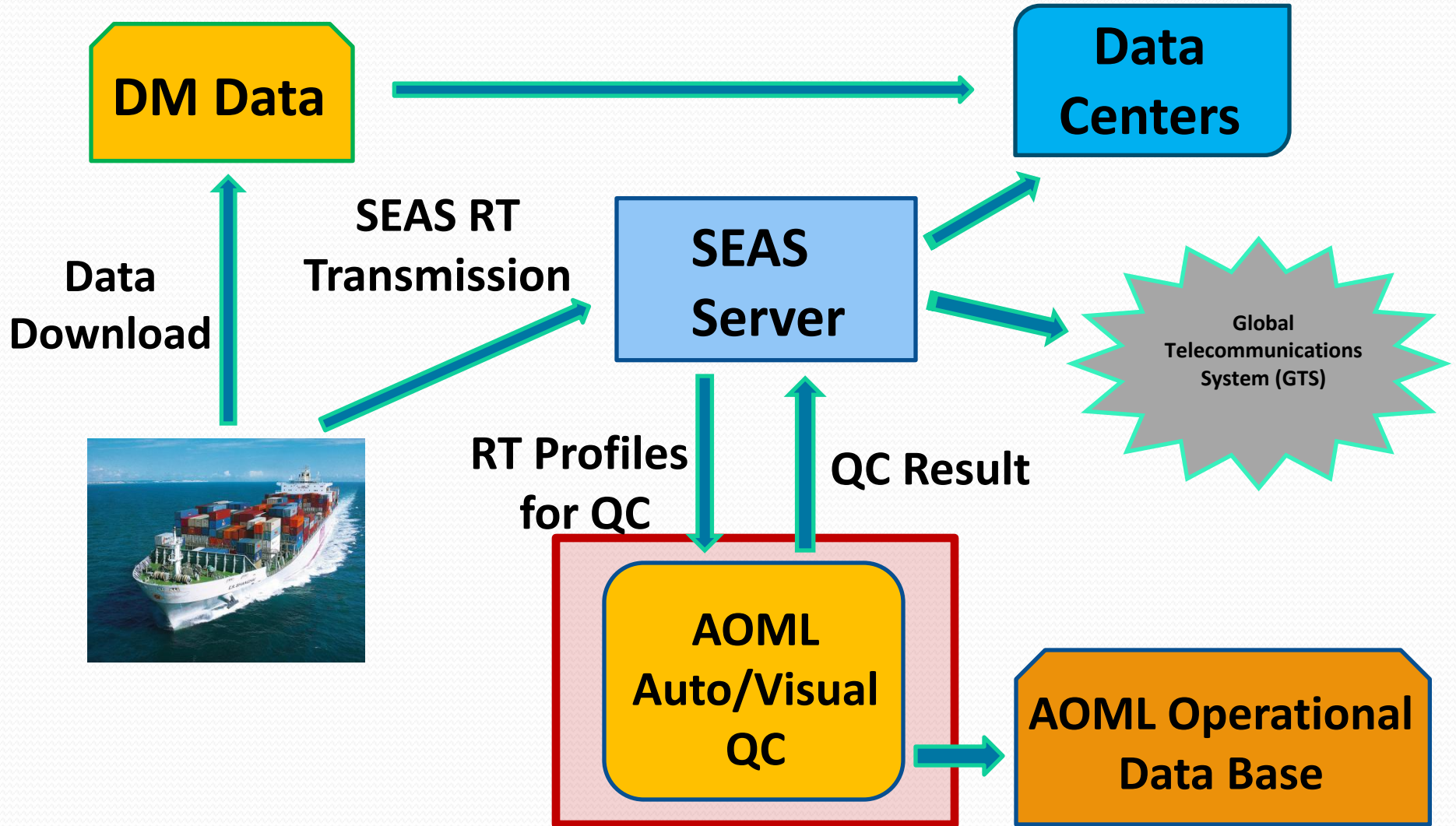


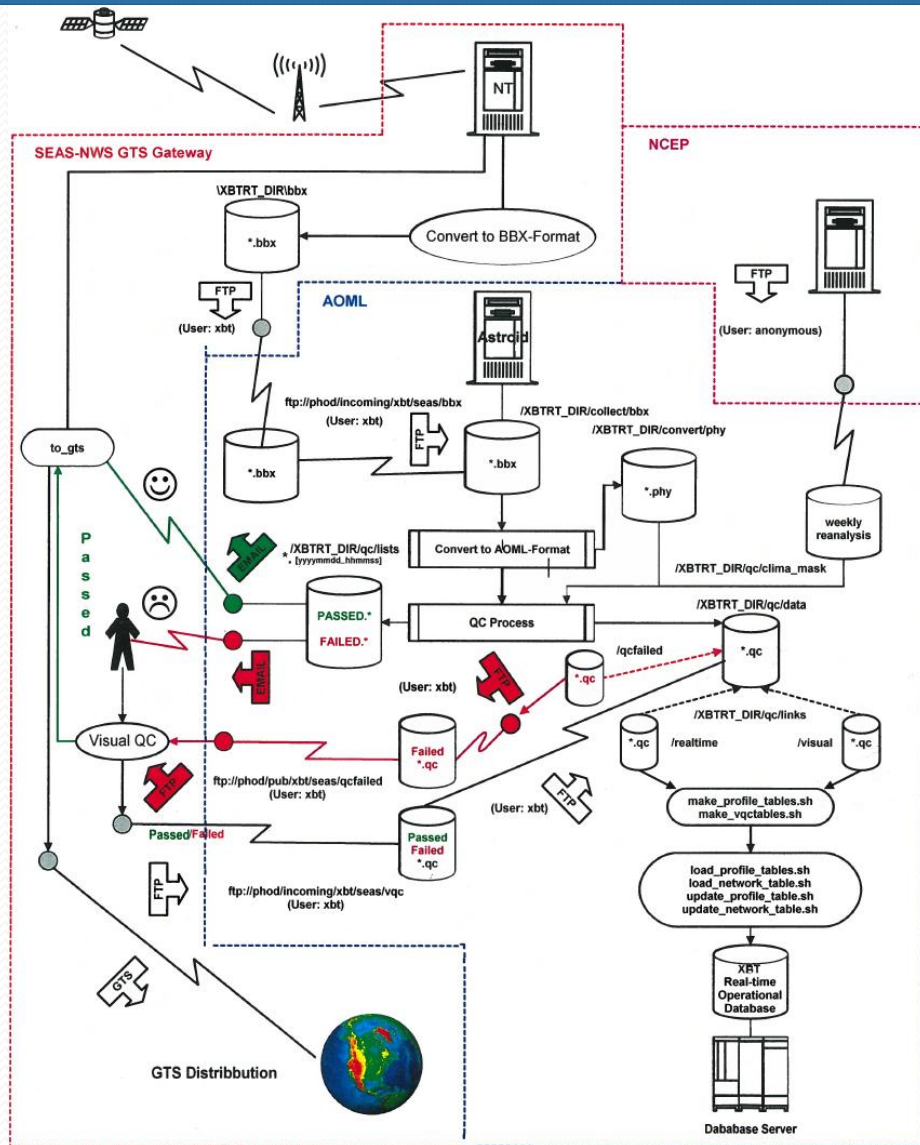
AOML's Real Time & Delayed Mode XBT Quality Control

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Yeun-ho.chong@noaa.gov

AOML: XBT Data Flow



AOML: Quality Control for RT XBT Data



Automatic Quality Control Processing System for SEAS XBT Real-Time Data

AOML: Automatic Quality Control for RT XBT Data



AOML Auto QC Tests:

- Gross check
- Constant value
- Spike
- Vertical Gradient
- Climatology
- Analysis
- Date
- Location
- Depth

AOML Auto QC Tests:

Spike

A measurement fails this test if tolerance of 0.4°C for difference between observed temperature and the associated median (of 3 observations) is exceeded

$$T_{test} = | T_2 - (T_3 + T_1) / 2 | - | (T_3 - T_1) / 2 |$$

Vertical Gradient

This test flags gradients and inversions. A measurement fails this test if the temperature gradient is outside of range $0.2^{\circ}\text{C}/\text{m}$ to $1.0^{\circ}\text{C}/\text{m}$

$$\text{grad}(T)_{test} = (T_2 - T_1) / (Z_2 - Z_1)$$

AOML: Automatic Quality Control for RT XBT Data



AOML Auto QC Tests:

Gross check

This test checks the extreme depth and temperature values:

$$\text{Good:} \quad -2.5^{\circ}\text{C} < T < 40.0^{\circ}\text{C}$$
$$0.0 \leq Z < 11000.0 \text{ m}$$

Constant value (global flag)

This test checks if the profile is constant from top to bottom:

$$\text{Good:} \quad T_{min} \neq T_{max}$$

AOML: Automatic Quality Control for RT XBT Data



AOML Auto QC Tests:

Date (global flag)

This test checks for impossible date and time:

Good: Year > 1997; $0 \leq \text{Hour} < 24$
Month = 1, 2, ..., 12; $0 \leq \text{Min.} < 60$
Day = 1, ..., corresponding max.

Location (global flag)

