Jason II Reports

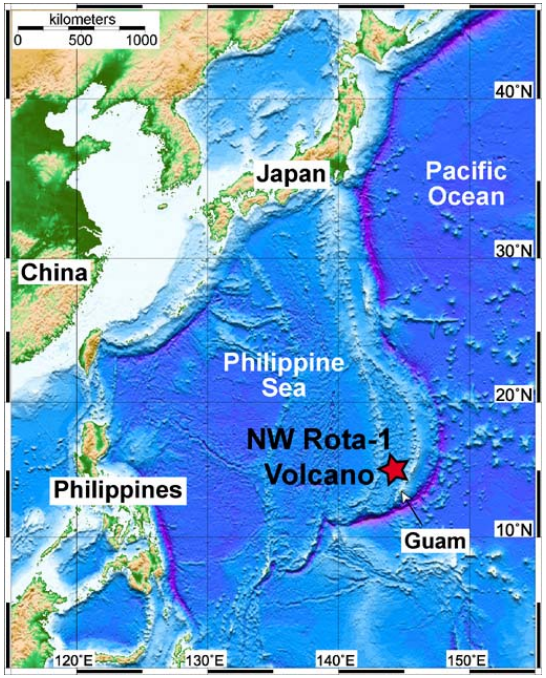
Bill Chadwick

Kilo Moana/Jason II

March 13-30, 2010

NW Rota-1 2010 Expedition (2nd year of 2)

R/V Kilo Moana – March 16-30, 2010, Guam-Guam



Objectives:

- Characterize longer-term eruptive & landslide activity with moored instruments
- Focused sampling of tephra, lava, fluids, gases, biology, water-column plumes
- Look for interactions between volcano and biological community

More information:

- http://nwrota2010.blogspot.com/
- At AGU: T11E-06, OS33F-01, V43C-2391

NW Rota-1 2010 Expedition “Lowlight”

• 0 successful CTD casts (new CTD crane & winch failed catastrophically, ship lost power, bow-thruster controller damaged)

NW Rota-1 2010 Expedition Highlights

• 9 Jason ROV dives (100 hrs bottom time), 4 dive days lost

• 18 hrs of HDTV video, 11500 HD framegrabs, 3000 DSC images

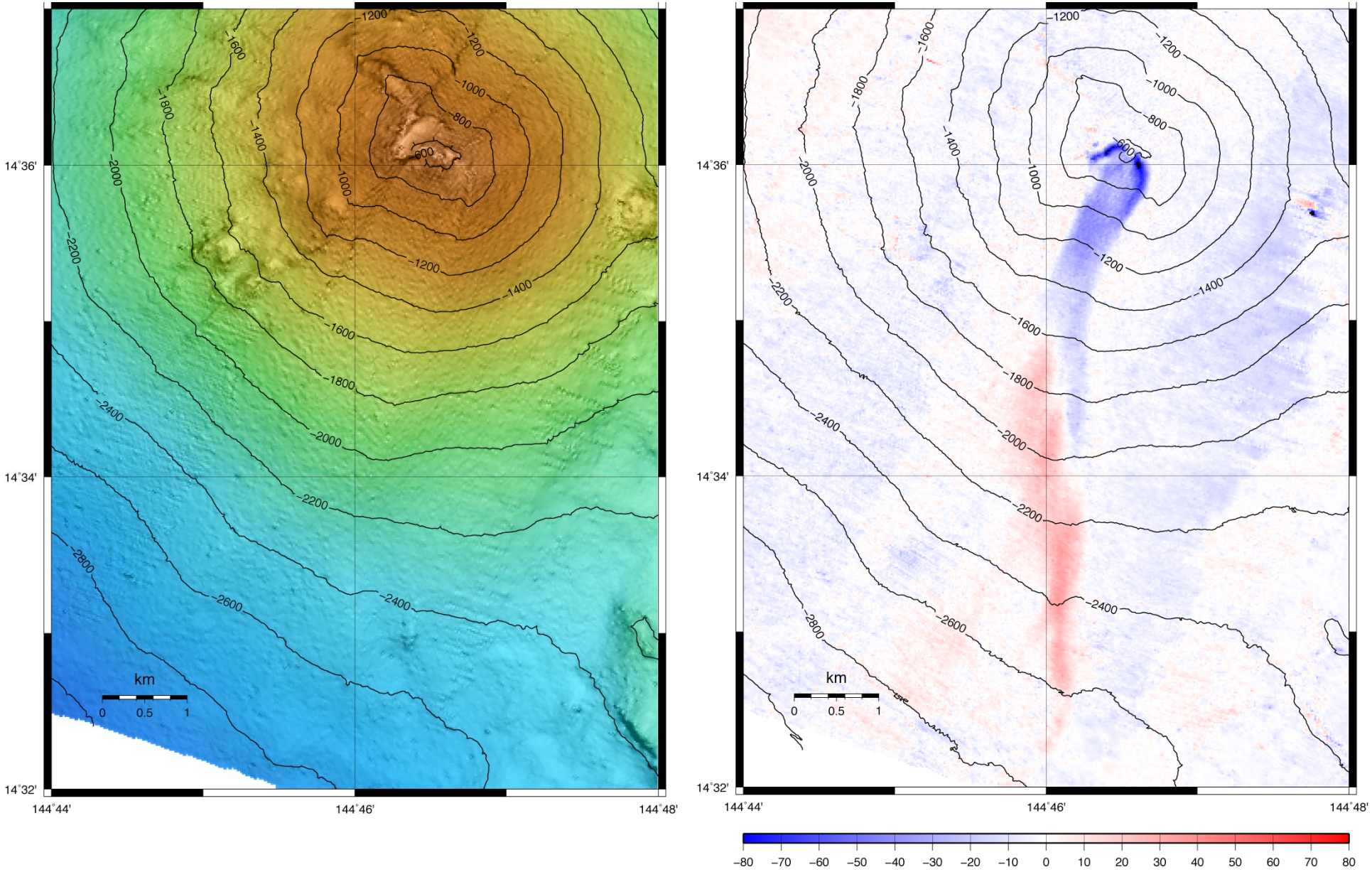
• 34 geology samples (rock, tephra, sulfur)

