# Summary of Argo APEX Pressure Issues
# Progress Report

Susan Wijffels and Paul Barker, September, 2008

**Problem 1): DACs are not adjusting APEX pressure values for known pressure biases, as found via the surface pressure value.**

Status: Paul Barker and Susan Wijffels are working through the various APEX-user DACs to check on what they do. Paul Barker has been attempting to use the data in the technical files to produce a new estimate of PRES_ADJUSTED for all APEX. Below we present assessments of DAC practice as we have found it and actions so far.

We urge DACs to populate the technical files with the reported surface pressure offset.
We also urge the adoption of common names in the technical files.
We agree with the Kobayshi and Johnson paper that all DACs should adjust pressure both in real-time and delayed-mode.

Progress so far – NOTE THIS IS FOR APEX ONLY!

**UK** - do not adjust pressure, either in R/T or D/M. Technical files DO provide sfc_pressure_offset. Email sent and BODC promised to start fixes in the next few months. [ACTION UNDERWAY]

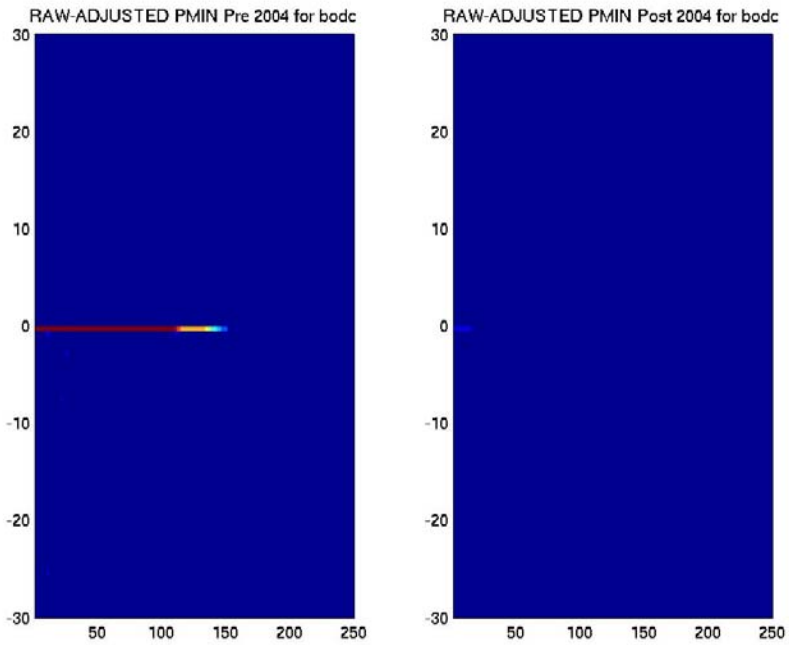



**Figure 1** Histogram of profile median PRES – PRES_ADJUSTED (db) versus cycle number for all BODC floats. Left: For floats deployed before 2004 (mostly Paine and AMATEK sensors). Right: For floats deployed before 2004 (mostly Druck sensors). Colour saturates at red for over 10 occurences. A flat red line at 0 db indicates that PRES = PRES_ADJUSTED for all floats, as is the case for BODC.

**India** - do not adjust pressure in either R/T or D/M. Technical files DO NOT provide sfc_pressure_offset, but instead report shallowest pressure logged. Email sent - Uday is working with Ann Thresher on decoding past hex data and implementing Australian real-time data processing software. Prospects for reprocessing old hex data to extract sfc_pressure_offset is not yet known. [ACTION UNDERWAY]