This test checks for impossible locations

Good: $-180 \leq \text{Longitude} \leq 180$
 $-90 \leq \text{Latitude} \leq 90$

AOML: Automatic Quality Control for RT XBT Data

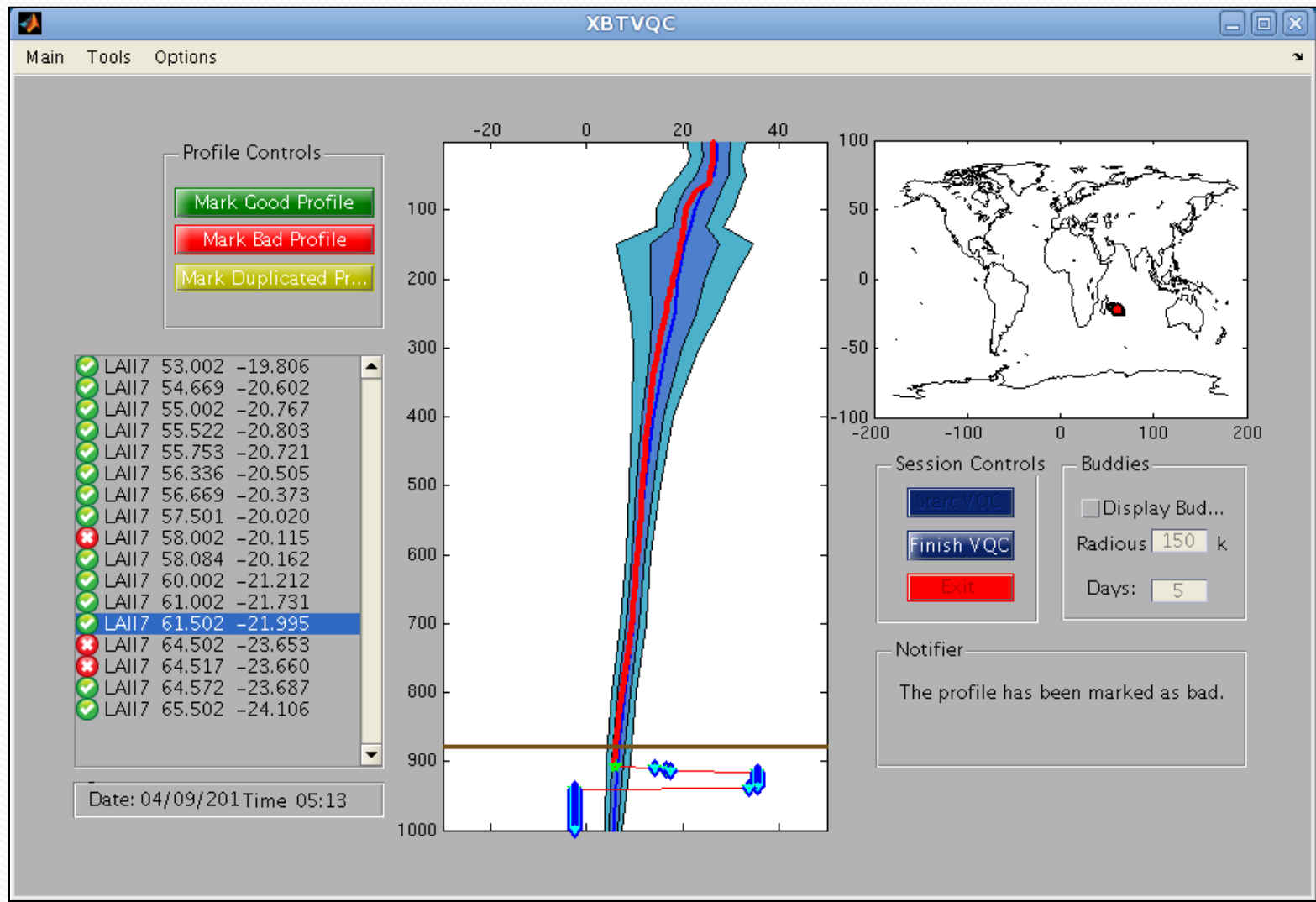


AOML Auto QC Tests:

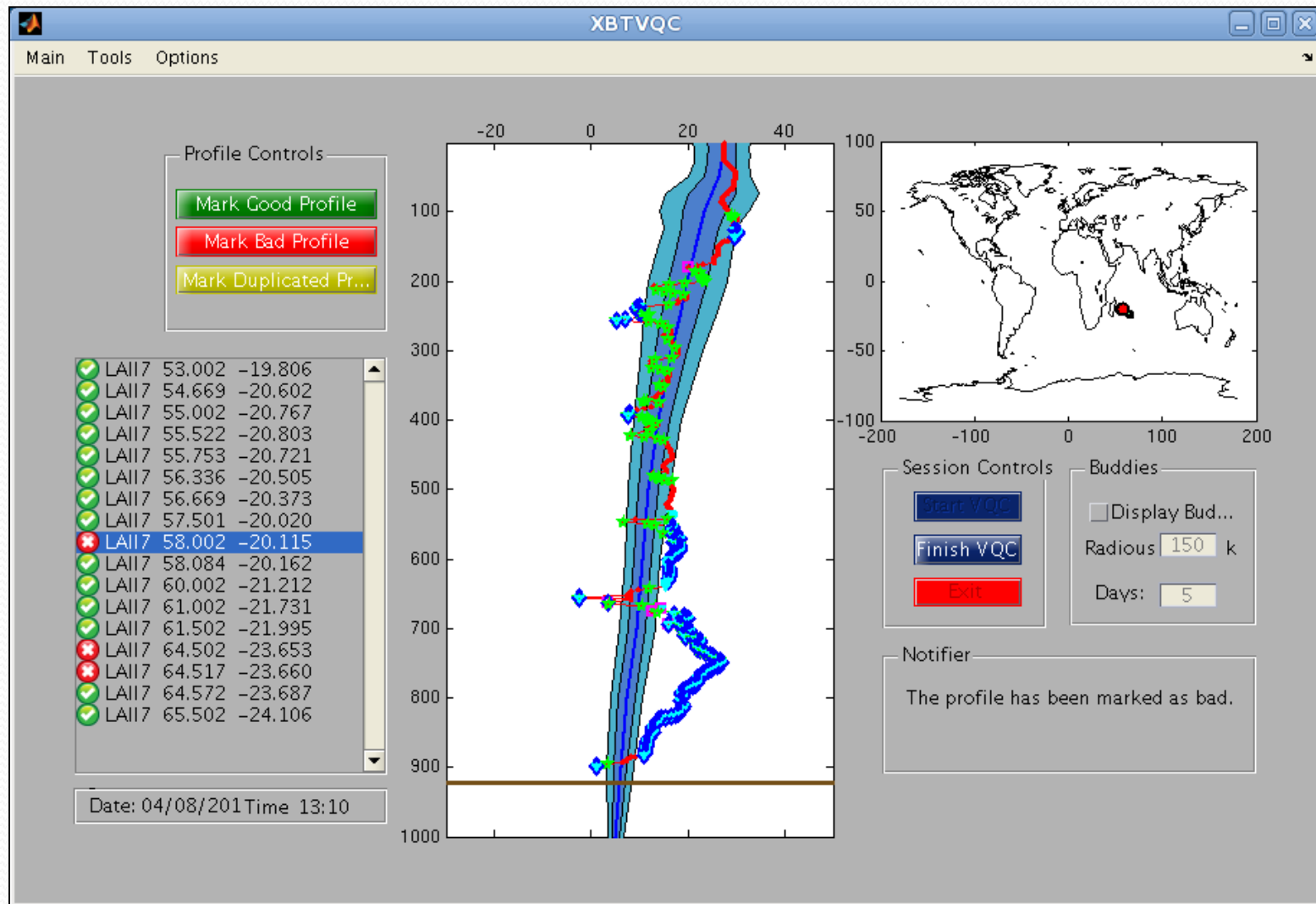
Depth (global flag)