• 50 vent fluid samples, 26 filtered samples, 15 gastight samples

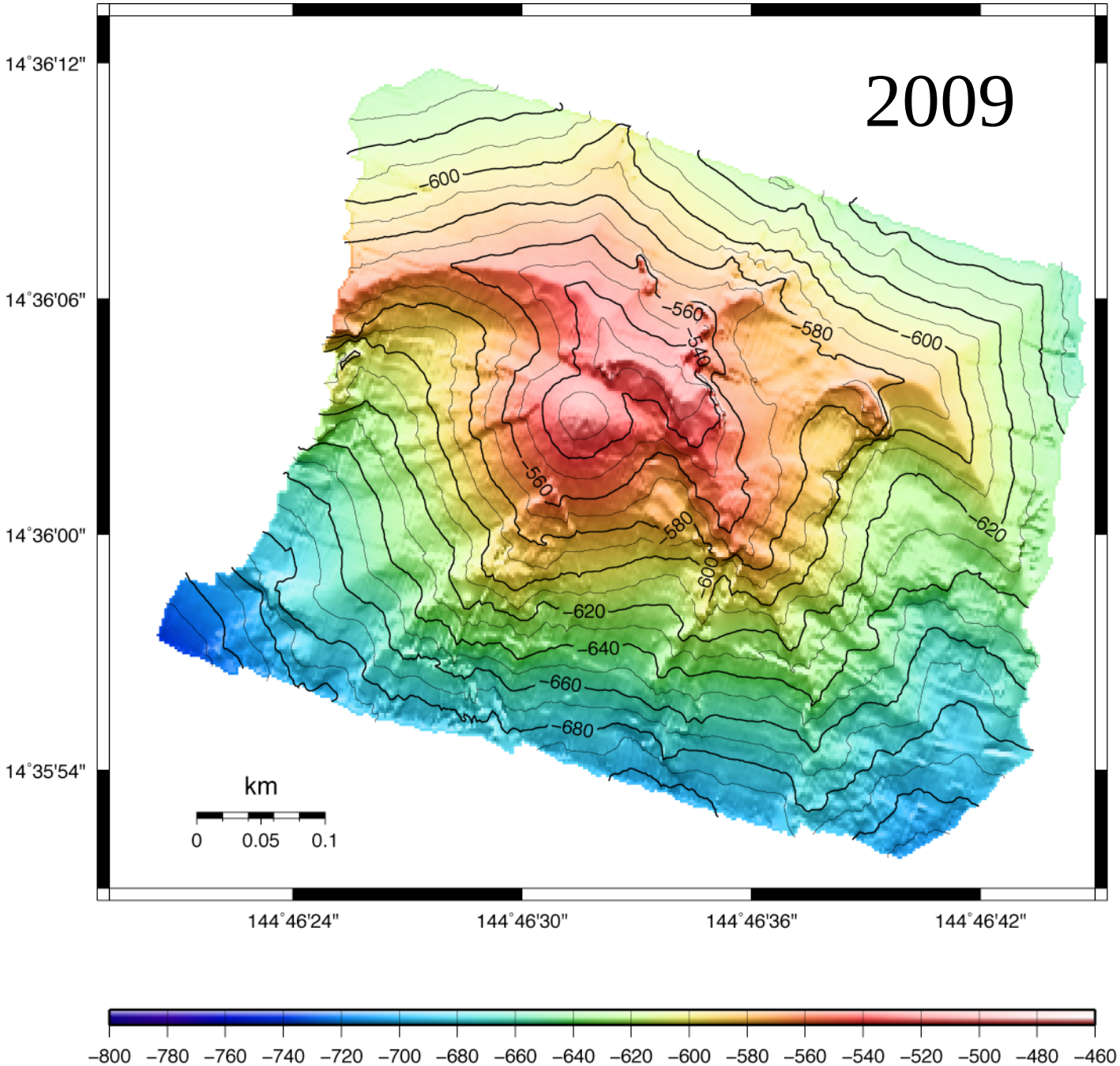
• 24 biological samples (shrimp, barnacles, mat), 16 plankton tows

• 4 portable hydrophone deployments, 1 mooring recovery

• Multibeam resurveys with EM122 (ship) and SM2000 (Jason)



Depth changes 2009-2010 (m)


