode QC

(#1) BMRC: 40.5% accepted (ignoring no data profiles)

(2) FNMOC: **71.7%** accepted (ignoring no data profiles)

(3) MEDS: **83.5%** accepted (ignoring no data profiles)

(4) UKMO: **95.5%** accepted (ignoring no data profiles)

Decision of Centres

BMRC	Accept:	1537	FNMOC	Accept:	1929
	Reject:	2255		Reject:	762
	No data:	11222		No data:	12323
UKMO	Accept:	21	MEDS	Accept:	2223
	Reject:	1		Reject:	438
	No data:	14992		No data:	12353

2007-08: Salinity Delayed mode QC (global)

Delayed Mode QC (percent good data)

100%	118900
75% - 100%	8653
50% - 75%	420
25% - 50%	0
0% - 25%	0
0%	0
TOTAL	127973

Profiles with **50% - 100% good data** according to delayed mode QC

(#1) BMRC: 99.1% accepted (ignoring no data profiles)

(3) FNMOC: 98.3% accepted (ignoring no data profiles)

(4) MEDS: 97.1% accepted (ignoring no data profiles)

(2) UKMO: 98.9% accepted (ignoring no data profiles)

Decision of Centres

BMRC	Accept:	115443
	Reject:	1014
	No data:	5504

FNMOC	Accept:	99361
	Reject:	1714
	No data:	20886

UKMO	Accept:	1560
	Reject:	17
	No data:	120384

MEDS	Accept:	97073
	Reject:	2898
	No data:	21990

2007-08: Salinity Delayed mode QC (global)

Delayed Mode QC (percent good data)

100%	118900
75% - 100%	0
50% - 75%	0
25% - 50%	0
0% - 25%	0
0%	0
TOTAL	118900

Profiles with **100% good data** according to delayed mode QC

Decision of Centres

BMRC	Accept:	107614	FNMOC	Accept:	92266
	Reject:	627		Reject:	1417
	No data:	5095		No data:	19653
UKMO	Accept:	1458	MEDS	Accept:	90778
	Reject:	16		Reject:	1854
	No data:	111862		No data:	20704

(#1) **BMRC: 99.4%** accepted (ignoring no data profiles)

(3) **FNMOC: 98.5%** accepted (ignoring no data profiles)

(4) **MEDS: 98.0%** accepted (ignoring no data profiles)

(2) **UKMO: 98.9%** accepted (ignoring no data profiles)

Can we make conclusions on how well the centres do?

- Breakdown by ranking (#1, #2, #3, #4) :
 - BMRC: 8, 0, 0, 0 (**32**)
 - FNMOC: 0, 3, 4, 1 (**18**)
 - UKMO: 0, 4, 0, 4 (**16**)
 - MEDS: 0, 1, 4, 3 (**15**)
- **Red number** in brackets is a basic overall score based on:
 - 4 points for each #1
 - 3 points for each #2
 - 2 points for each #3
 - 1 point for each #4

Further work

- Iron out minor problems and make portal publicly online.
- Add ability to click on a profile symbol and get a profile plot.
 - e.g. could see spikes etc in some rejected profiles
- Add ability to rubberband an area of results and get a scatter plot or probability density function plot of profiles.
- Incorporate data on pressure QC
- Incorporate data from EN3 QC
- Include information on which QC tests passed/failed

Conclusions

- Database & portal provide quick & easy access to data for users
- Proportion of delayed mode argo decreases markedly as we approach present month.
- Gaps in available data in N Atlantic if using delayed mode 2009
- Operational centres are not able to carry out same level of QC within their tight timeframes
 - They accept profiles which later deemed mostly bad by DMQC and vice versa.
- This trend varies between centres
 - BMRC appears to do significantly better than other 3. Other 3 are closely matched.
 - Not enough data in Jim's files to be too sure about UKMO
- Only presented limited data for a limited time here – conclusions to be taken lightly for now!

