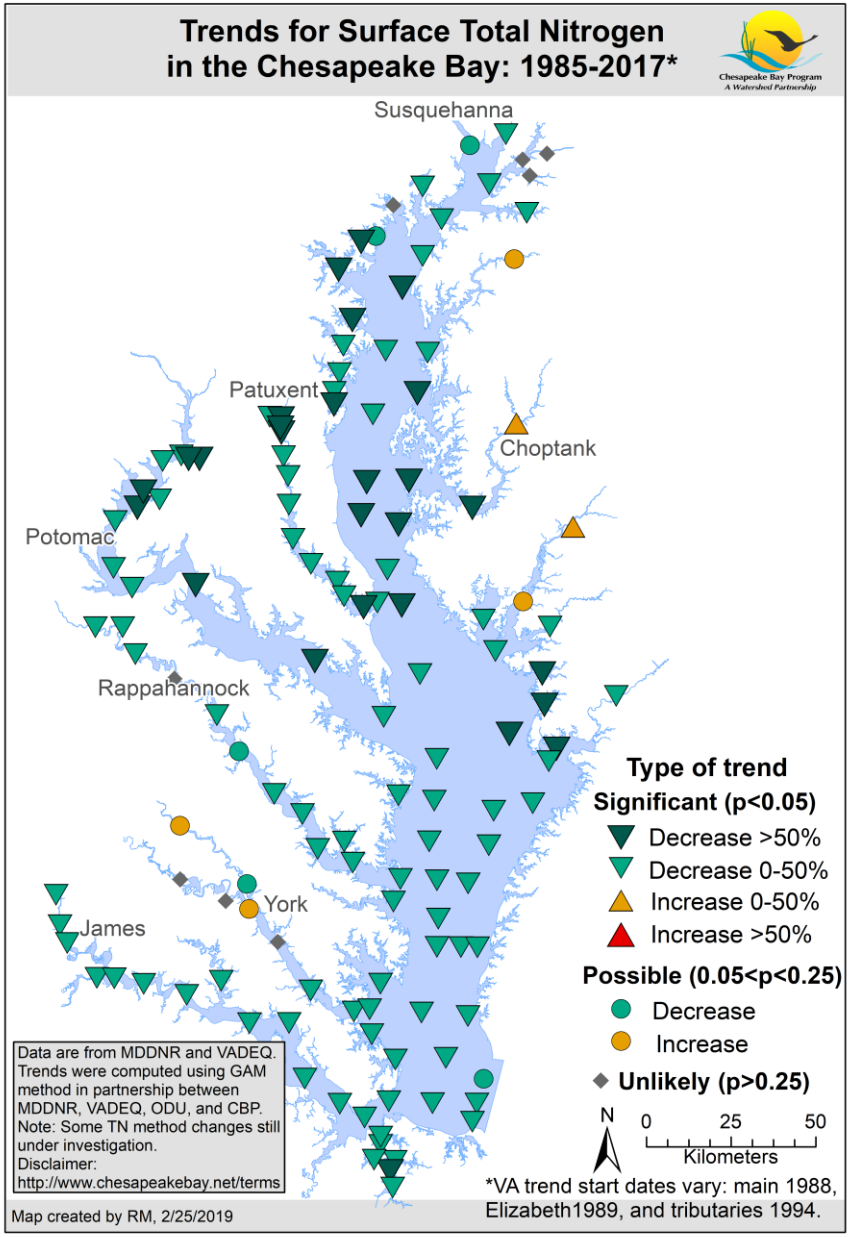
Long-term pH evaluation: Possible shift in VA mainstem

Most content from: **Marjy Friedrichs, VIMS**
Presenting: **Rebecca Murphy, UMCES at CBP**