2009
14°36'12"
14°36'06"
14°36'00"
14°35'54"
144°46'24"
144°46'30"
144°46'36"
144°46'42"
-600
-560
-540
-580
-600
-560
-580
-600
-620
-620
-640
-660
-680
km
0
0.05
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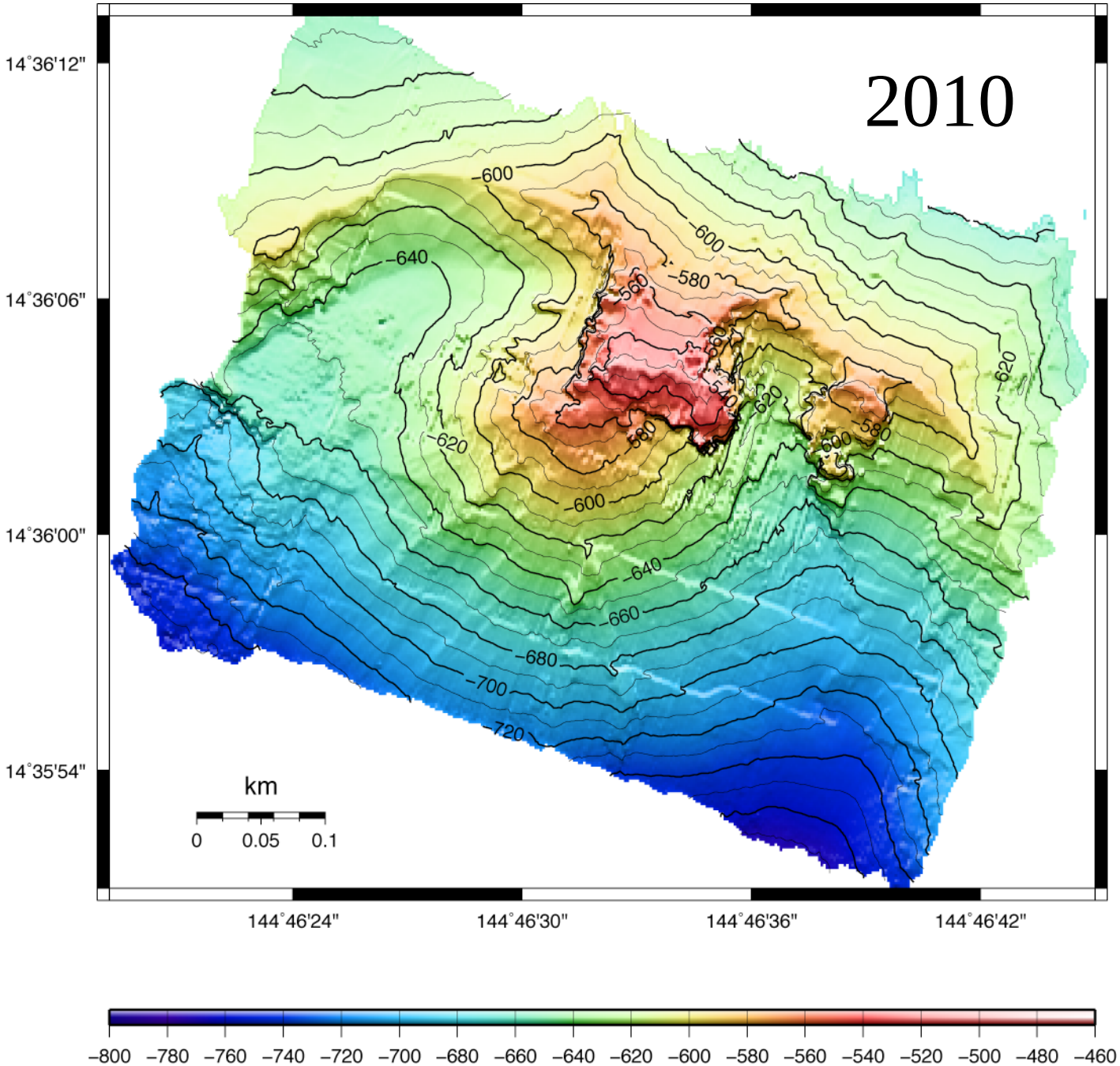
-800 -780 -760 -740 -720 -700 -680 -660 -640 -620 -600 -580 -560 -540 -520 -500 -480 -460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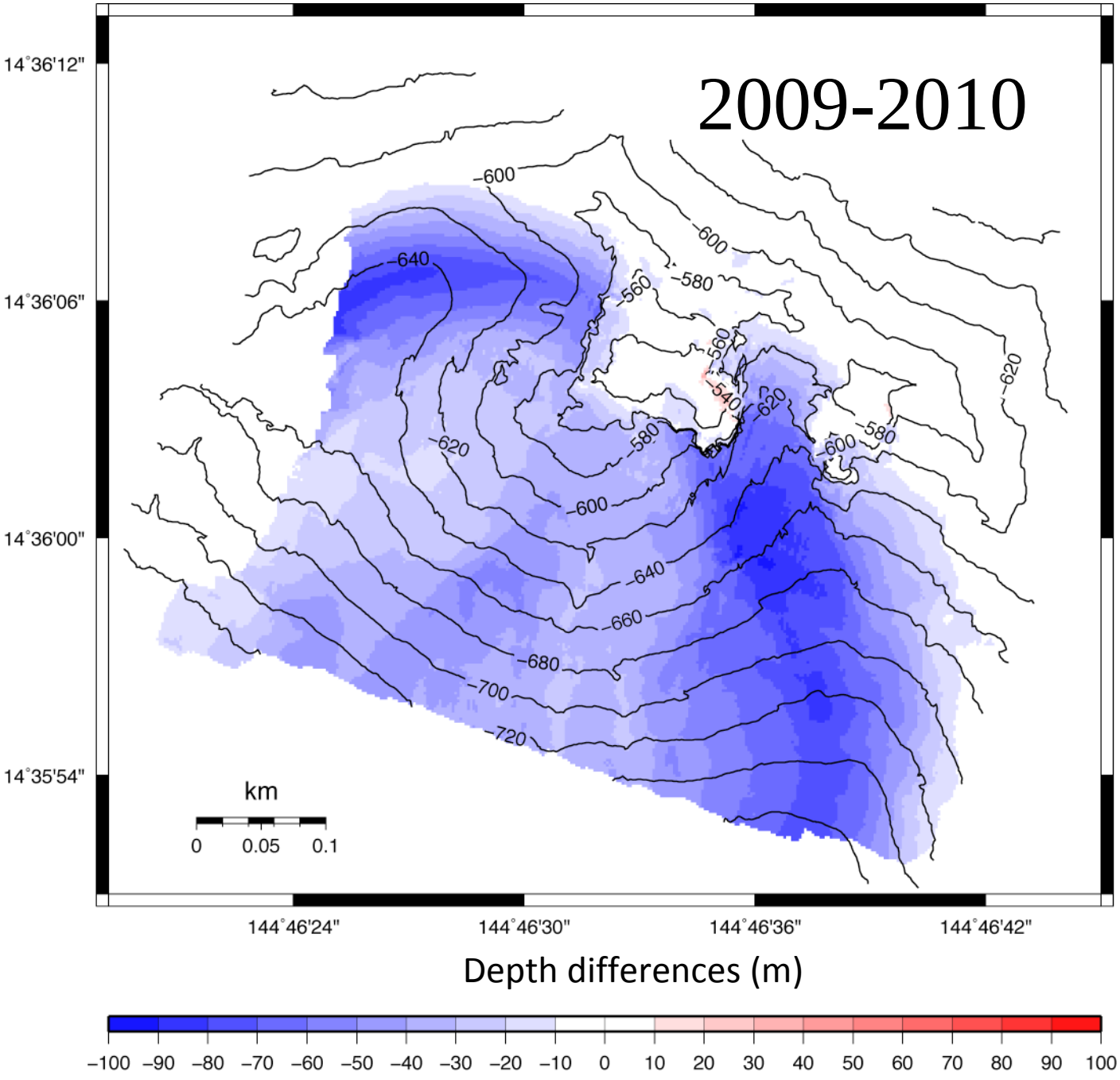
km
0
0.05
0.1
−800 −780 −760 −740 −720 −700 −680 −660 −640 −620 −600 −580 −560 −540 −520 −500 −480 −460