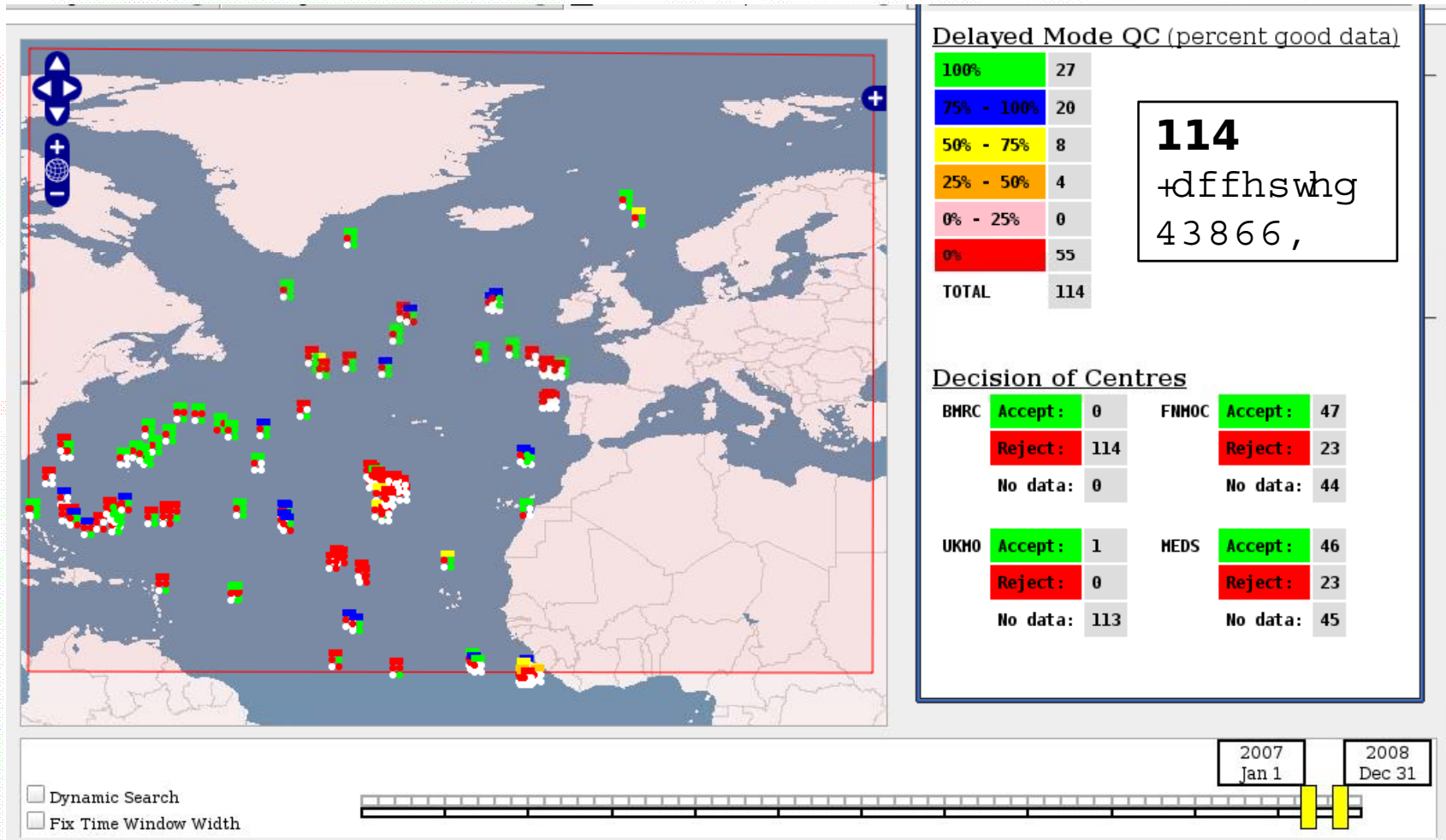
The background of the slide is a complex, colorful pattern. It features a grid of small, multi-colored squares (red, green, blue, yellow) that form a larger, abstract shape resembling a stylized 'A' or a similar character. The colors are vibrant and the overall effect is a dense, pixelated texture. A white rectangular box with a thin black border is centered on the slide, containing the text 'Thanks for your attention' in a simple, black, sans-serif font.

