

Bottom Temperature Variability in the Kuroshio Extension

S. Bishop D. Randolph Watts

Department of Physical Oceanography
University of Rhode Island

KESS Workshop, 2006

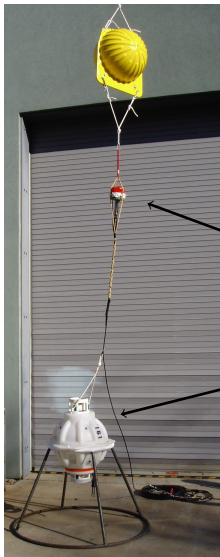
Outline

- 1 Motivation**
 - CPIES
 - Raw Data
- 2 Can We Estimate Real θ ?**
 - CTD's
 - Contouring
- 3 Results**
 - Griddata Movie

Outline

- 1 Motivation**
 - CPIES
 - Raw Data
- 2 Can We Estimate Real θ ?**
 - CTD's
 - Contouring
- 3 Results**
 - Griddata Movie

CPIES



CPIES:

current and pressure recording
inverted echo sounder

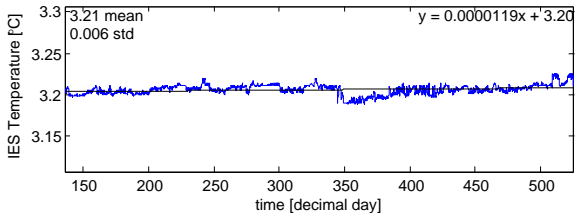
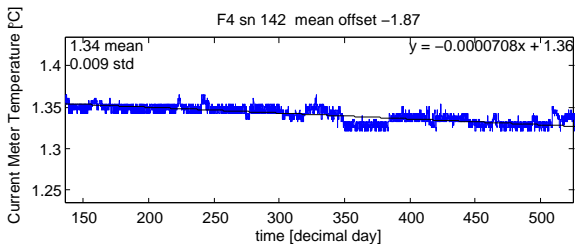
Measures bottom current.
(50 m off bottom)

Emits 12kHz sound pulses.
Measures round trip travel
times of acoustic pulses to sea
surface and back.
Measures bottom pressure.

Outline

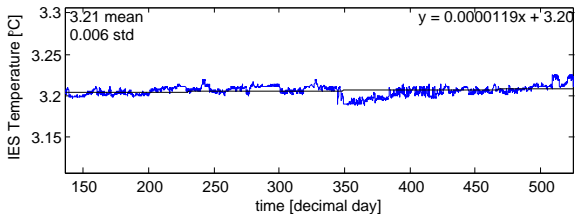
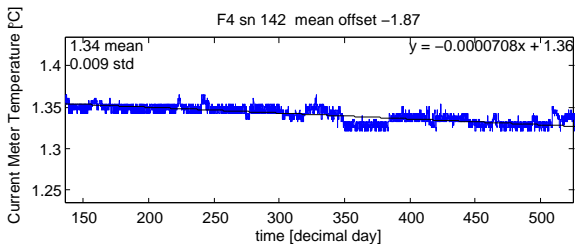
- 1 **Motivation**
 - CPIES
 - Raw Data
- 2 **Can We Estimate Real θ ?**
 - CTD's
 - Contouring
- 3 **Results**
 - Griddata Movie

Bottom Temperature Site F4



Bottom Temperature Site F4

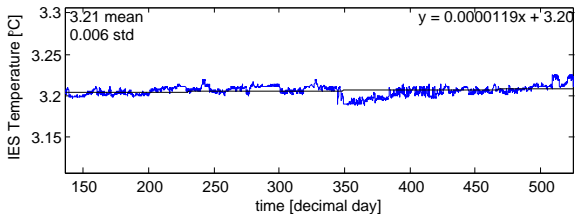
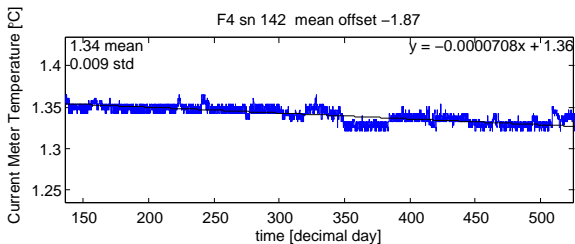
Things to Look At:



Bottom Temperature Site F4

Things to Look At:

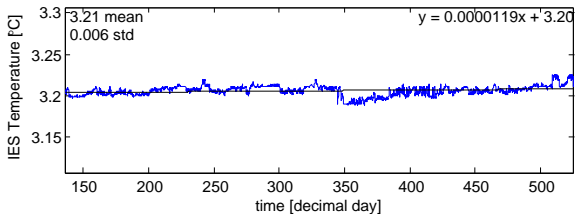
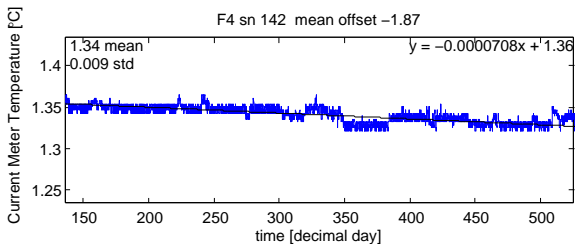
- Offset



Bottom Temperature Site F4

Things to Look At:

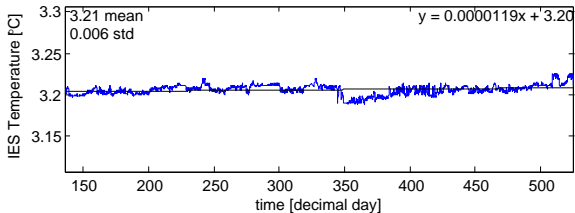
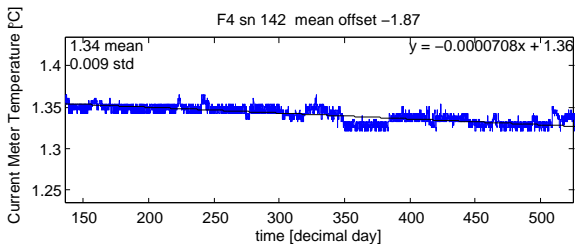
- Offset
- Digitization Error



Bottom Temperature Site F4

Things to Look At:

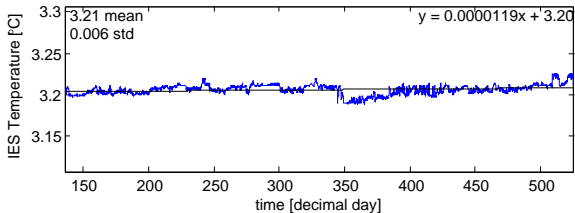
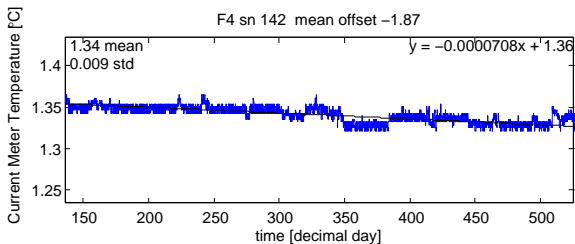
- Offset
- Digitization Error
- Drift



Bottom Temperature Site F4

Things to Look At:

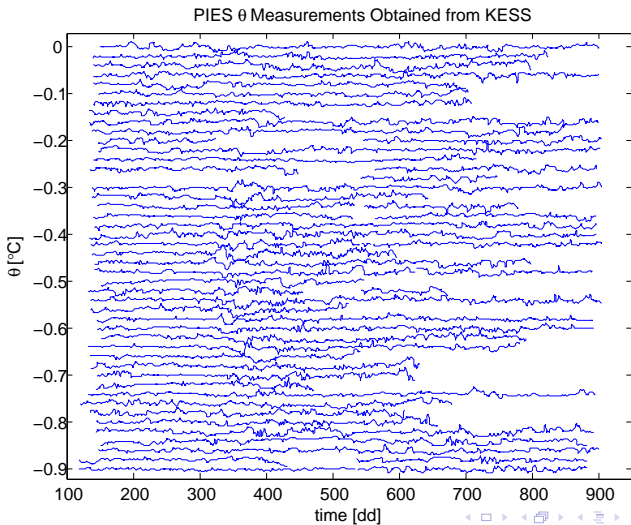
- Offset
- Digitization Error
- Drift
- Variability 4-6 $m^{\circ}C$