This test checks for profiles located at sea using ETOPO5.

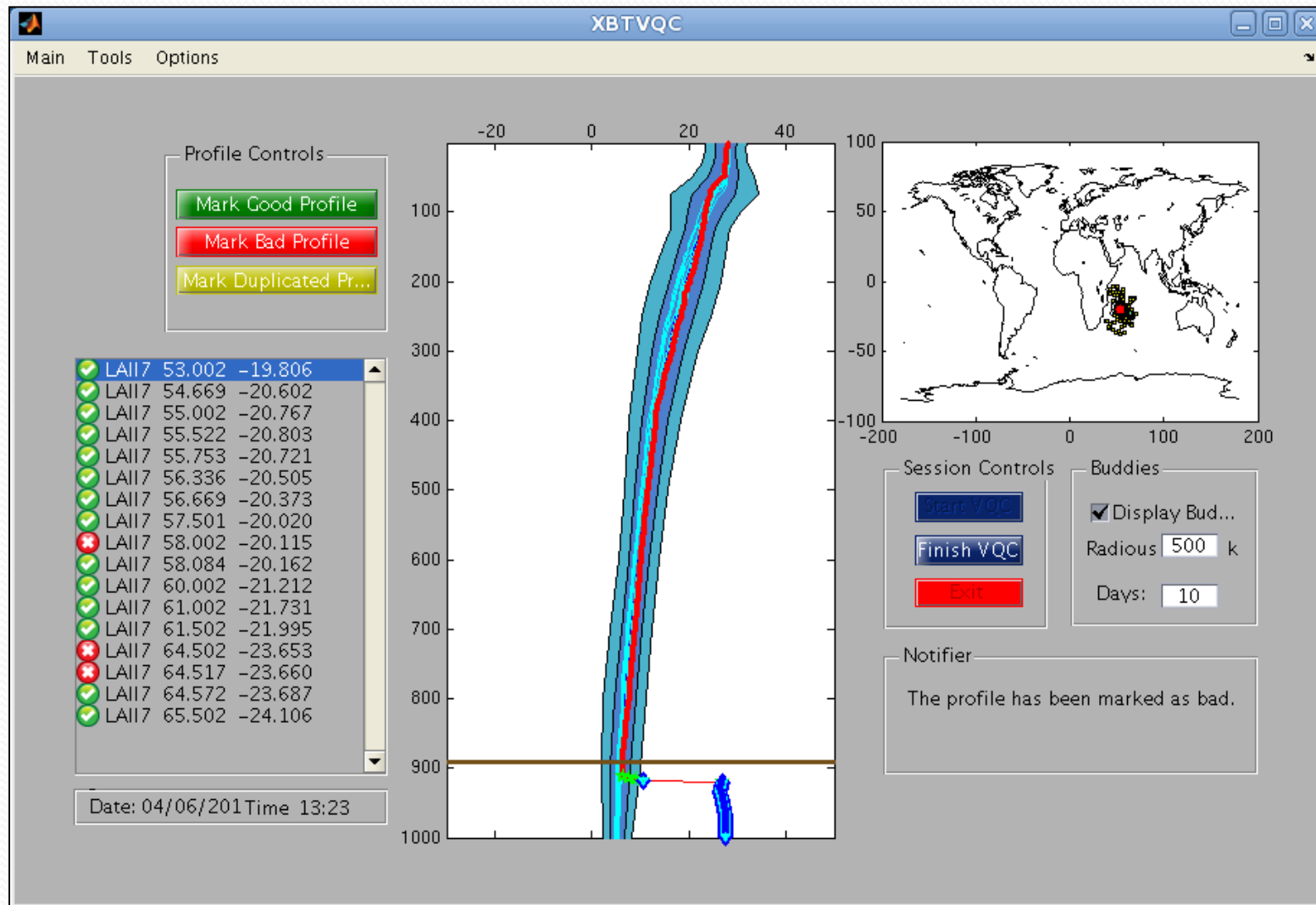
AOML: Visual Quality Control for RT XBT Data