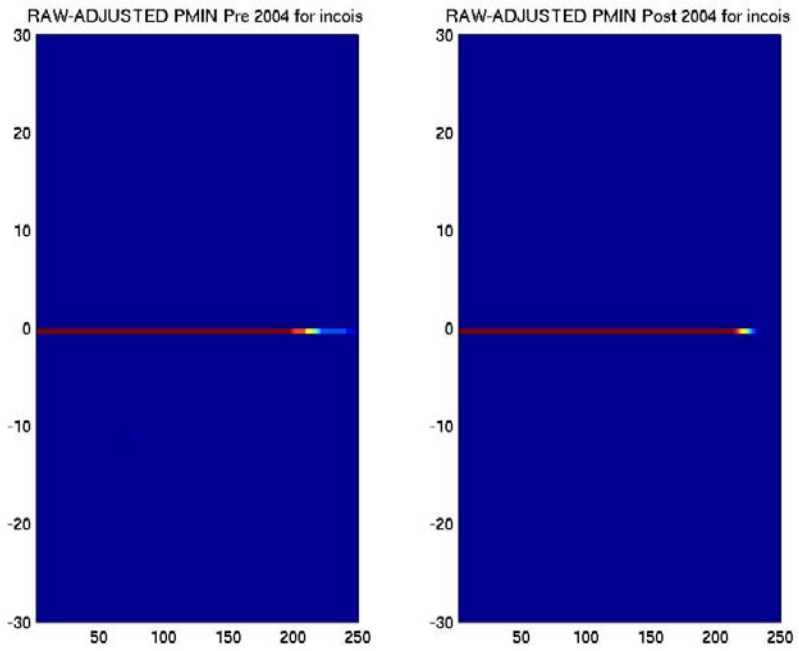



**Figure 2** As for Figure 1, but for INCOIS.

**Canada** - do not adjust pressure in either R/T or D/M. Email sent and work underway to correct this [ACTION UNDERWAY]

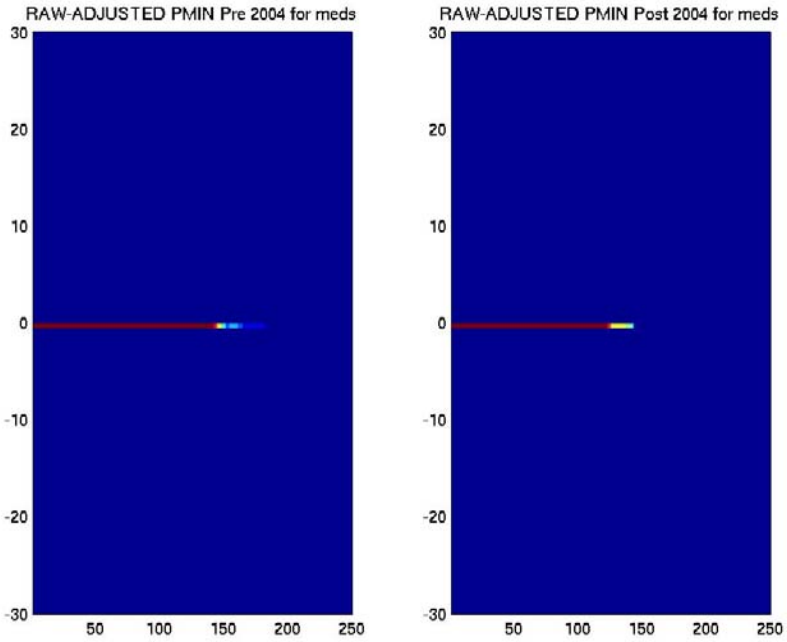



**Figure 3** As for Figure 1, but for MEDS

**Korea** – do not adjust pressure in either R/T or D/M [ACTION NEEDED TO CORRECT]

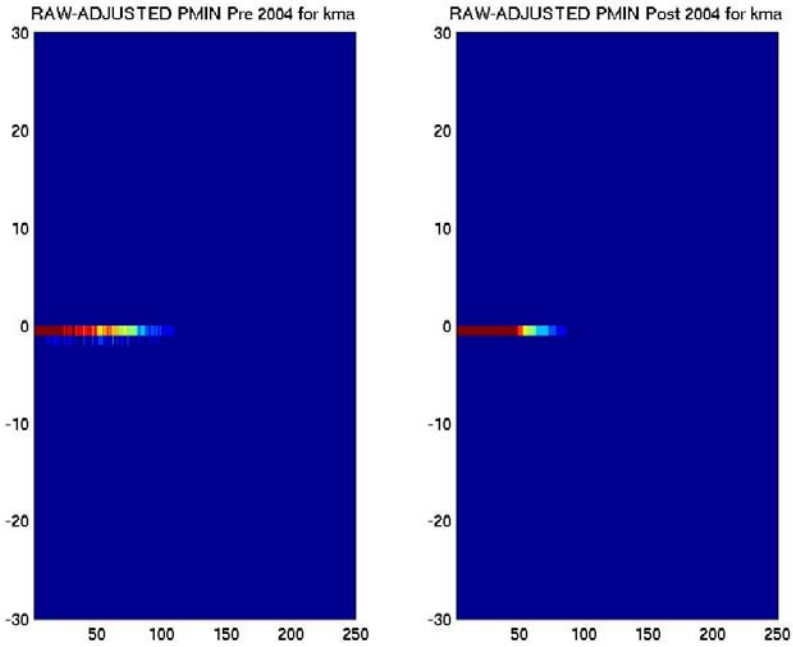



**Figure 4** As for Figure 1, but for KMA.

**China** – do not adjust pressure in either R/T or D/M [ACTION NEEDED TO CORRECT]

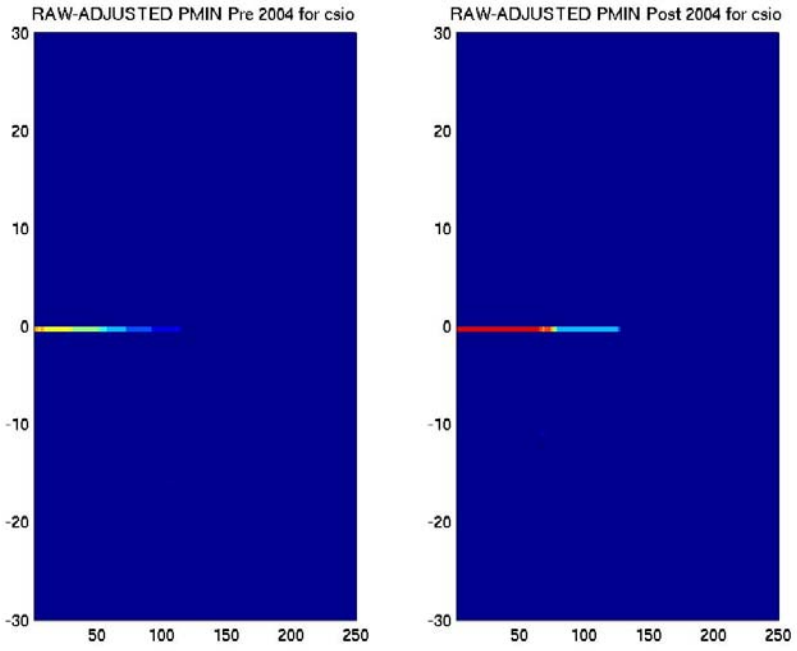