Data Integrity Work Group
July 18, 2019

Tidal Trends Analysis Team

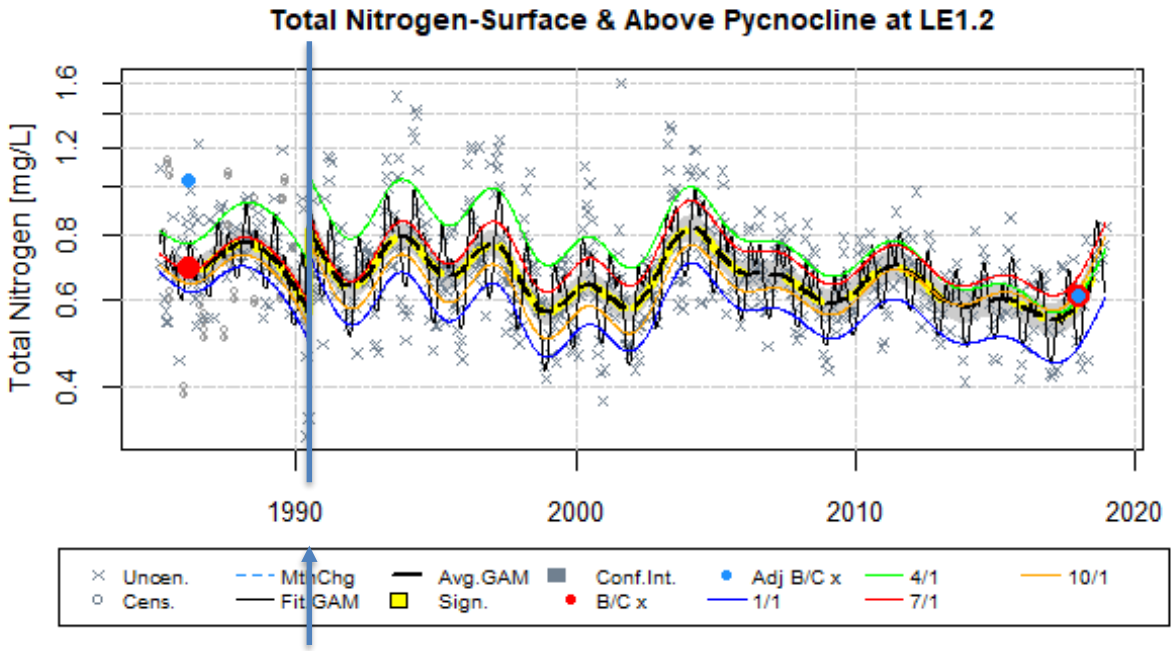
- In June 2018, Elgin Perry gave a presentation to DIWG on approaches for tidal water quality trends analysis and method changes
- This is for tidal trends production, being conducted every year by MDDNR, VADEQ, ODU, CBP collaboration



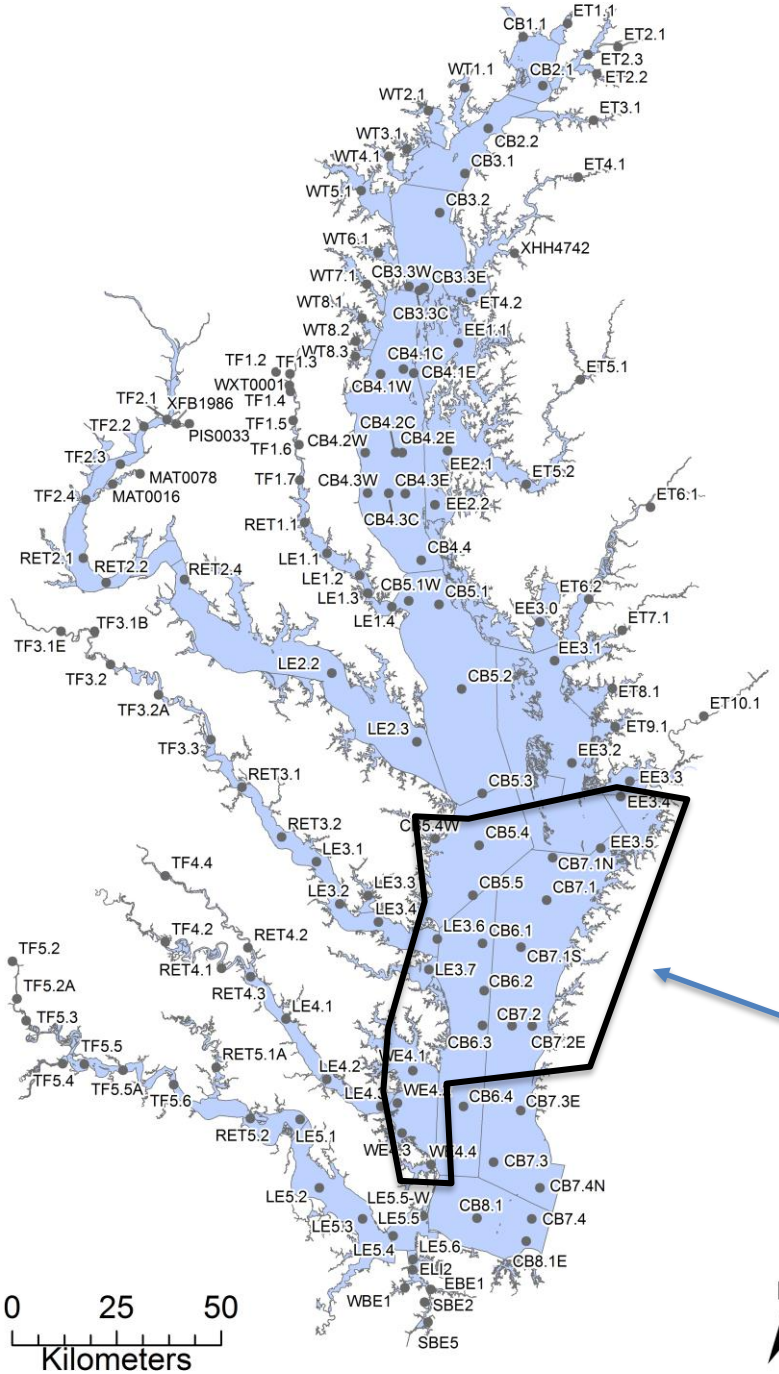
Interventions

- Intervention approach for long-term trends with method changes that possibly caused shifts