2009-2010
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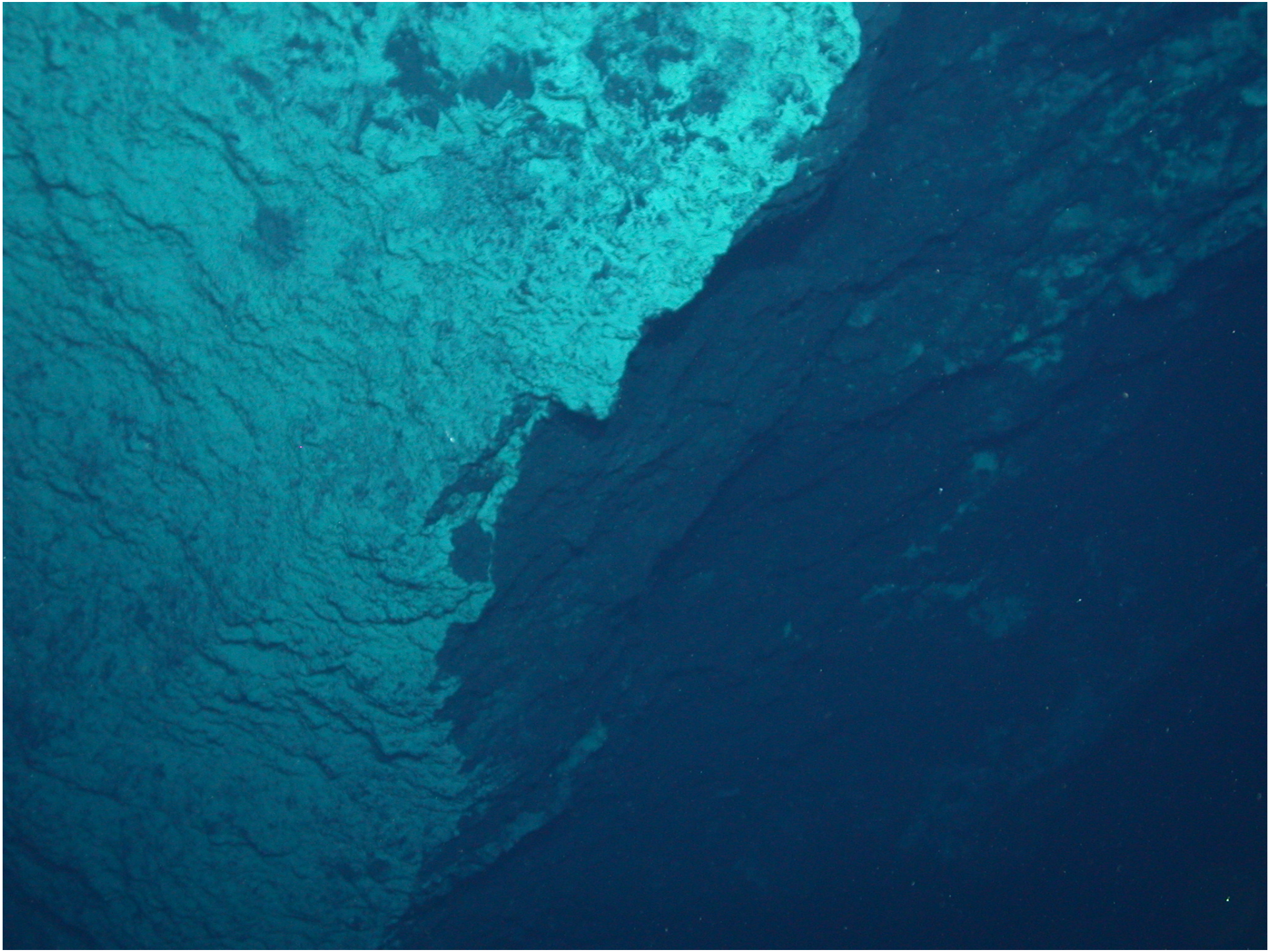
144°46'42"
-600
-640
-560
-580
-620
-540
-660
-680
-700
-720
km
0
0.05
0.1
Depth differences (m)
-100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100