Thanks for your attention

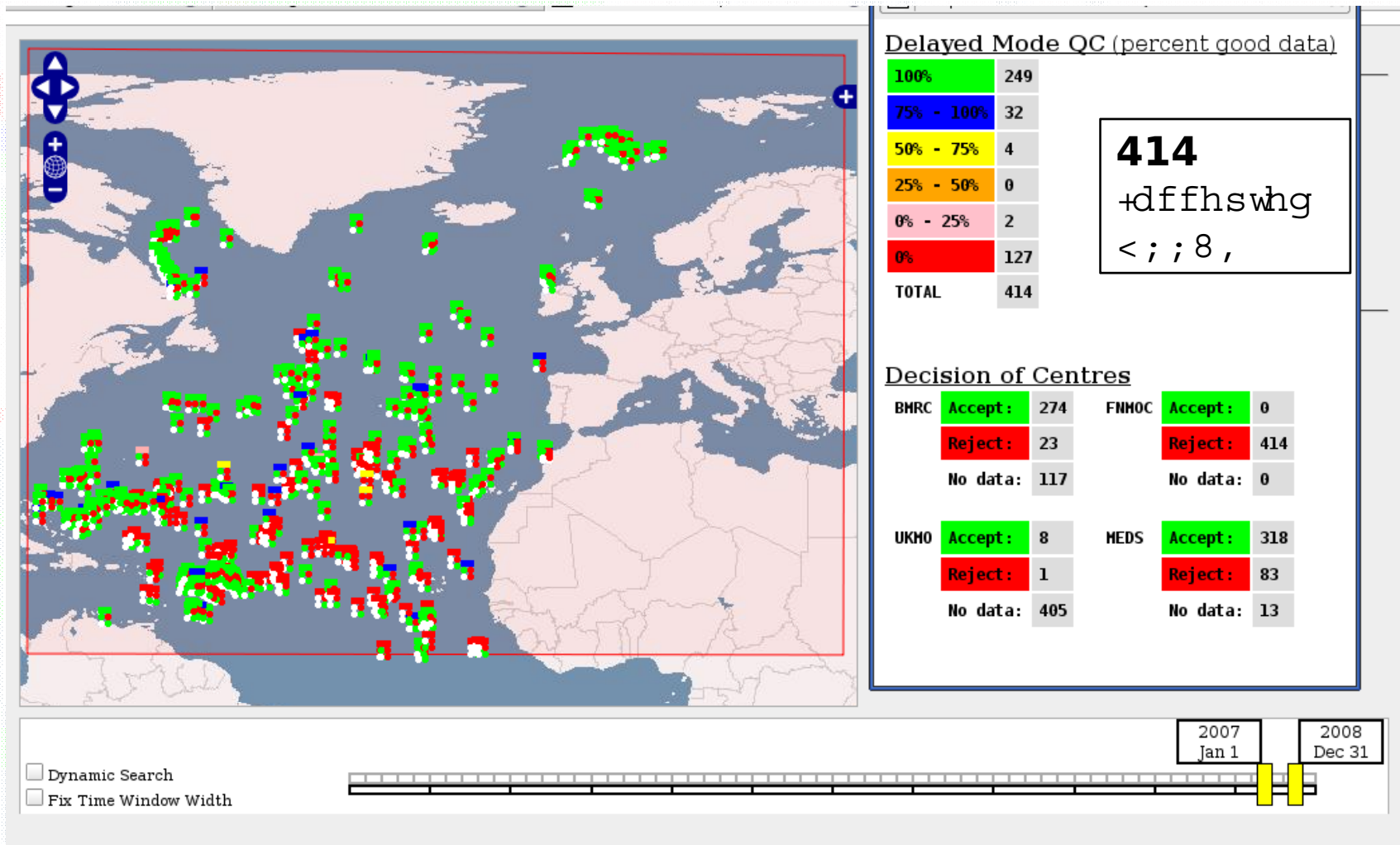


Z k l f k # s u r i d h v # z h u h # u h m f w h g # e | # w k h # f h q w u h v B