TN ~ intervention + s(date) + s(doy) + ti(doy, date)



7/1/1990 lab change from DHMH to CBL; and change from TKNW+NO23 --> PN+TDN (p=0.0001)

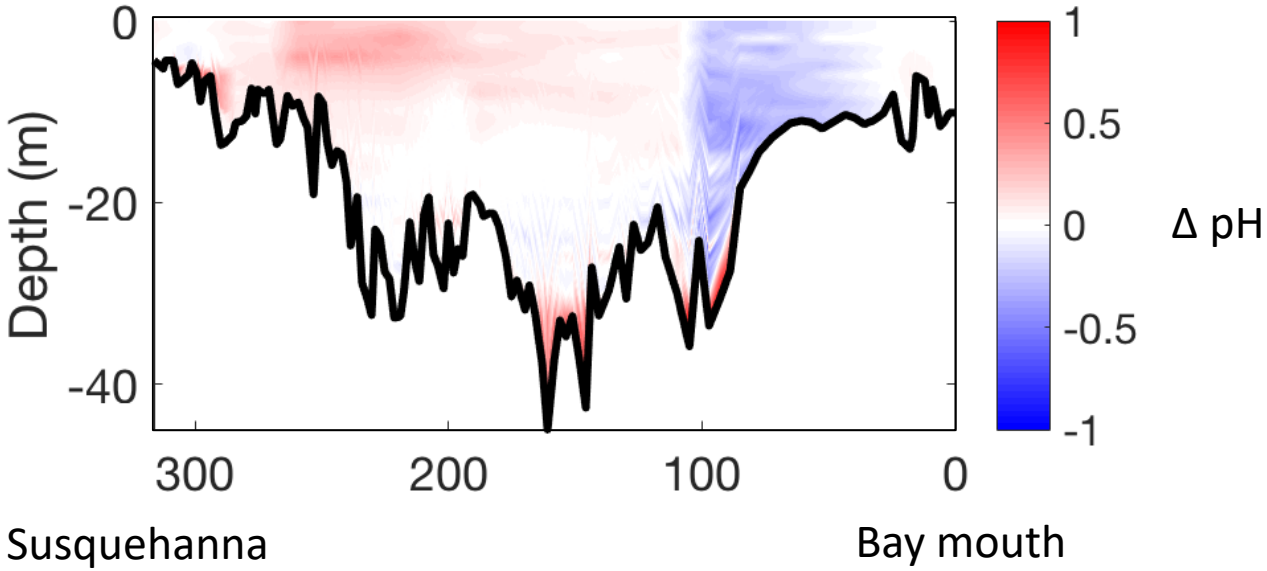


pH

- pH isn't in our normal suite of trends
- Collaborator Marjy Friedrichs from VIMs evaluating it
- Different changes over time in VA mainstem where VIMS sampled until 1/1/1996 switch to ODU

Identification of pH measurement issues

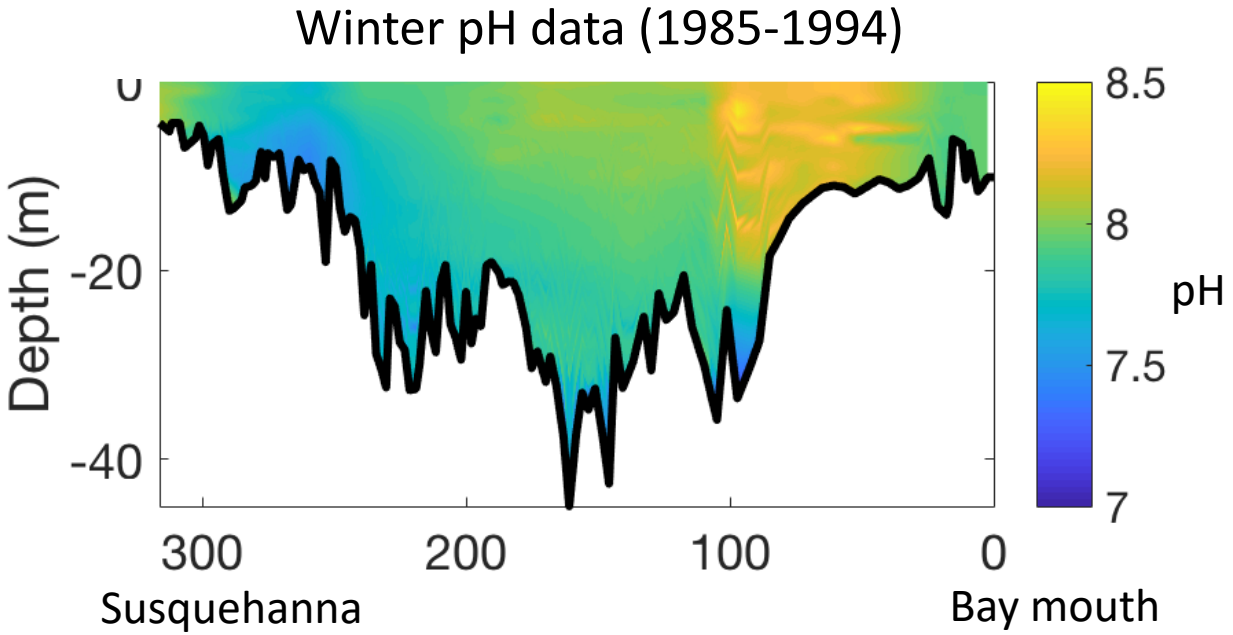
Mean summer pH (1995 to 2004) – Mean summer pH (1985 to 1994)