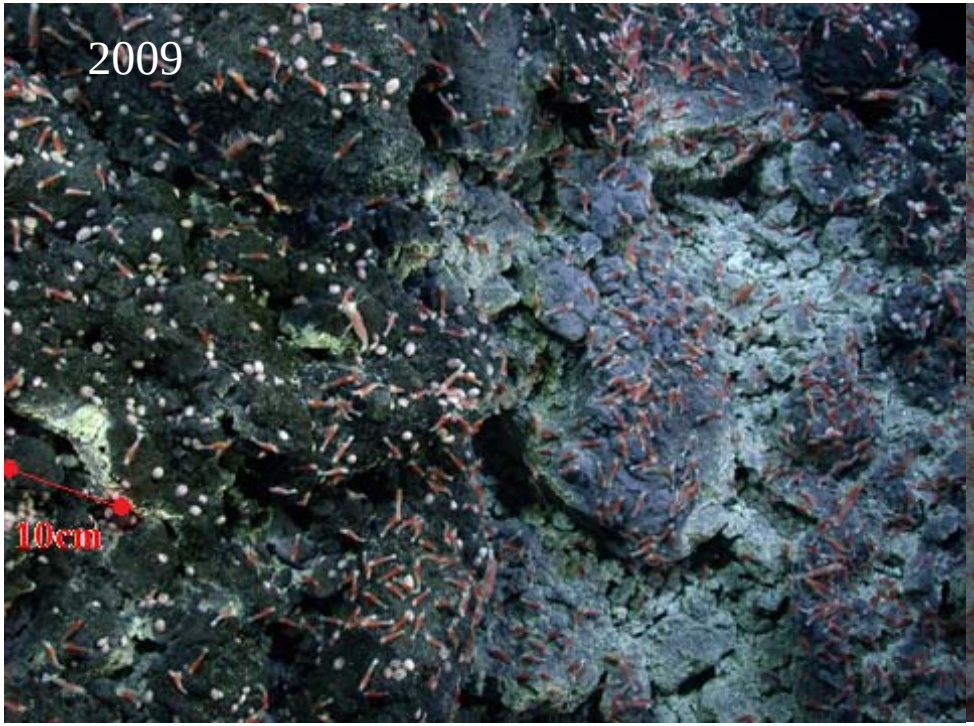
The Shrimp of NW Rota-1

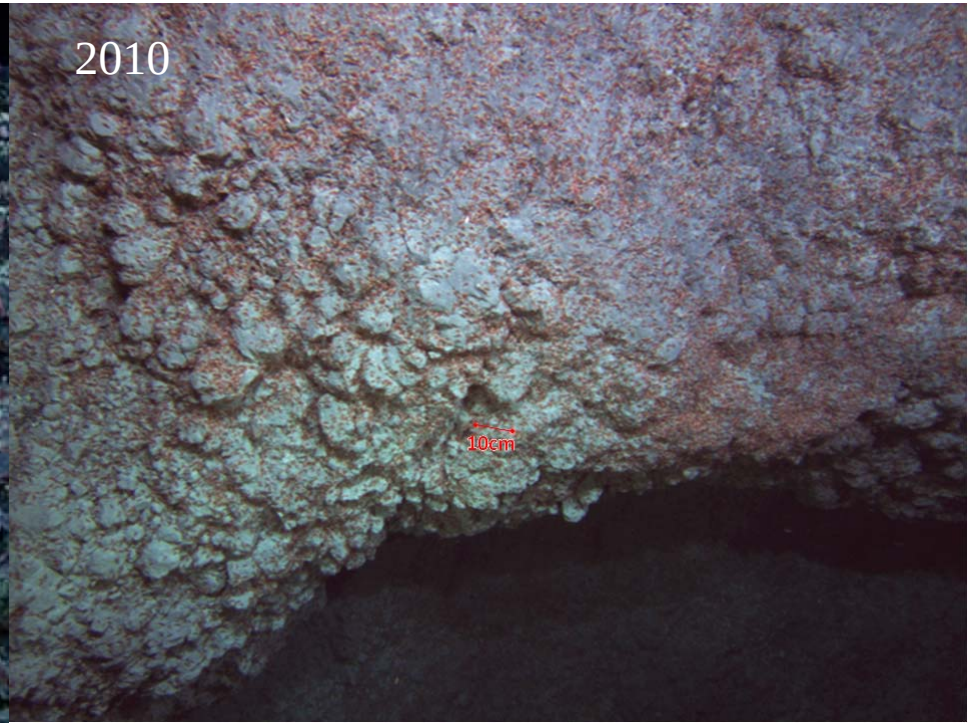
Opaepele loihi

- Wide distribution
- Feeds on bacterial mat only
- Pelagic larvae
- Huge recruitment after slide

Alvinocaris sp.

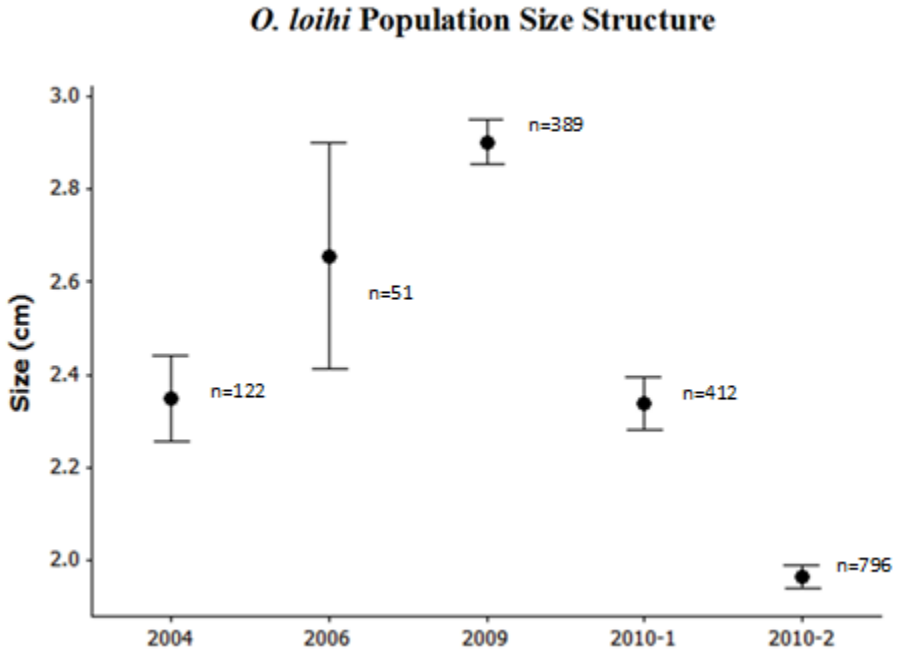
- Restricted distribution
- Feeds on mat, then predator
- Pelagic larvae
- Almost wiped out after slide