**Figure 5** As for Figure 1, but for CSIO.

**France** – do not adjust pressure in either R/T or D/M. [ACTION NEEDED TO CORRECT]

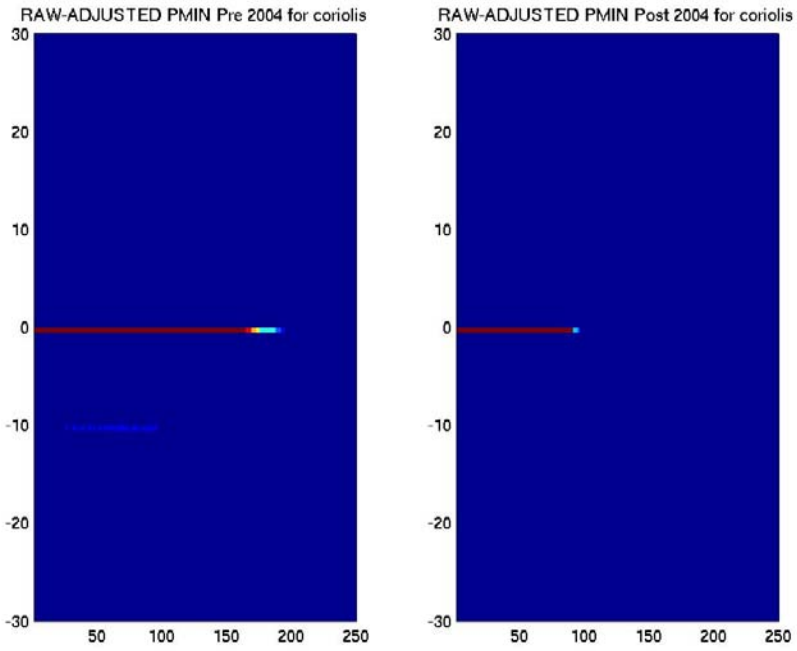



**Figure 6** As for Figure 1, but for CORIOLIS.

**US** – largely do not adjust pressure in R/T [ACTION NEEDED TO CORRECT]

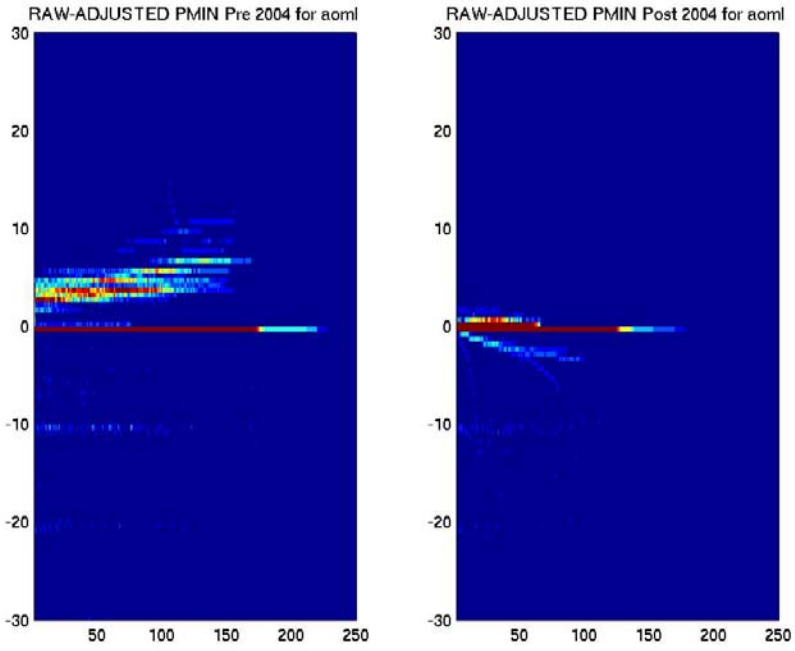



**Figure 7** As for Figure 1, but for AOML.

Many UW floats do not adjust pressure in D/M – see Figure 8 [ACTION NEEDED TO CORRECT].