- The difference in summer pH between 1985-1994 and 1994-2004 is strikingly different in VA vs. MD.
- Does this represent a difference or change in methodology?

From Marjy Friedrichs

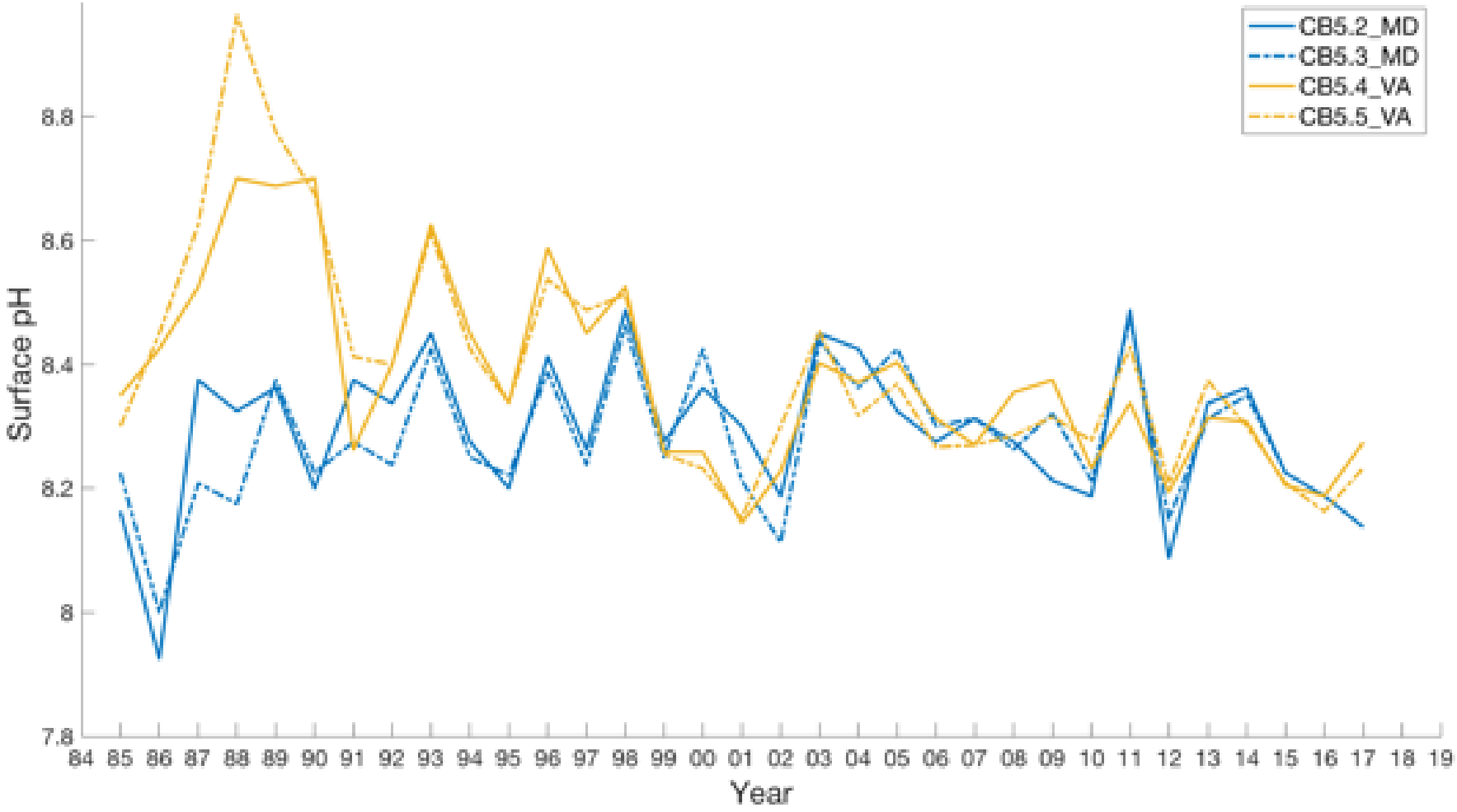
Identification of pH measurement issues



- The problem appears to be in the early years of the northern VA (VIMS) pH data
- These data look very different from the MD and southern VA (ODU) data, and the later northern VA data (collected by ODU)