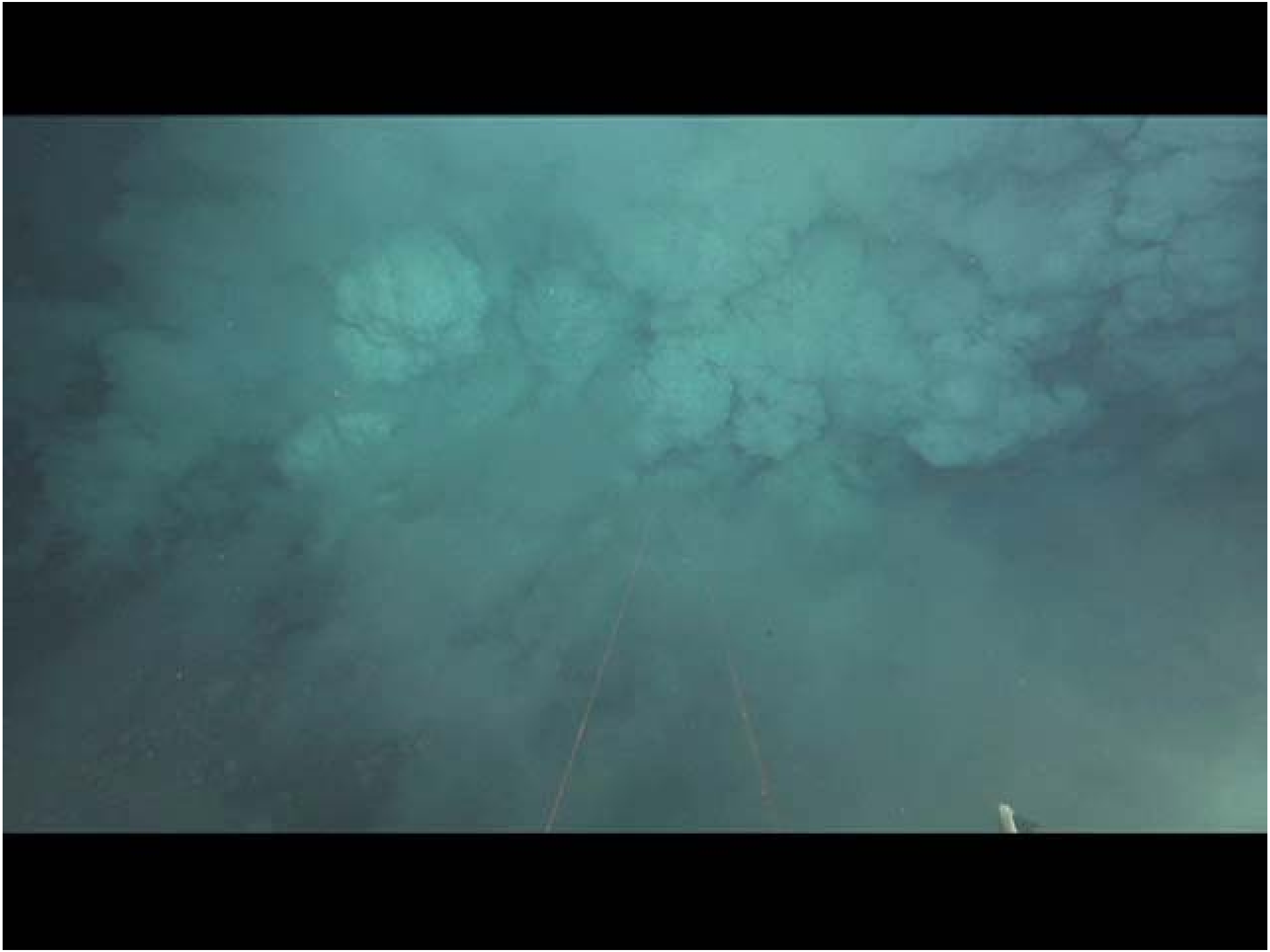




2010

- Landslide wipes out most of existing vent habitat, creates new habitat
- Colonized by 1000's of new *O. loihi*
- No newly recruited *Alvinocaris*
- Hypothesis: Difference in relative survivorship of recruits





James Cowen
Presenter: Huei-Ting (Tina) Lin

Atlantis/Jason

June 15 - July 1, 2010

Our 2010 Submersible experiences

Presenter: Huei-Ting (Tina) Lin
Representative of Dr. James Cowen
University of Hawaii at Manoa
Department of Oceanography

Cruise: AT15-66

- **Research Vessel: Atlantis**
- **Submersible: JASON**
- **Cruise dates: 2010/06/15~30**
- **Projects:**
  (1) **Microbial Observatory: James Cowen et al.**
  (2) **Large-scale, Long term Tracer transport: Andy Fisher et al.**
  (3) **CORK maintenance: Keir Becker**

Few weeks before the cruise…

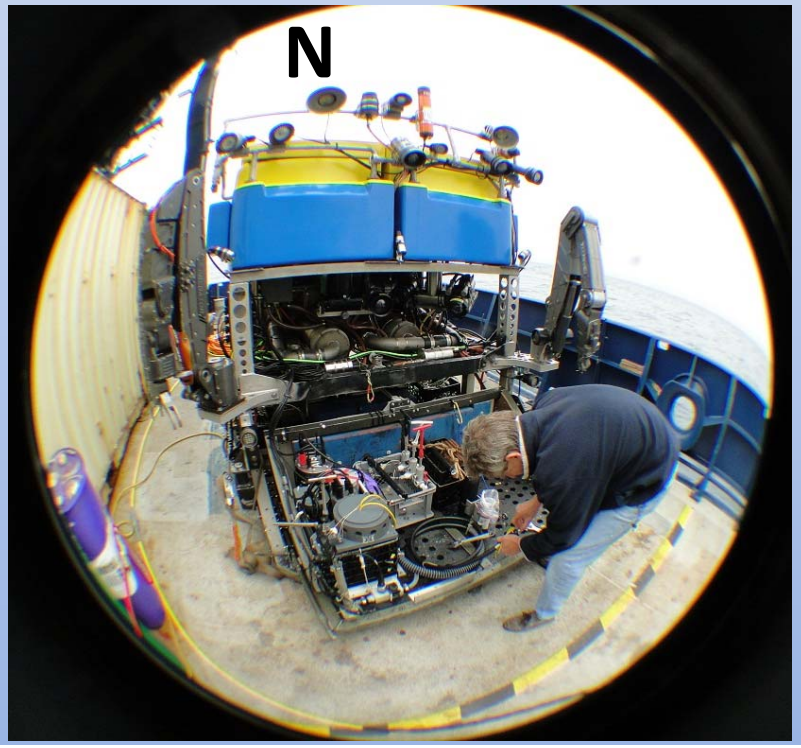
ALVIN

waiting for recertification

switch

JASO

N



To react to the change

- **JASON: from maintenance period to operational mode**
- **UH : Several emergency consultations**
  - **Example: change of electronic interface**

Although….