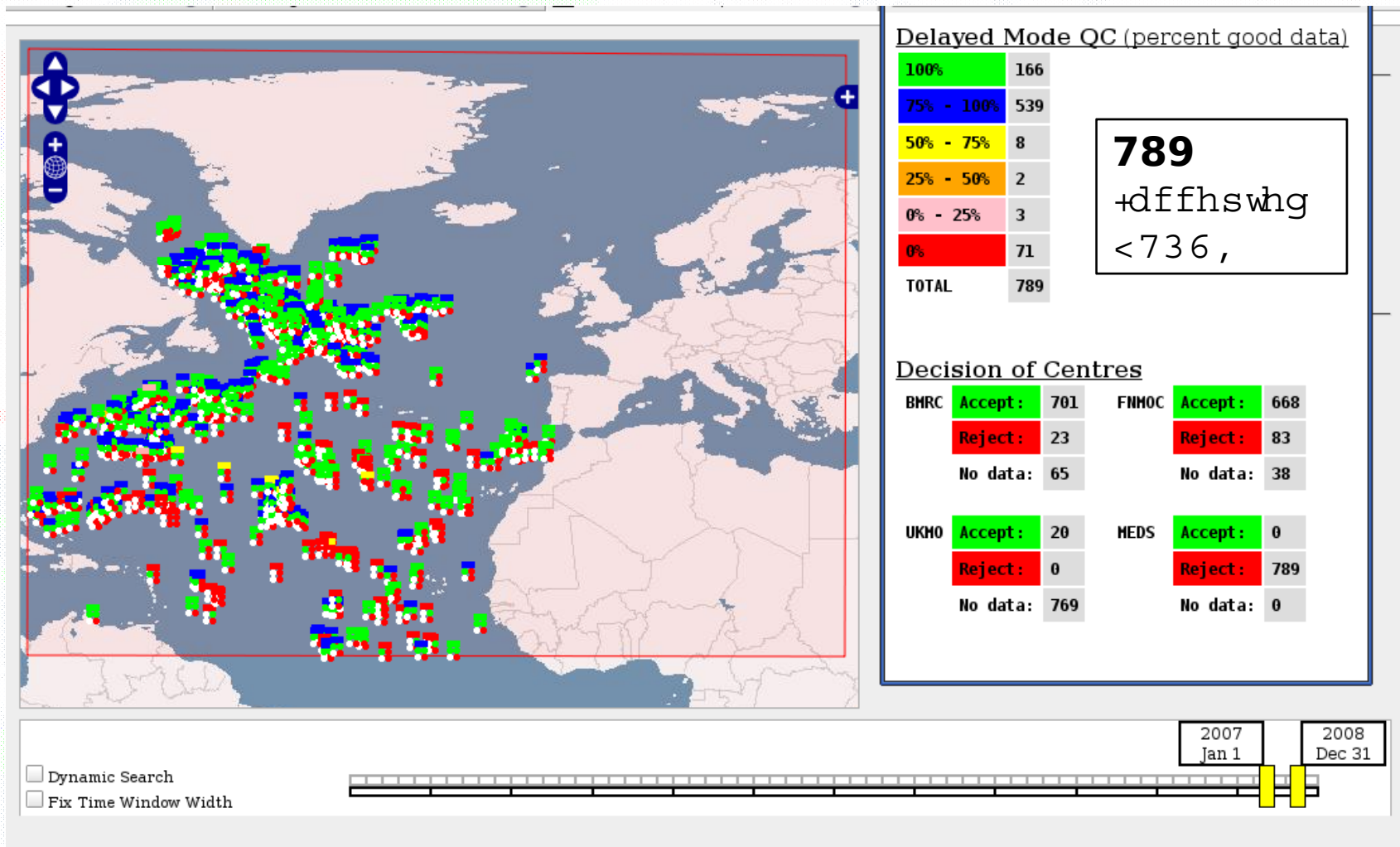
Q #Dw#B : 03 ; #G hœ | hg#p rgh#T F #yv#E P UF #T F