From Marjy Friedrichs

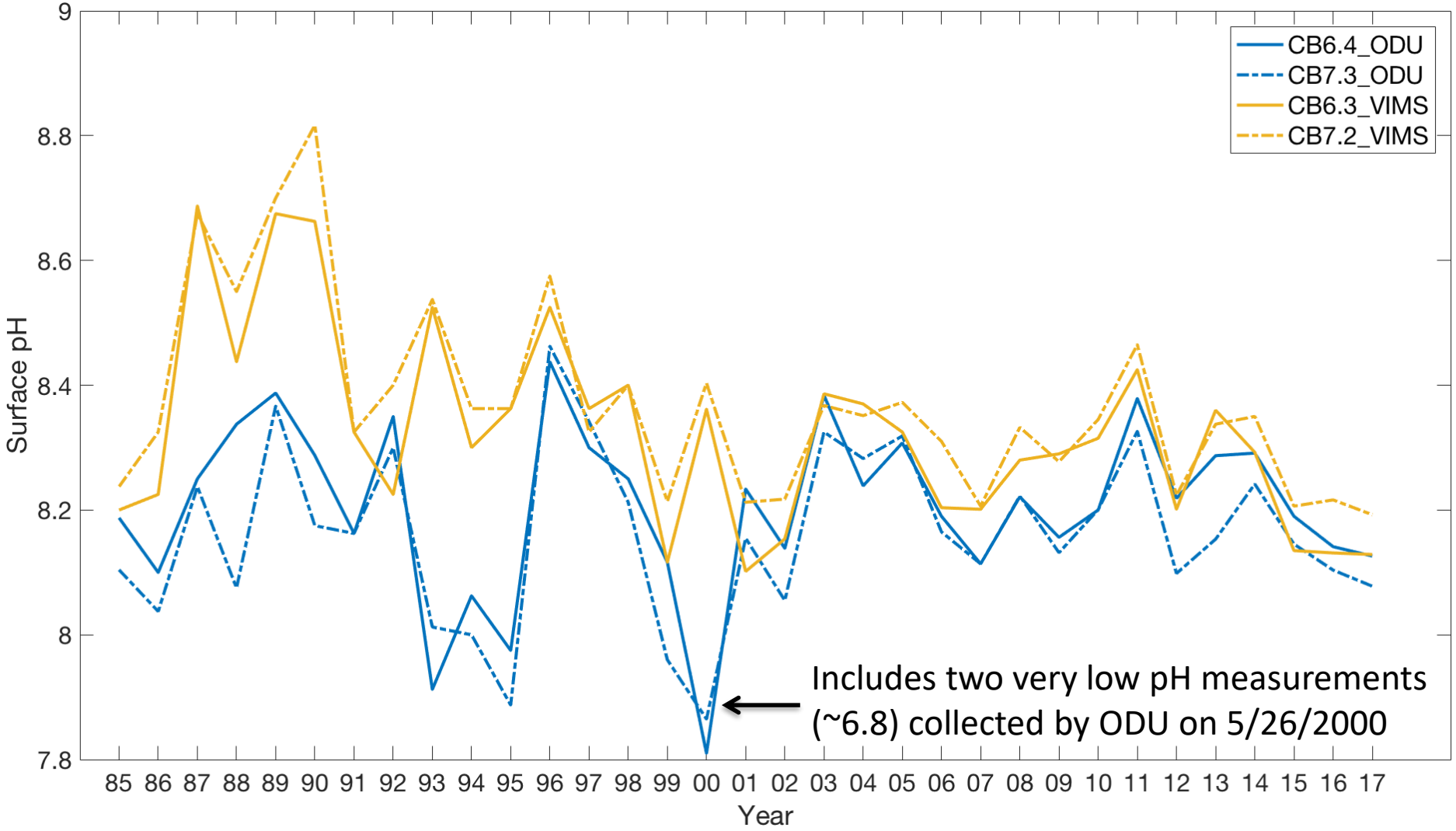
Surface pH comparison: MD and VA-VIMS measurements
May-Aug average



These stations are near each other, so should show similar variability; however differences might arise since the MD and VA cruises can occur on different days and cruises could be cancelled for one state and not the other.