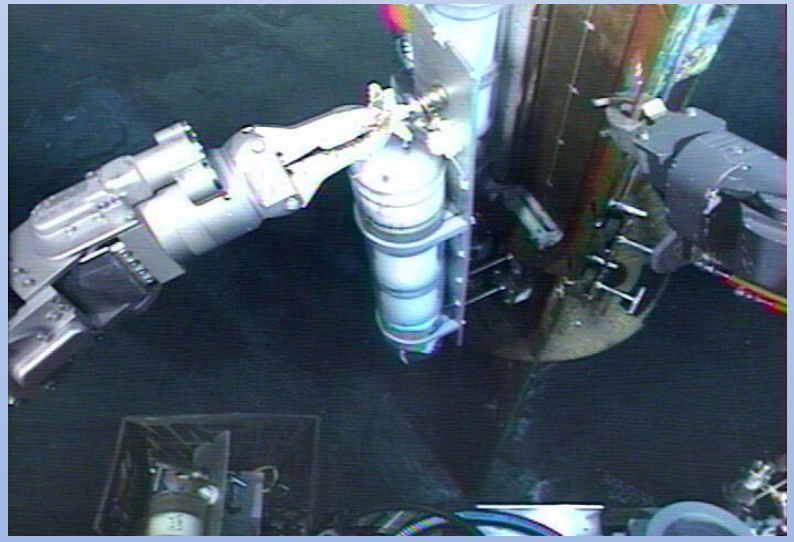
- Lost the first 2 dive days for JASON to get ready
- Lost another 2 dive days due to a leakage in JASON pressure casing

JASON/ALVIN crew on board made huge and innovative effort.

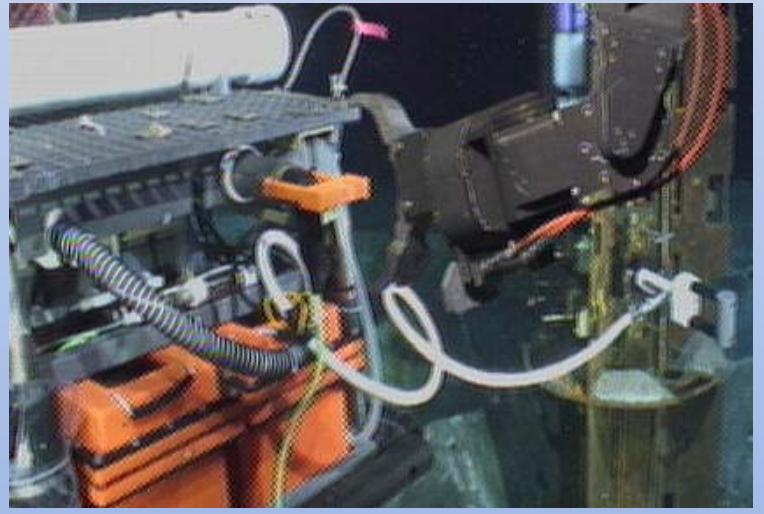
Accomplishment

Basement fluid collection

Pressure & temperature Data downloading



OSMO sampler Exchanges



Prepare for tracer transport experiment

More…

- Verify positioning of valves of all CORKs
- Do 360 degree video and still photo surveys of all holes

→ Get ready for IODP Expedition 327

****3 dive days recovered for 2011**

From our group

We really appreciate the proactive support and effort by the entire deep submergence group.

Their professional work helps to get science going.