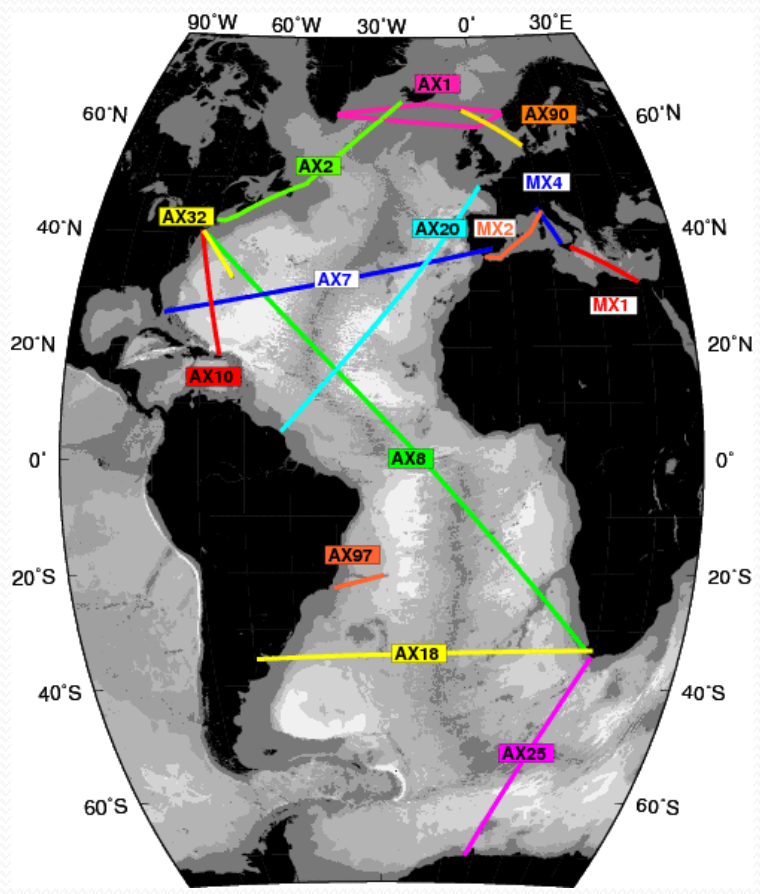
AOML: Visual Quality Control for RT XBT Data



AOML: Visual Quality Control for RT XBT Data



AOML: Data Flow for DM XBT data

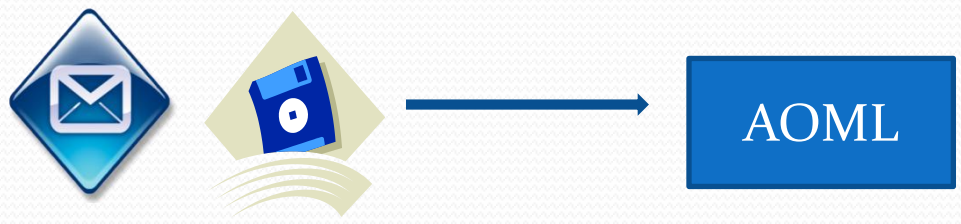


Data comes from the rider via e-mail or in cd.

(ax7, ax8, ax10, ax18, ax25, ax97)

Data comes from the rider via e-mail or ftp downloaded. (ax1, ax2, ax20)

Data comes from the rider via e-mail. (mx1, mx2, mx4)



AOML: Quality Control for DM XBT Data



AOML DM QC Tests:

Location check

Date/Time increasing check

Speed check

Levitus 2009 Climatology

Local Climatology

Duplicate check

Waterfall check

AOML: Quality Control for DM XBT Data



DM Thresholds and Values used :

Speed check : distances between drops more than 60 km or speed more than 20 m/s.

Duplicate check : lon < 0.07° & lat < 0.07° & time < 2 min.

Local climatology : nearest 25 profiles within +/- 45 days

Levitus 2009 climatology

Waterfall plot for consistency

AOML: Quality Control for DM XBT Data



DM Typical Problems :