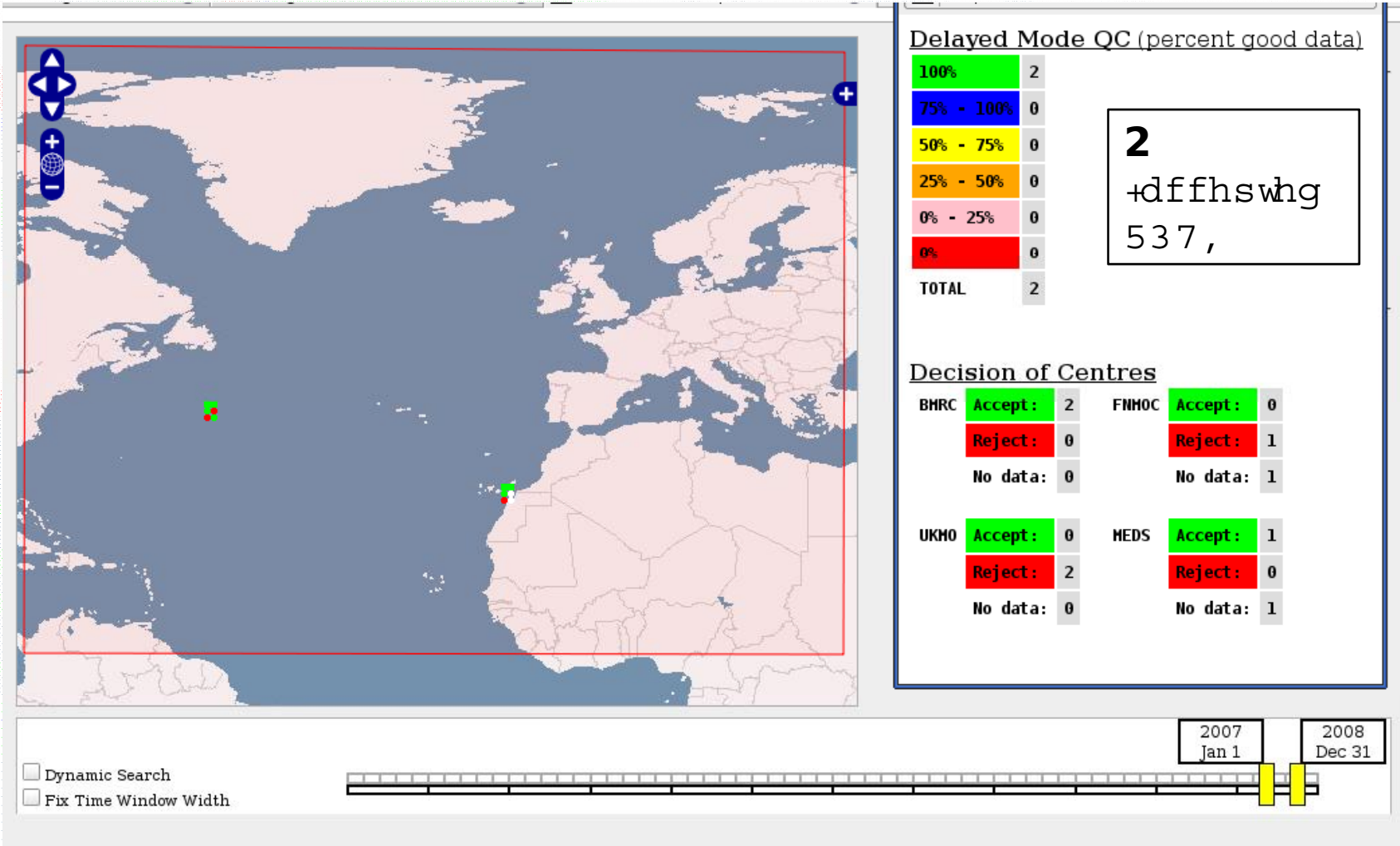
Q #Dw#B : 03 ; #G hœd | hg#p rgh#T F #yv#I Q P R F #T F