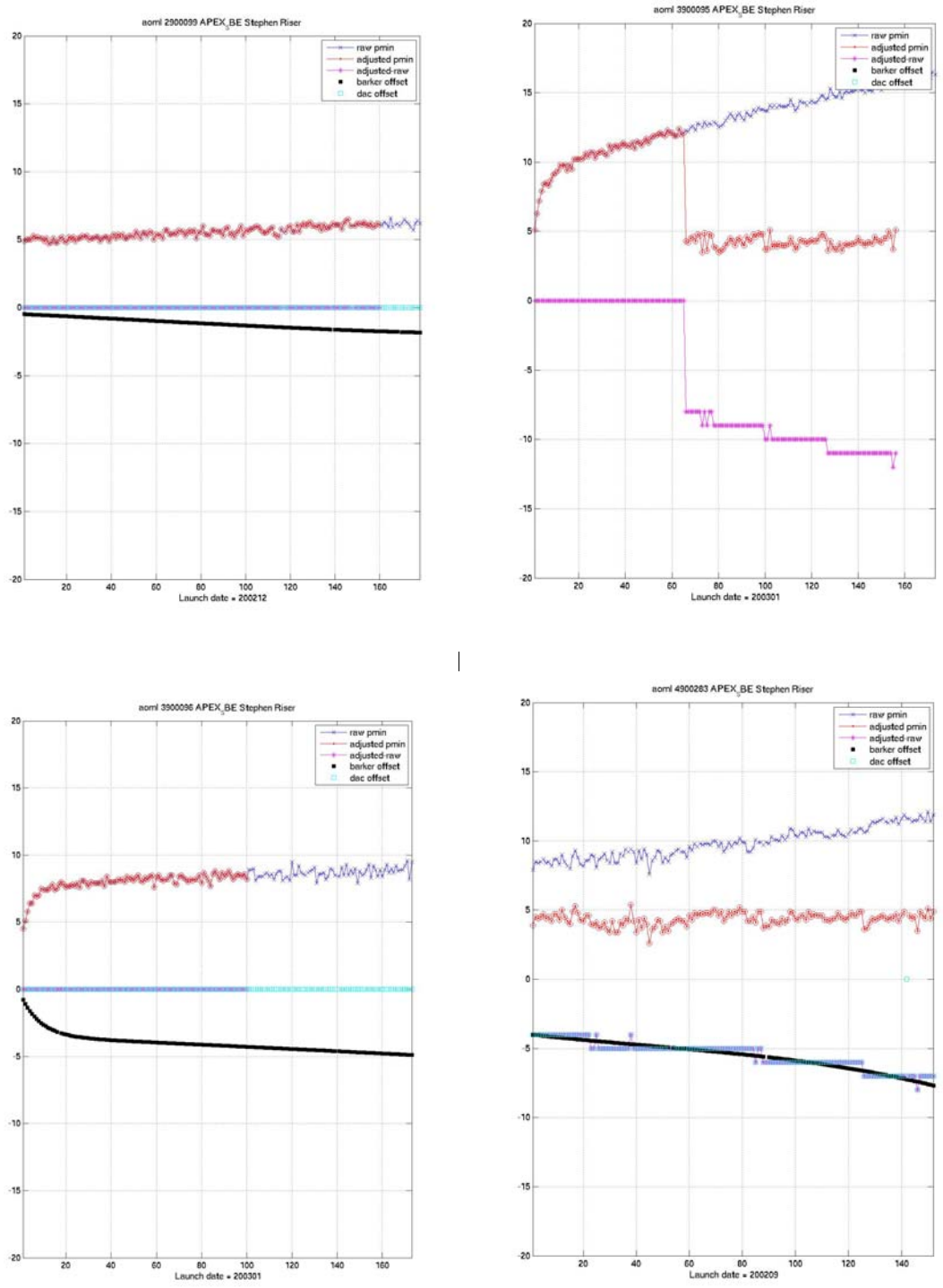



**Figure 8** Comparisons of raw PRES and PRES_ADJUSTED as shown by the minimum reported pressure, for AOML floats with PI = Steve Riser. For these floats, PRES = PRES_ADJUSTED, even for some of all of the delayed mode data, even though a clear positive pressure sensor drift is evident by a drift to high values of min(PRES). The black squares show the assessed adjustment required to PRES from the data analysed in the technical files by Paul Barker. The bottom right panel shows a correctly adjusted float in DM – min(PRES_ADJUSTED ~ 4.5db) and agreement of DAC offset with Barker correction.

PMEL do adjust pressure in D/M – see Figure 9.