Raw Data

Waterfall

After Removing Linear Straight Line Fit

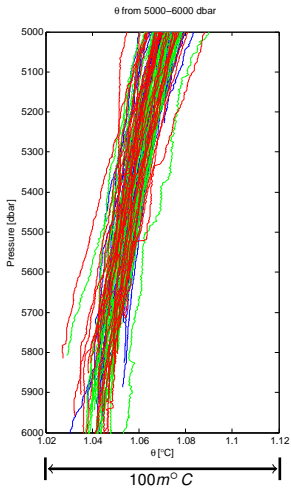
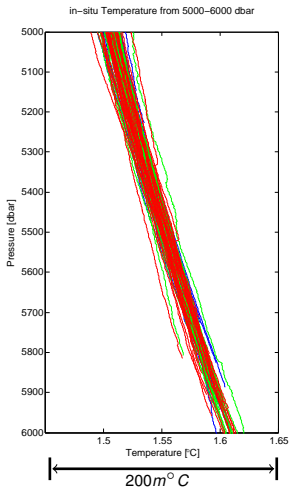


Outline

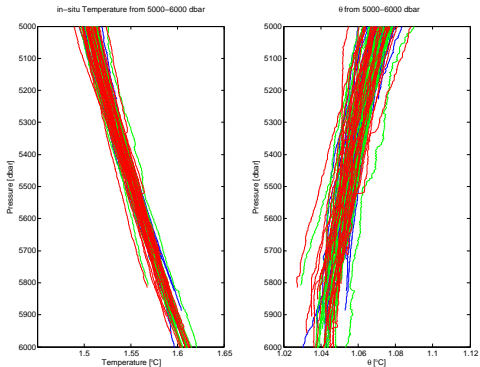
- 1 **Motivation**
 - CPIES
 - Raw Data
- 2 **Can We Estimate Real θ ?**
 - CTD's
 - Contouring
- 3 **Results**
 - Griddata Movie

CTD's

CTD's

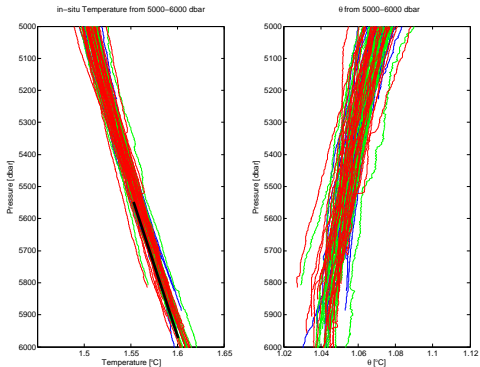


ATG

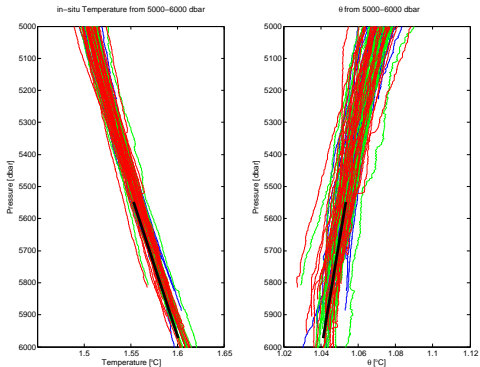


CTD's

ATG



$$\Gamma \sim 10^{-4} \frac{^{\circ}\text{C}}{\text{m}}$$



$$\Gamma \sim 10^{-4} \frac{^{\circ}\text{C}}{\text{m}}$$

$$\frac{\partial \bar{\theta}}{\partial p} \sim -2 \times 10^{-5} \frac{^{\circ}\text{C}}{\text{m}}$$

Outline

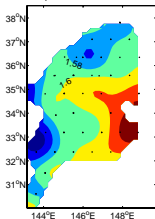
- 1 **Motivation**
 - CPIES
 - Raw Data
- 2 **Can We Estimate Real θ ?**
 - CTD's
 - **Contouring**
- 3 **Results**
 - Griddata Movie