Q #Dw#B : 03 ; #G hœd | hg#p rgh#T F #yv#P HG V#T F



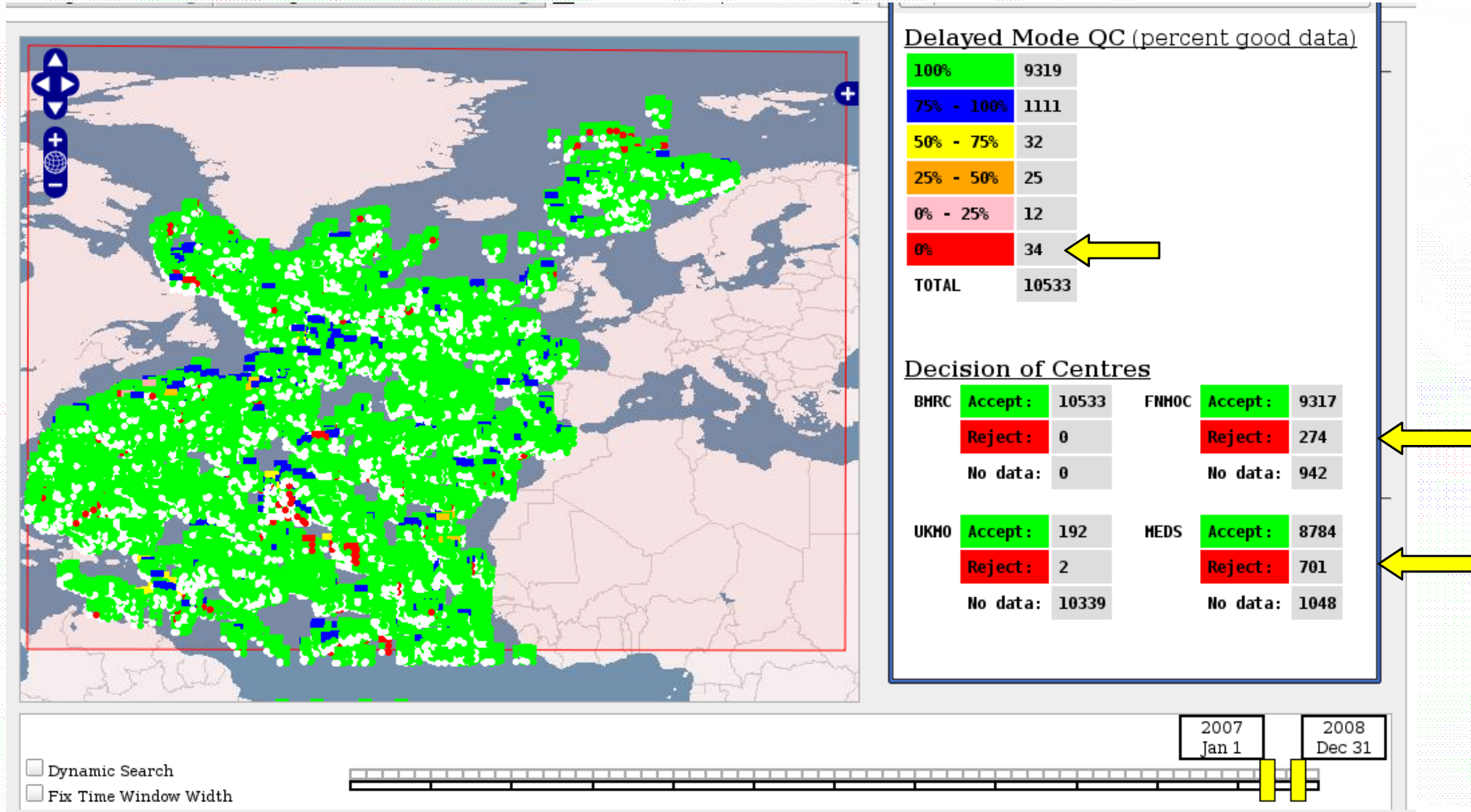
Q #Dw#B : 03 ; #G hœd | hg#p rgh#T F #yv#XNP R #T F