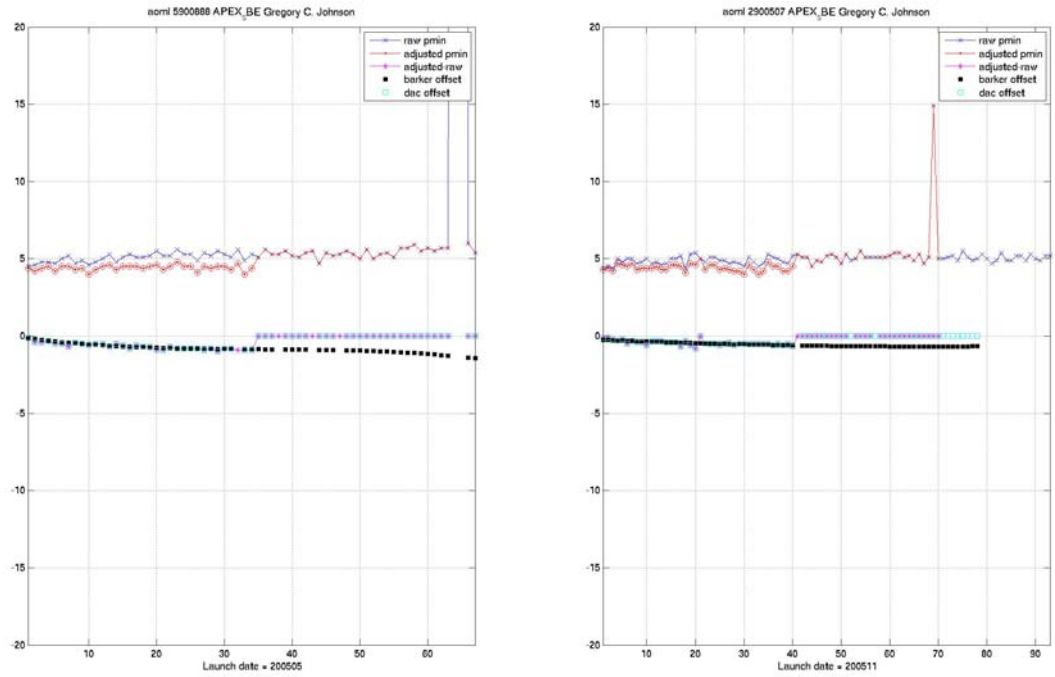



**Figure 9** As for Figure8, but showing how these floats have been correctly adjusted in DM, but not RT.

**Australia** - adjust in R/T and D/M (see Figure 10) – needs to improve 'despiking' of sfc_pressure_offset

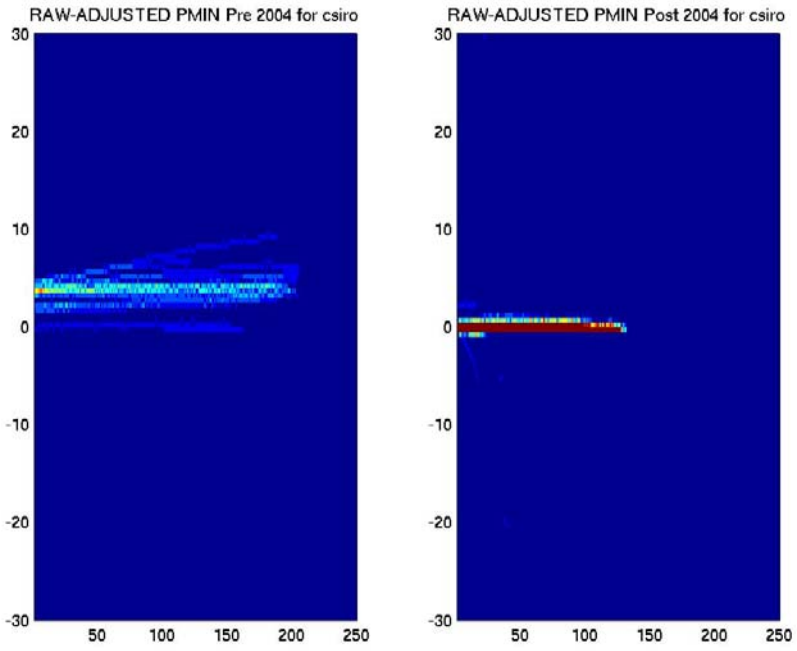



**Figure 10** As for Figure 1 but for CSIRO. Here floats are adjusted in RT and DM. Post 2004 floats (Druck) largely shows the remarkable stability of this sensor.

**Japan** – largely adjusts in R/T and D/M. Some checking is required on PRES (raw) values, which appear to actually be PRES_ADJUSTED in some early floats and cycle numbers [ACTION NEEDED]

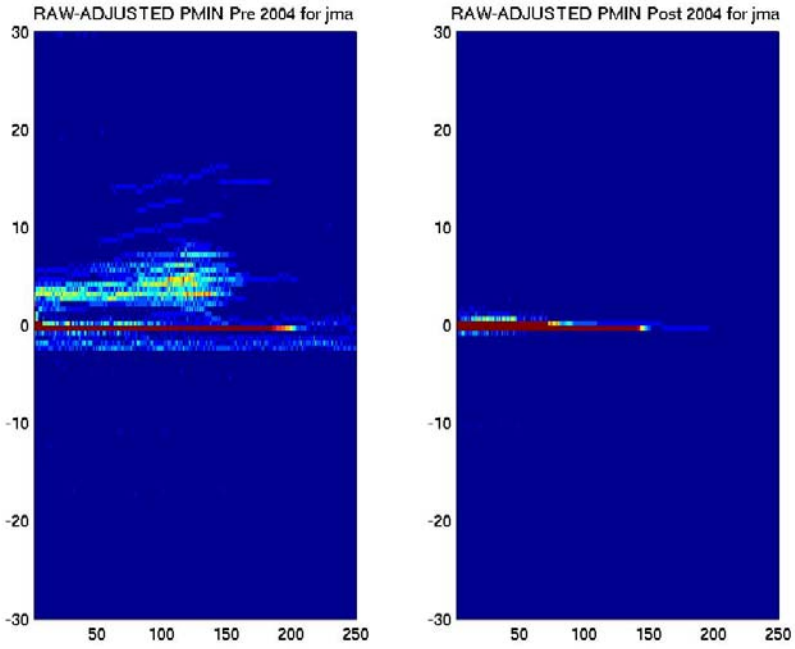



**Figure 11** As for Figure 1, but for JMA. Here floats are adjusted in RT and DM. Post 2004 floats (Druck) largely shows the remarkable stability of this sensor.

There may be many float for which PRES_ADJUSTED has been put into PRES (raw) fields – see Figure 13. [ACTION – CLARIFY IF PRES IN SOME FILES IS ACTUALLY PRES_ADJUSTED; if so, should these be fixed]. This is a major concern as some users want to generate their own PRES_ADJUSTED using the data in the technical files – if PRES is actually PRES_ADJUSTED, these users will end up double adjusting the data set.