From Marjy Friedrichs

Surface pH comparison: VIMS and ODU measurements
May-Aug average



From Marjy Friedrichs

Excerpts from CBP Data Guide

TITLE: **PHYSICAL PROFILE SAMPLING METHODS**

PARAMETER NAME: See individual parameter descriptions

GENERAL METHOD:

A vertical profile of *in-situ* physical parameters is determined at each sampling station. Water temperature, pH, dissolved oxygen (DO), salinity, and associated depth are measured at various intervals from the bottom to the surface of the water column. The depth of each measurement and total depth are also measured. Underwater, multi-parameter instruments such as YSI or Hydrolab® sondes are typically used. A sonde is outfitted with a data logger or computer to display, record and in some cases, store the measurements.

ODU: From May 1986 to February 1997 a Hydrolab® Surveyor II sonde attached to a sampling pump was used. The sonde was lowered in discrete increments with depth being determined from the depth sensor on the sensor, and the suite of readings copied by hand to field sheets.

PARAMETER NAME (NEW): **PH**

METHOD CHANGES:

ODU: From June 1984 to April 1986, pH was not measured as part of the vertical profile. pH was measured by a sensor on the research vessel only at depths where samples were collected.

DAITS ISSUES:

None

OTHER ISSUES:

Source=VIMS did not measure pH as part of the vertical profile. They collected aliquots of the nutrient samples and measured pH onboard the research vessel with a pH meter. A data query for these measurements will be the same as for nutrient data.

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In database: Confirmed indeed method code F01 for most pH, F02 for this set of VIMS values

Questions

- Are the pH values measured by VIMS incomparable to those collected by ODU and MDNR because VIMS pH is from on-board measurements instead of in situ vertical profiles?

- When looking at long-term trends in data, do we need to "throw out" the VIMS pH data (prior to 1/1996), or is there a way to correct for this?

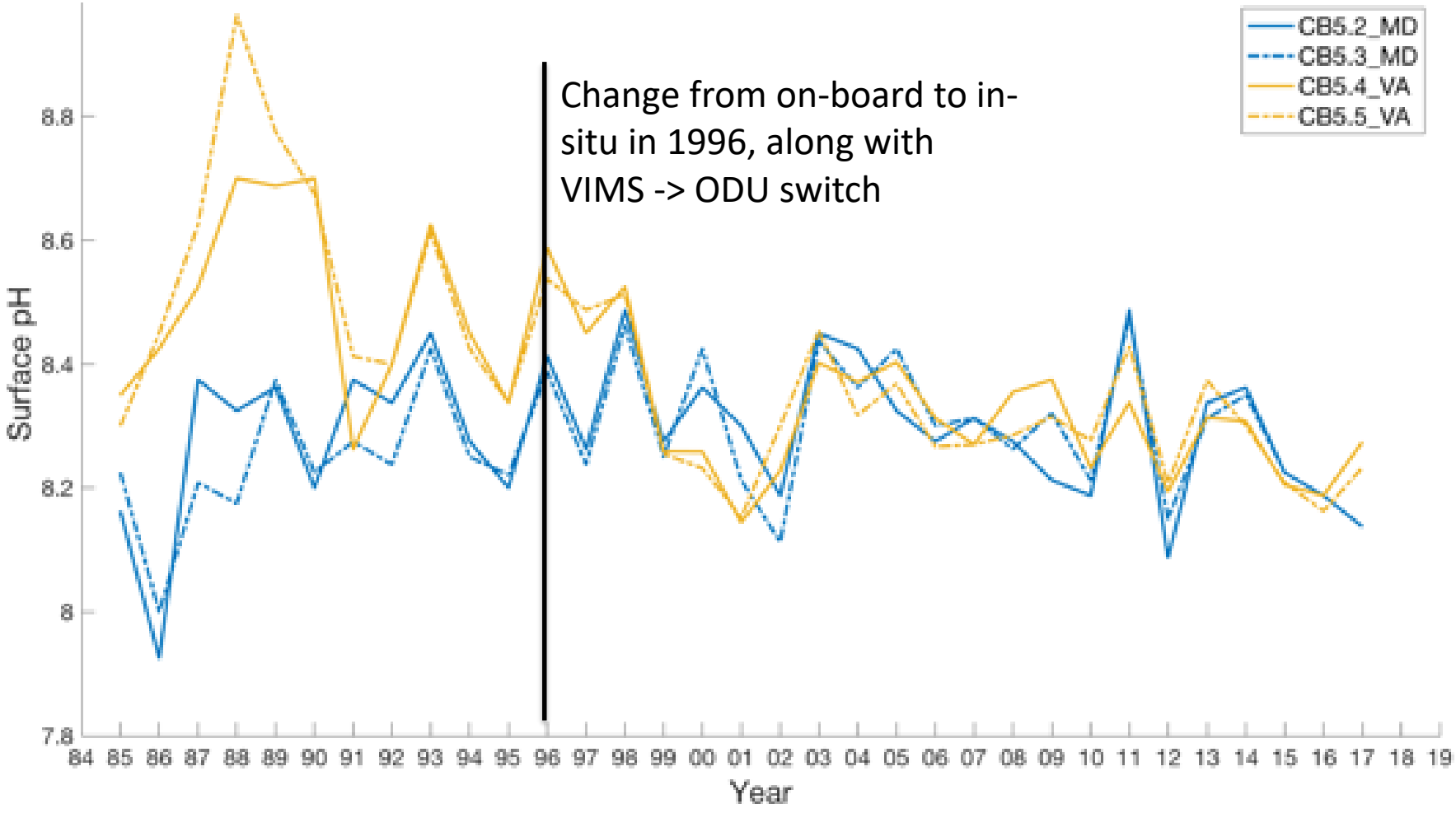
- Does this apply to any other types of WQ data, or just pH?