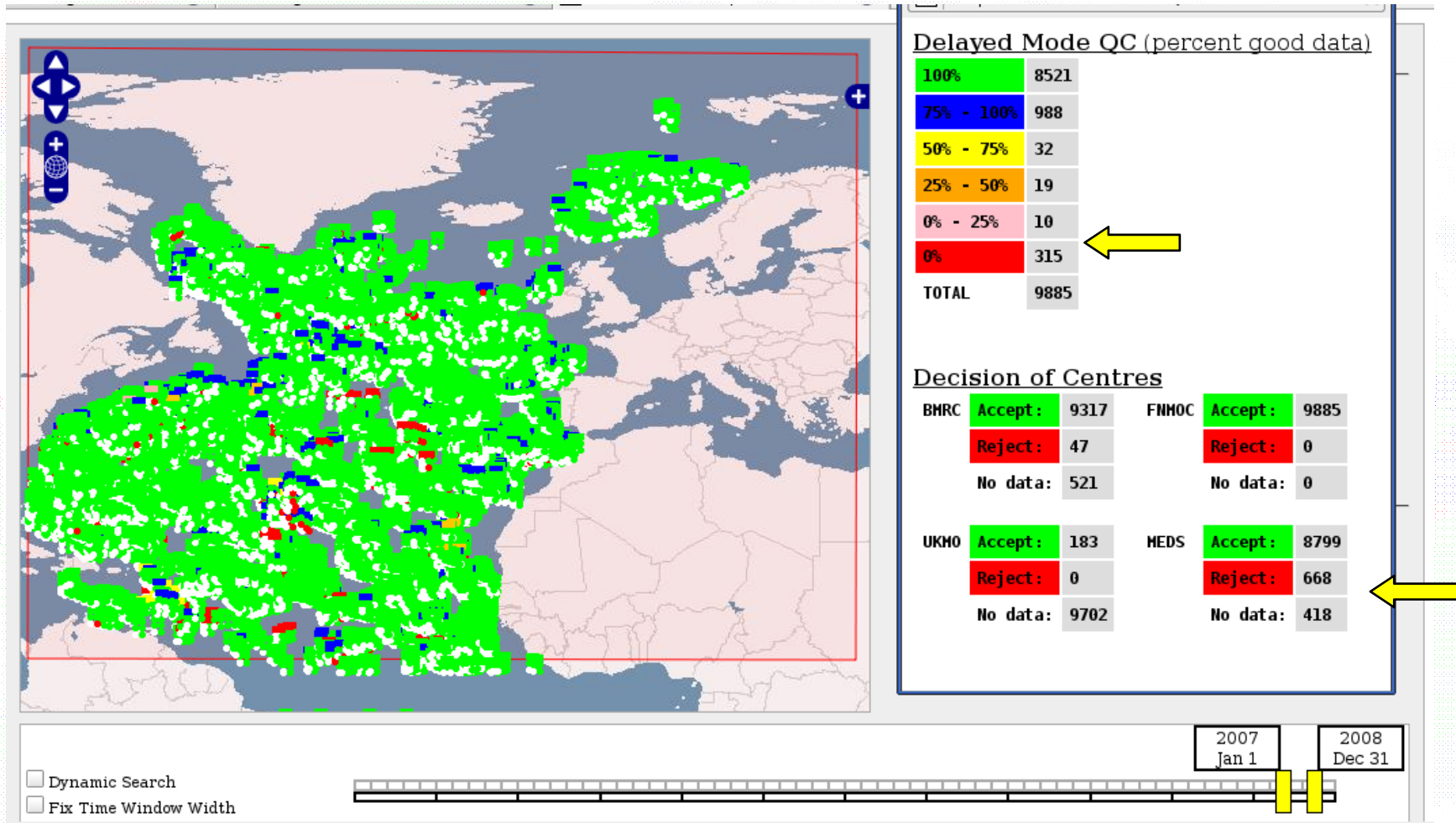


Z k l f k # s u r i d n v # z h u h # d f f h s w h g # e | # w k h # f h q w u h v B