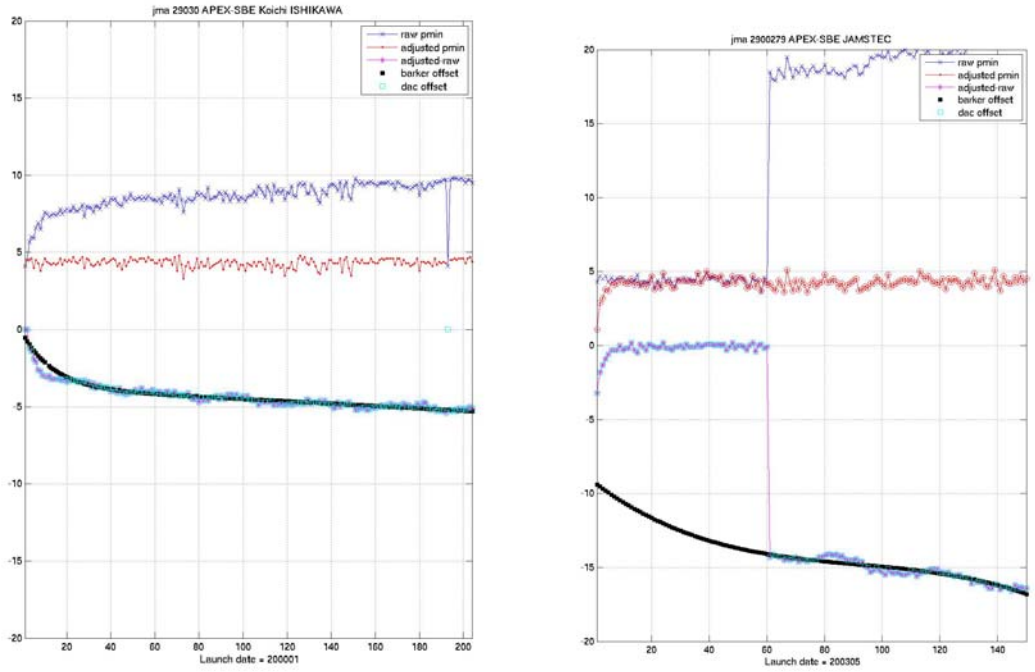
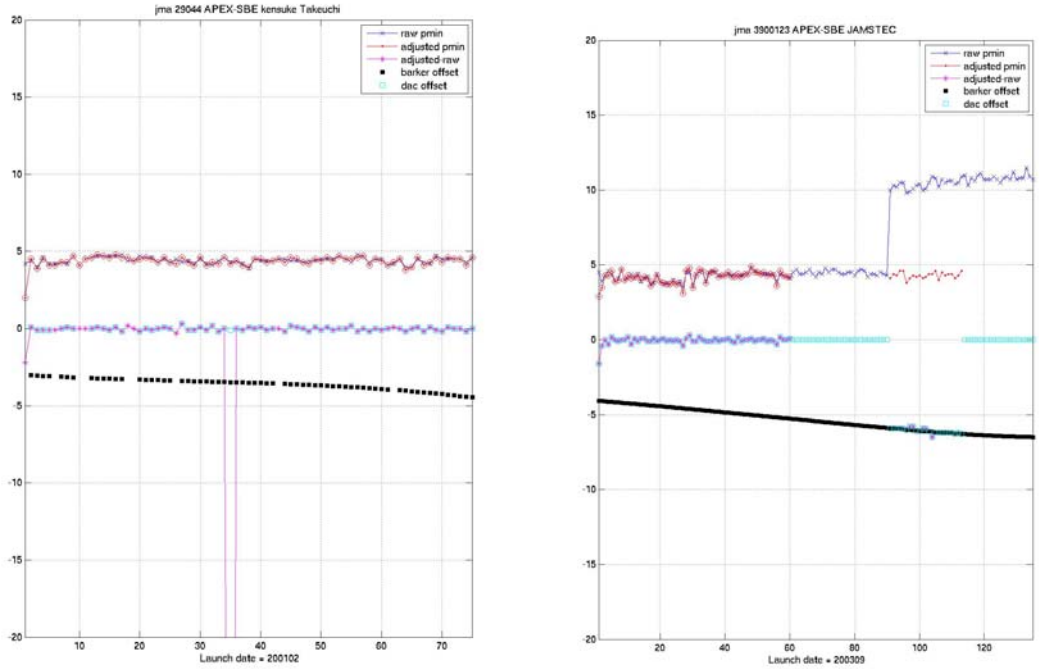