- Should this be carefully noted in the online database?

- *One other note about when shift occurred* →

From Marjy Friedrichs

Side-bar: Was change really in 1996, or a few years later?



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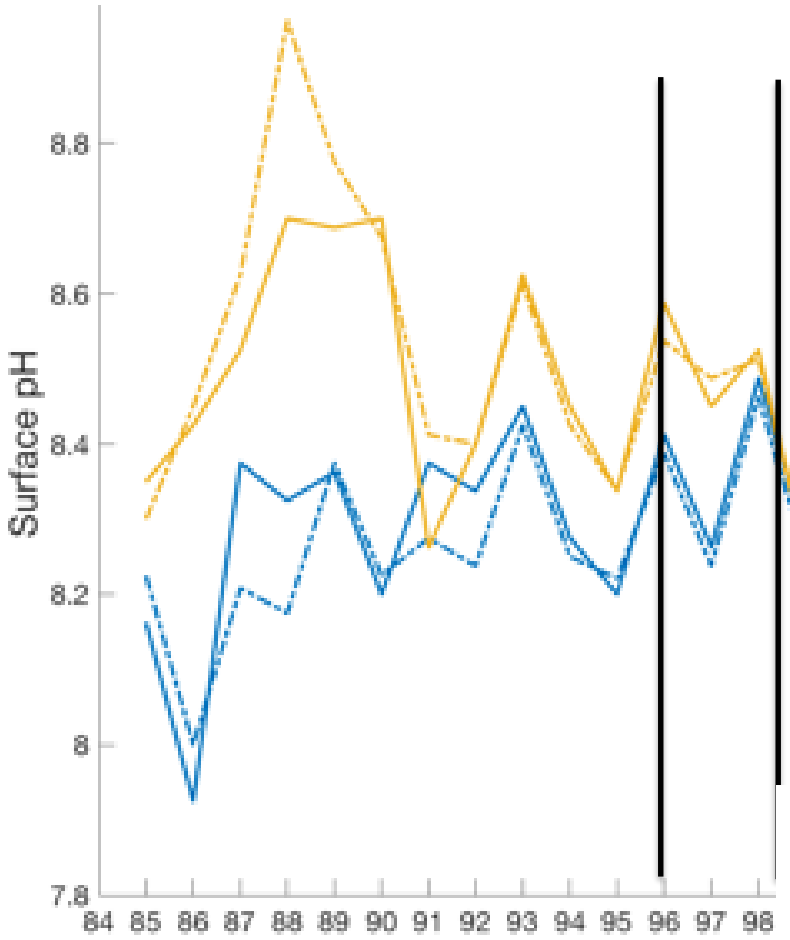
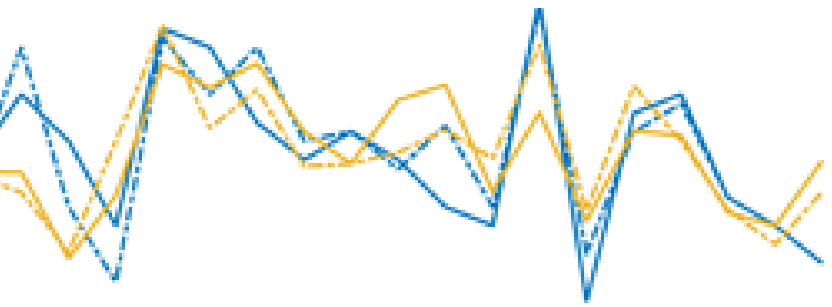
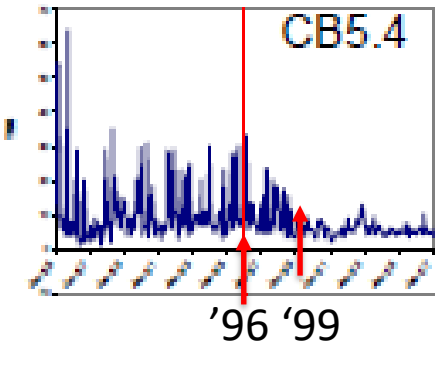
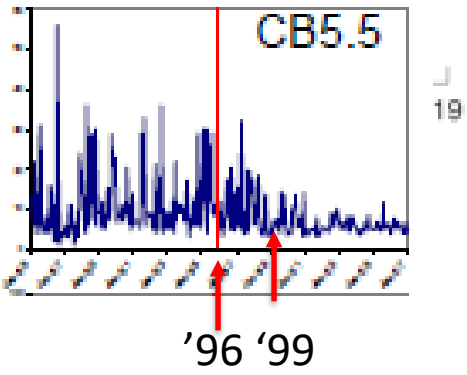