Contouring

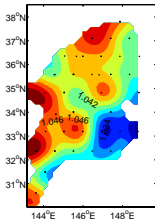
CTD Contouring

Systematic Spatial Distribution

bottom temperature 100 off bottom all cruises



bottom potential temperature 100 off bottom all cruises

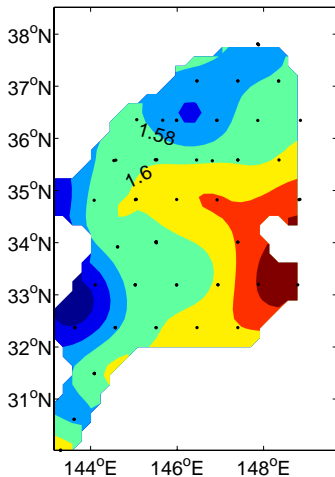


Contouring

CTD Contouring

Systematic Spatial Distribution

bottom temperature 100 off bottom all cruises

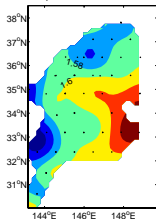


Contouring

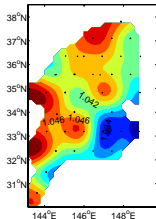
CTD Contouring

Systematic Spatial Distribution

bottom temperature 100 off bottom all cruises



bottom potential temperature 100 off bottom all cruises

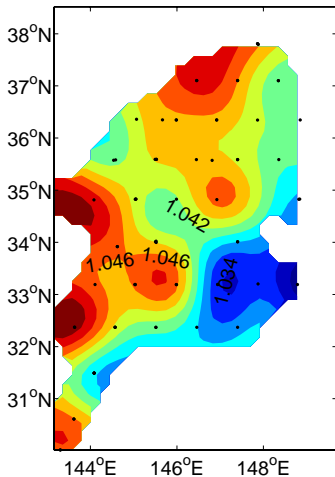


Contouring

CTD Contouring

Systematic Spatial Distribution

bottom potential temperature 100 off bottom all cruises

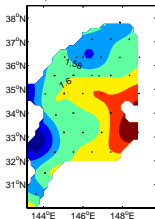


Contouring

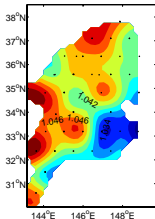
CTD Contouring

Systematic Spatial Distribution

bottom temperature 100 off bottom all cruises



bottom potential temperature 100 off bottom all cruises



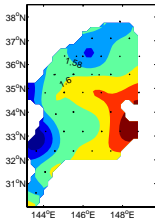
Contouring

CTD Contouring

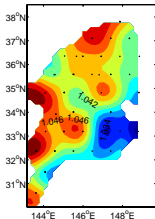
Systematic Spatial Distribution

Estimate Mean:

bottom temperature 100 off bottom all cruises



bottom potential temperature 100 off bottom all cruises



Contouring

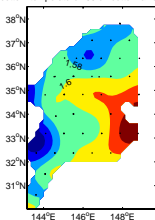
CTD Contouring

Systematic Spatial Distribution

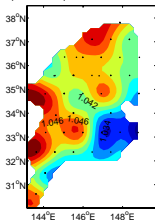
Estimate Mean:

- Contour 100m Off Bottom

bottom temperature 100 off bottom all cruises



bottom potential temperature 100 off bottom all cruises



Contouring

CTD Contouring

Systematic Spatial Distribution

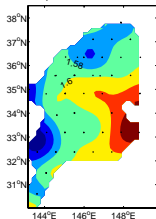
Estimate Mean:

- Contour 100m Off Bottom

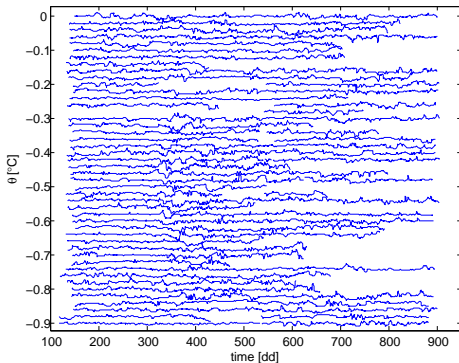
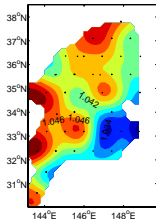
- $\frac{\partial \bar{\theta}}{\partial p} \sim -2 \times 10^{-5} \frac{^{\circ}\text{C}}{\text{m}}$

PIES θ Measurements Obtained from KESS

bottom temperature 100 off bottom all cruises



bottom potential temperature 100 off bottom all cruises



Outline

- 1 **Motivation**
 - CPIES
 - Raw Data
- 2 **Can We Estimate Real θ ?**
 - CTD's
 - Contouring
- 3 **Results**
 - Griddata Movie