Premature launch error

Temperature offset error

Wire break(stretch) error or touching side of ship

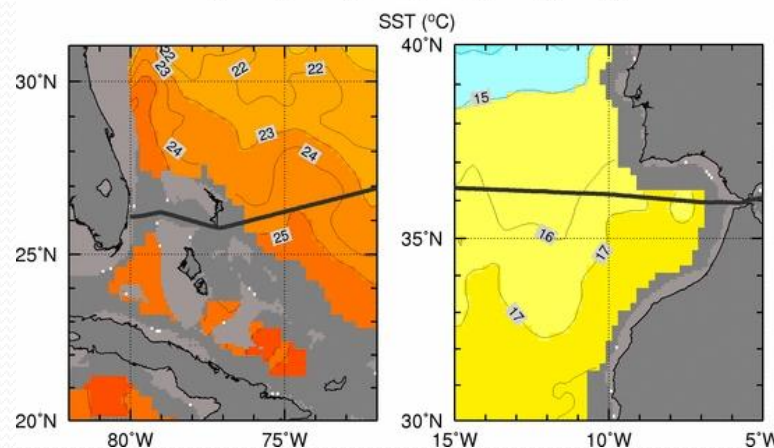
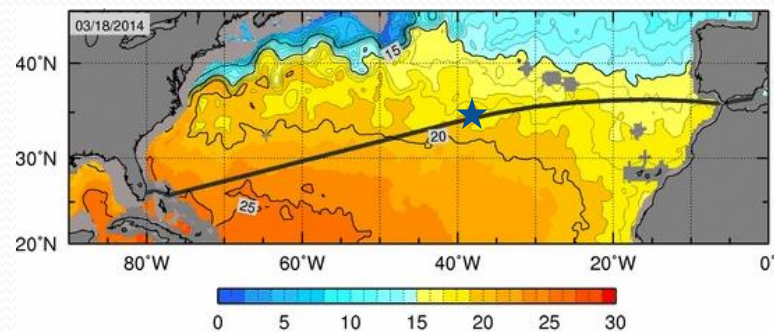
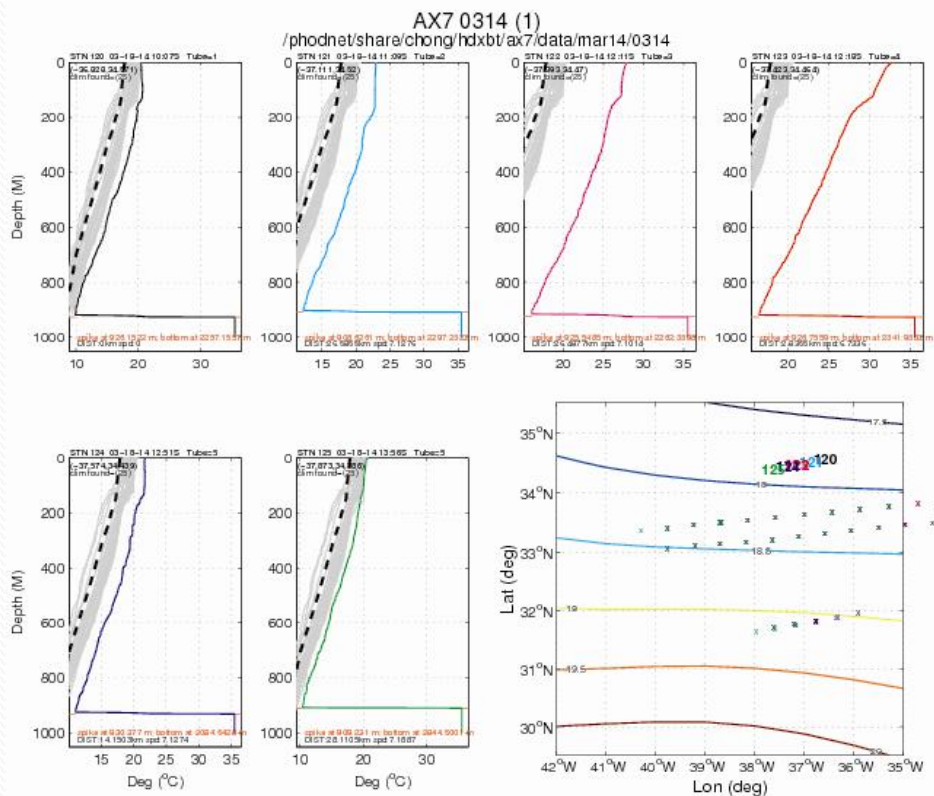
Spike error