For TSS, a shift was investigated b/c values seemed to be impacted still 3 years after the lab change (DAITS 045). Could pH be similar to TSS that the shift is actually 2-3 years after the method change? Is there any connection here?

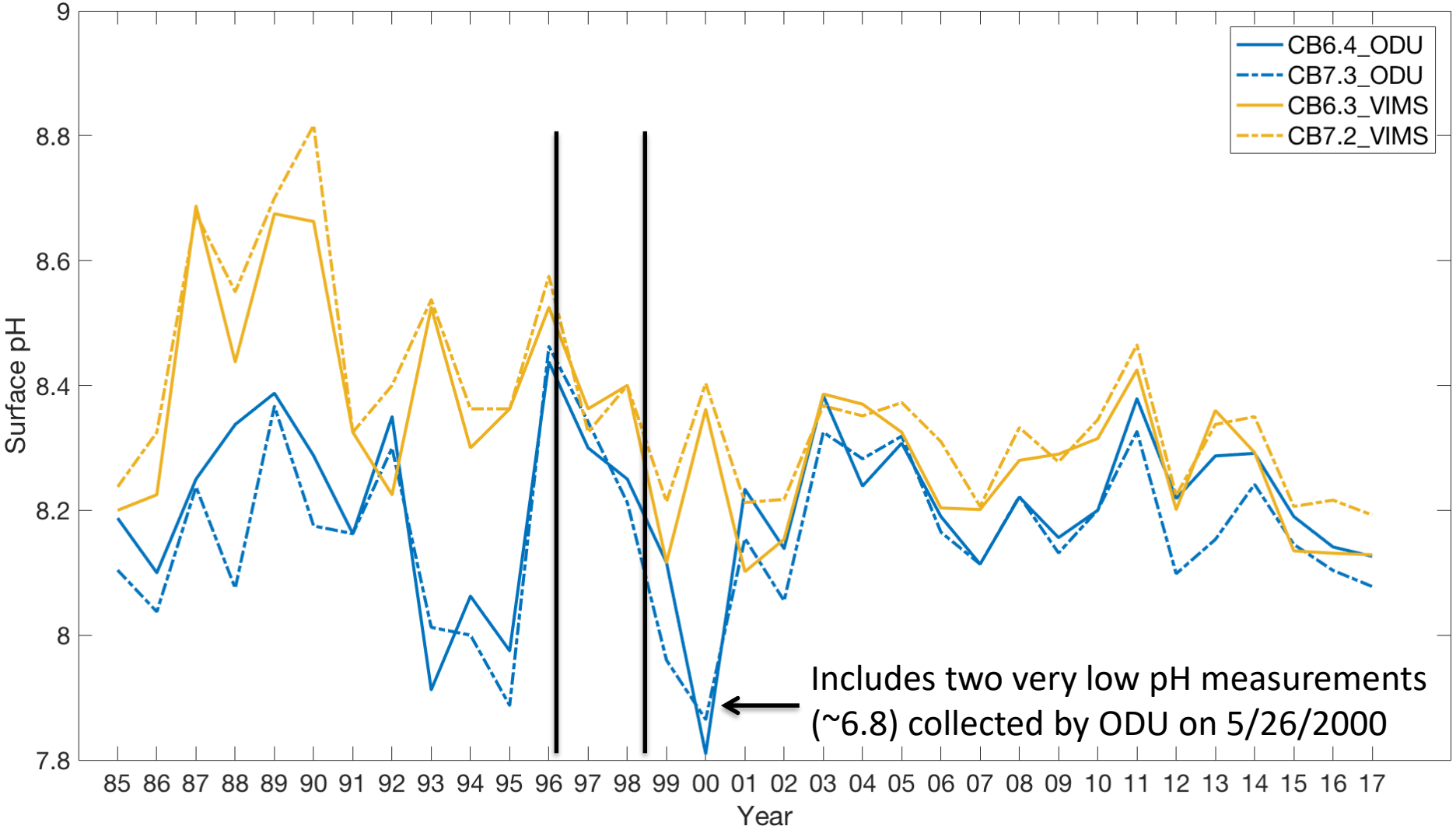


TSS from DAITS 045 (Tish Robertson in 2007)





Sidebar: not as different in the VA comparison



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