**Figure 12** Left: Correctly adjusted JMA float. Right: JMA float whereby PRES appears to equal PRES_ADJUSTED up to profile 60, but then reverts to real PRES (raw) after that (and correction agrees with Barker). Thus JMA processing appears to have changed around



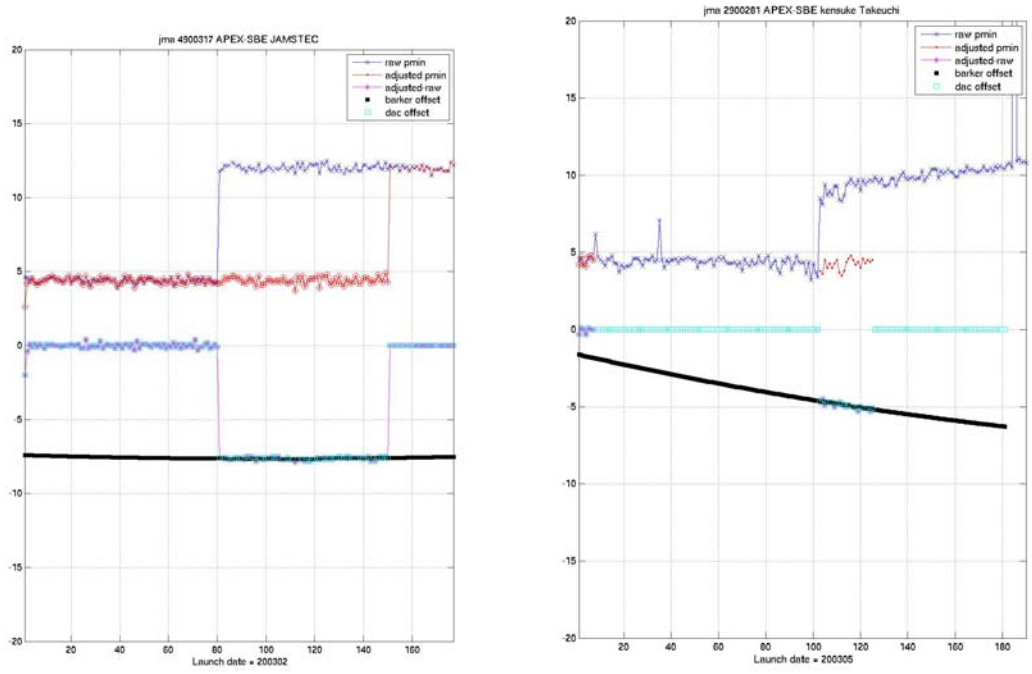



**Figure 13** Examples of changing treatment of PRES and PRES_ADJUSTED in JMA files. Top left example clearly has PRES_ADJUSTED in PRES fields as technical files show clear drift (see Barker curve). Other examples show change over during float life of putting actual raw values in PRES. Some floats also show R/T adjustment, but this is not always available.

## Problem 2): APEX floats with APF8 controller boards WITH TRUNCATED sfc_pressure_offset - THESE MAY EXHIBIT NEGATIVE DRIFT

When the pressure sensor bias drifts negative (e.g. reports -3db when at surface), APF8 will report a 0db surface pressure offset (or 5db in the CTD cutoff pressure). Thus for this group of floats, we cannot track or correct for pressure sensor drift, as we don't know what it is.

Actions:
1) Identify the WMOs of these floats for users – Paul Barker will make this list available on the WWW.
2) attempt to bound the possible error in this group of floats – use altimetric methods to do this (Willis = depth error vs depth, Guinehuit – dyn cm). Drucks should be separated out by treating two groups – those deployed before and after Jan 1, 04. to try to separate out the Drucks from other sensors.
Possible calculations are:
- whole of life PDF of offsets
- check for any ageing factor: generate PDFs of offset by cycle number in two groups – floats deployed before Jan 1, 2004 and those after
3) use above to see if we can derive a possible pressure error to add to netcdf files at GDACs

4) alert users of the limitations of pressure accuracy for this cohort so that they are excluded from analyses such as estimates of global ocean heat content.