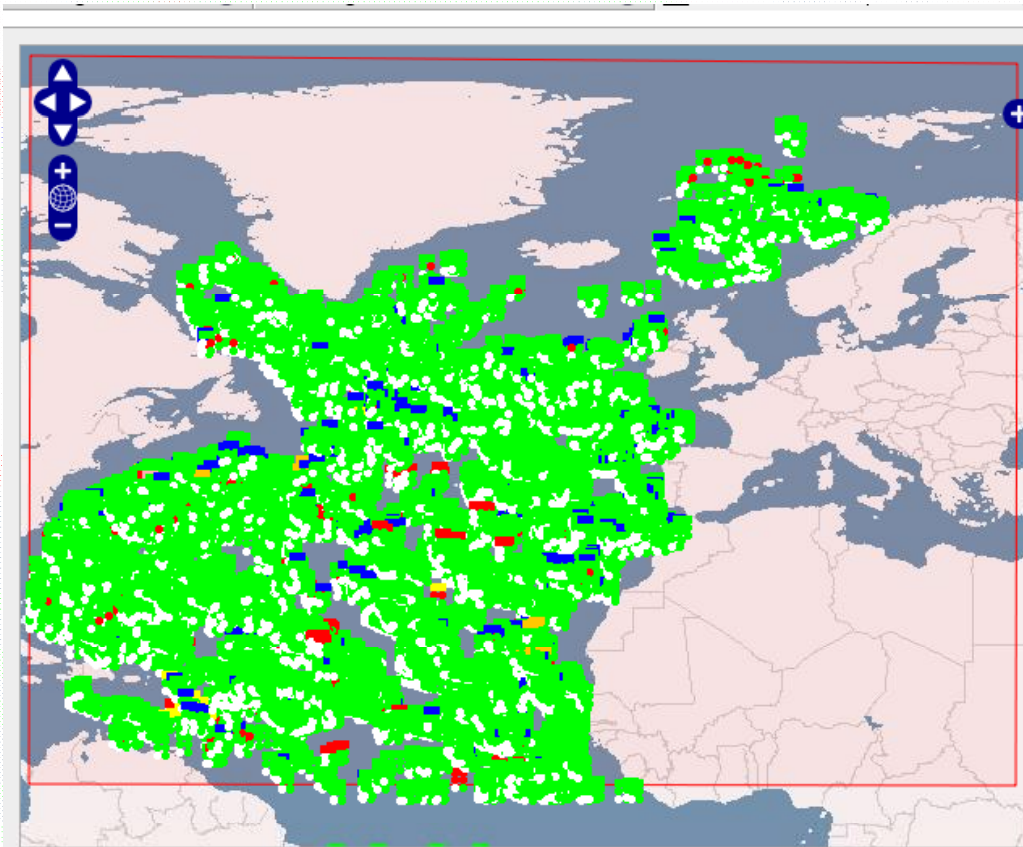
N Atl 07-08: Delayed mode QC vs BMRC QC



N Atl 07-08: Delayed mode QC vs FNMOC QC



N Atl 07-08: Delayed mode QC vs MEDS QC



Delayed Mode QC (percent good data)

100%	8464
75% - 100%	510
50% - 75%	28
25% - 50%	19
0% - 25%	8
0%	374
TOTAL	9403



Mozi _ x

http://loca

Delayed Mode QC
(percent good data)

100%	213
75% - 100%	13
50% - 75%	1
25% - 50%	0
0% - 25%	0
0%	91
TOTAL	318



Decision of Centres

BHRC	Accept:	8784	FNNOC	Accept:	8799
	Reject:	46		Reject:	318
	No data:	573		No data:	286
UKMO	Accept:	169	MEDS	Accept:	9403
	Reject:	1		Reject:	0
	No data:	9233		No data:	0

- Dynamic Search
- Fix Time Window Width

2007 Jan 1 2008 Dec 31



N Atl 07-08: Delayed mode QC vs UKMO QC