High frequency error

Just no good profile

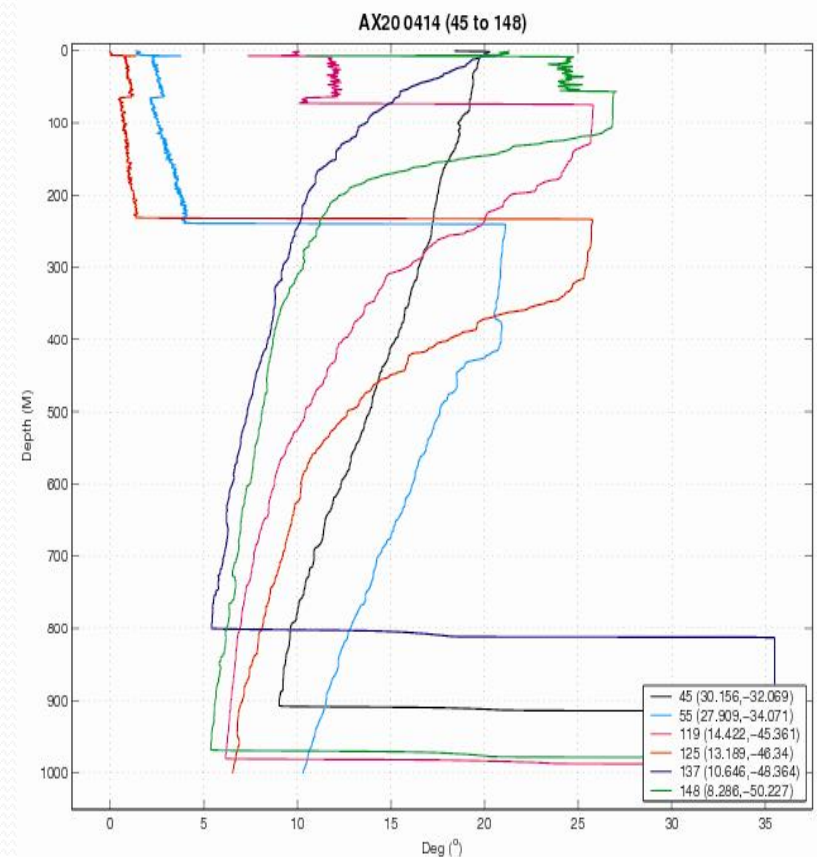
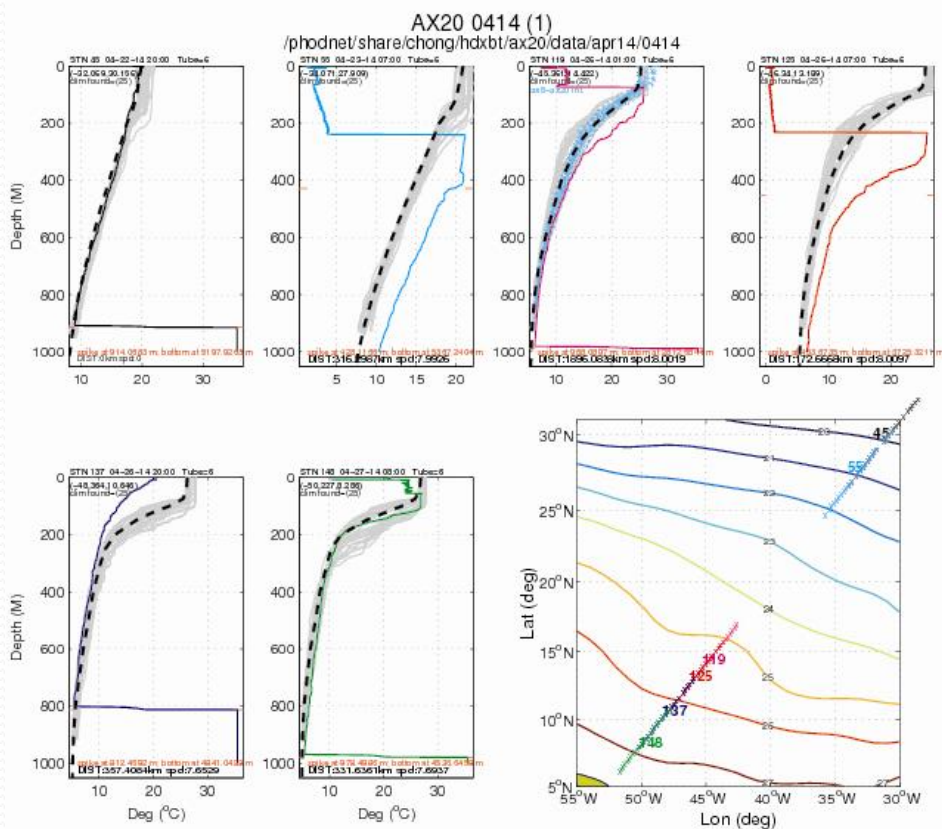
AOML: Quality Control for DM XBT Data

DM Temperature Offset Examples



AOML: Quality Control for DM XBT Data

DM Pre-mature Launch & other errors

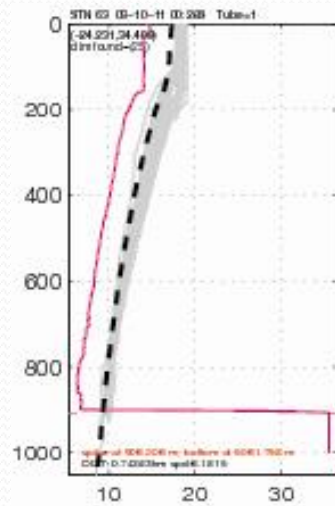


malfunction in Tube #6

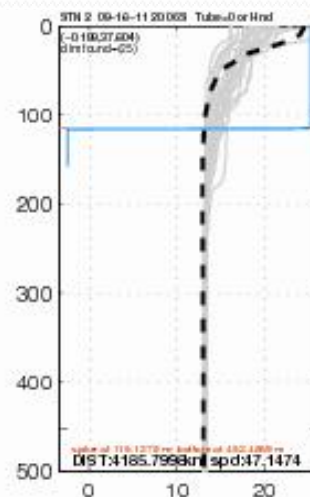
AOML: Quality Control for DM XBT Data

DM Examples of bad profiles

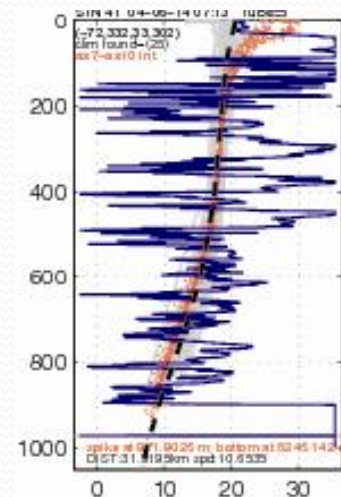
Temperature offset



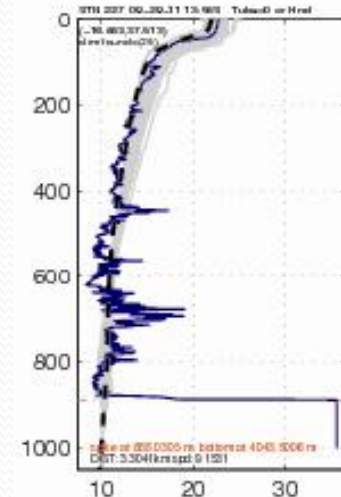
Just no good profile



High frequency



Leakage

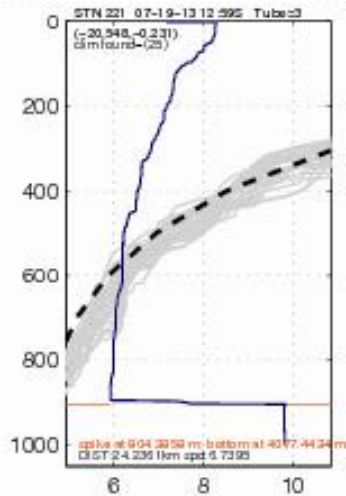


- Black dotted line : Levitus 2009 climatology
- Grey lines : local climatology
- Colored solid lines : profiles

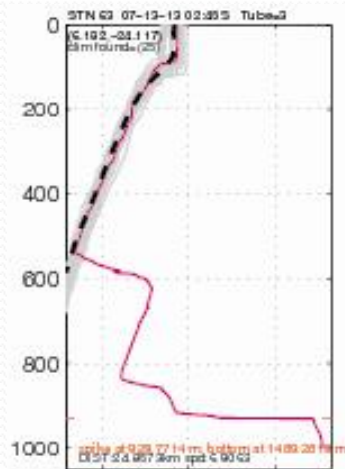
AOML: Quality Control for DM XBT Data

DM Examples of bad profiles

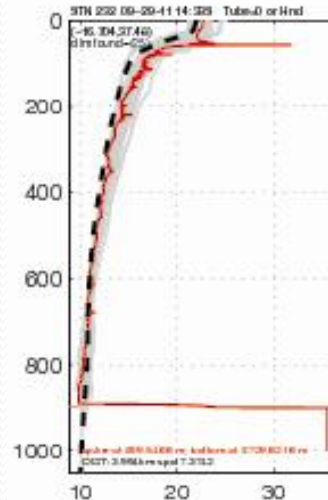
Bad probe



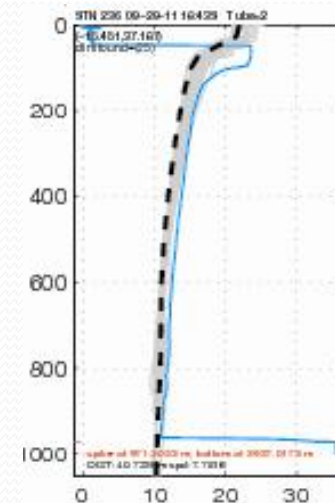
Wire stretch



Spike



Premature Launch



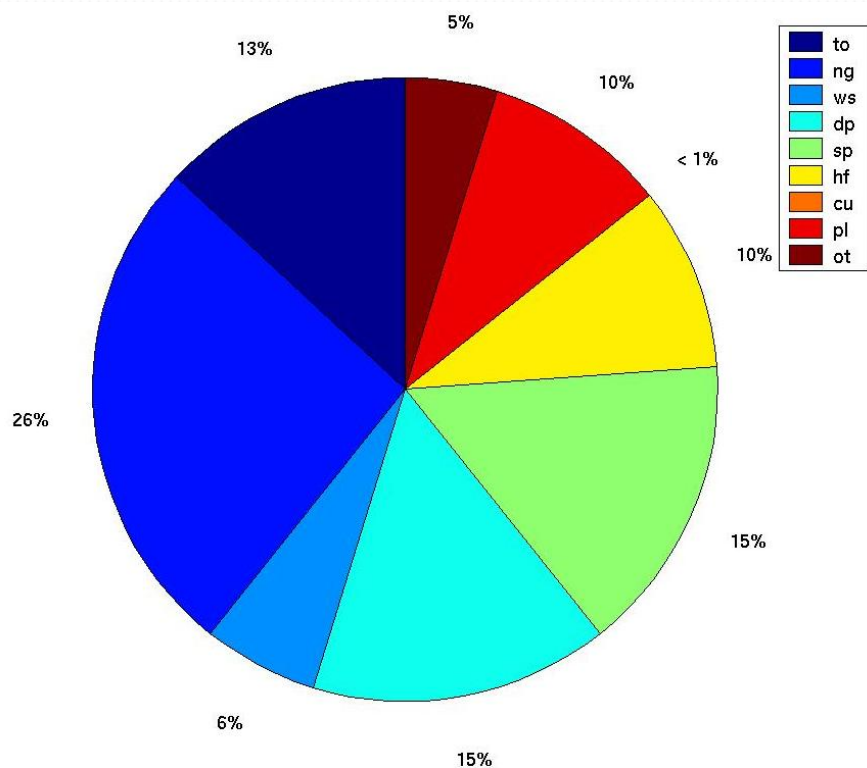
- Black dotted line : Levitus 2009 climatology
- Grey lines : local climatology
- Colored solid lines : profiles

AOML: Quality Control for DM XBT Data



DM Most common problems in %

AX7 2013 Errors



Errors	# of XBTs
TOR	11
NGR	22
WSR	5
DPR	13
HFR	13
CUR	0
PLR	8
OTHER	4

AOML: Quality Control for DM XBT Data



DM Number of Profiles QC'ed in FY2013: 7087

HD Line	# of XBTs
AX1	248
AX2	197
AX7	964
AX8	3055
AX10	438
AX18	885
AX20	476
AX25	305
AX97	268
MX1	56
MX2	79
MX4	116