John Delaney
and Deb Kelley

Thompson/Jason II

July 26 – Aug 23, 2010

Dave Butterfield

Thompson/Jason II

Aug 26 – Sept 7, 2010

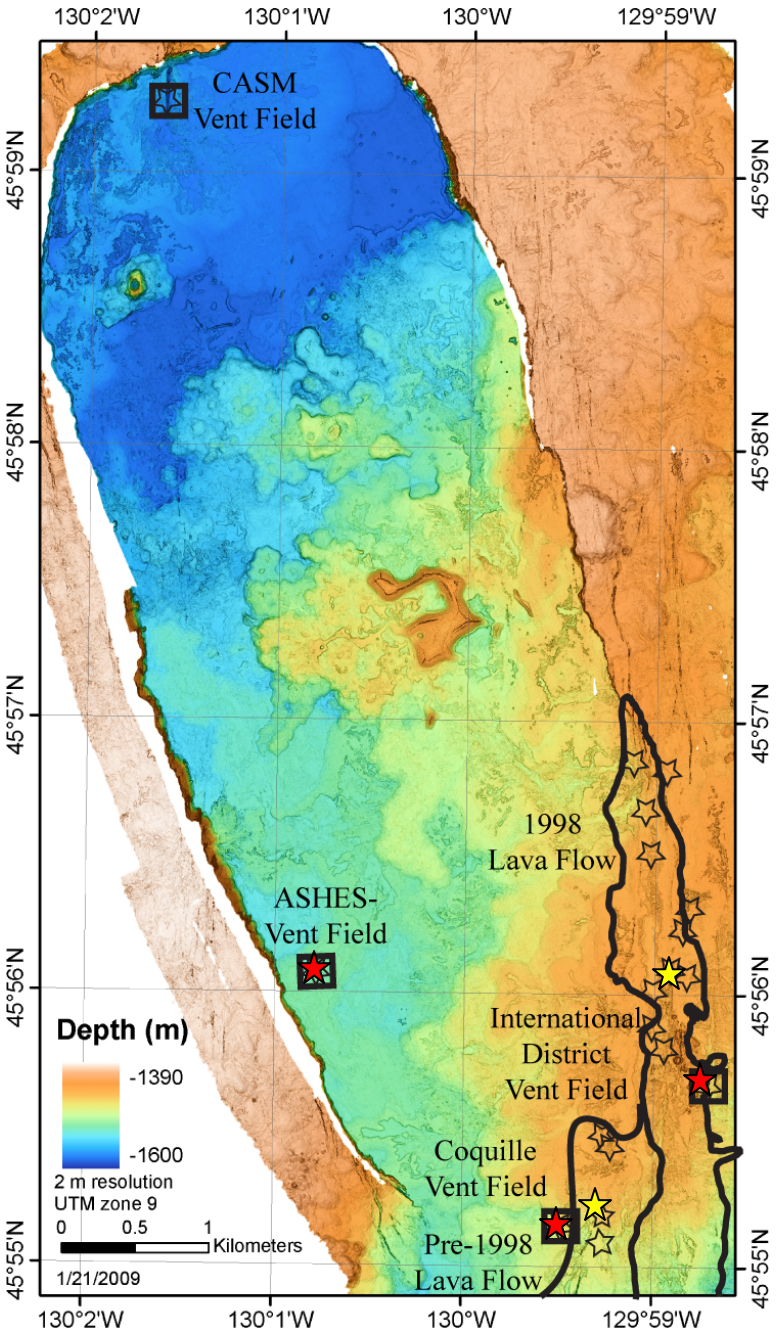
TN253 NeMO 2010 Summary

- August 26 to September 7, 2010, Newport-Astoria
- Funded by:
  - NSF OCE0926199, Butterfield/Huber “Function, Activity, and Adaptation of Microbial Communities in Geochemically Diverse Subseafloor Habitats”
  - NSF OCE 0725605, Chadwick/Nooner “Monitoring Inflation at Axial Seamount”
- 6 Jason ROV dives
  - Longest dive 3.6 days
- 19 Scientists (4 post-docs, 4 undergraduates) – Geology/Geophysics/Chemistry/Microbiology/Natural Products
- Cruise Data & Metadata Submitted, Report Available Online

TN253 NeMO 2010 Summary

- Total Days on Station at Axial: 10.1
- Total Jason Time in Water: 6.5 days
- Time Lost to Weather: 1.1 days
- Time Lost Power Failure: 0.33 day

- 24-hour Flexible Operations
- Deck Work Primarily in Daylight
- All Primary Objectives Accomplished
- Reson Sonar Survey for Delaney Cancelled



Axial Volcano - Linking Chemistry with Microbial Community Structure, Function, Metabolic Activity

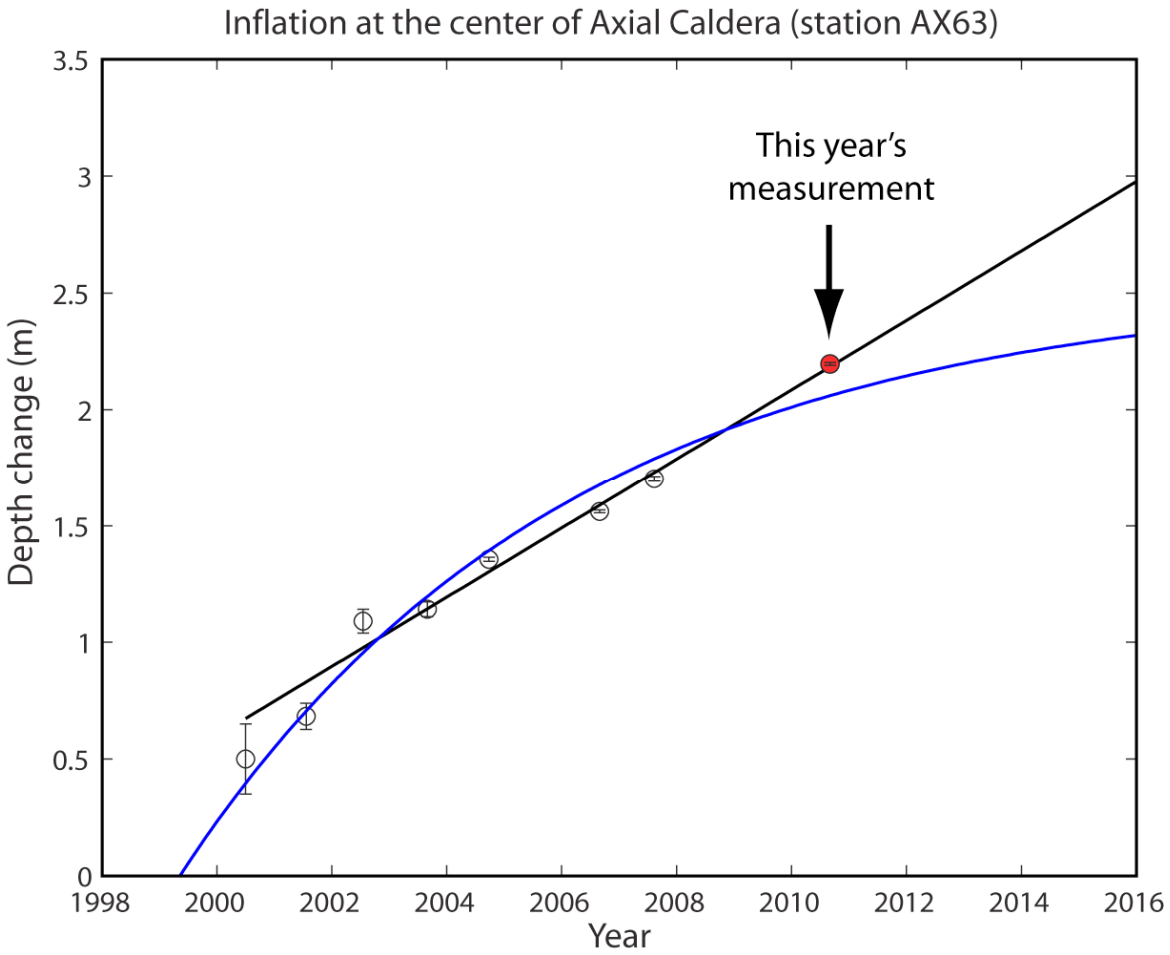
- 65 HFS Chemistry samples
- 23 Ti Gas-Tight samples
- 27 DNA/RNA filters
- 29 Vent Sites sampled
- Shipboard Culture/Analysis
- Bioactive Products

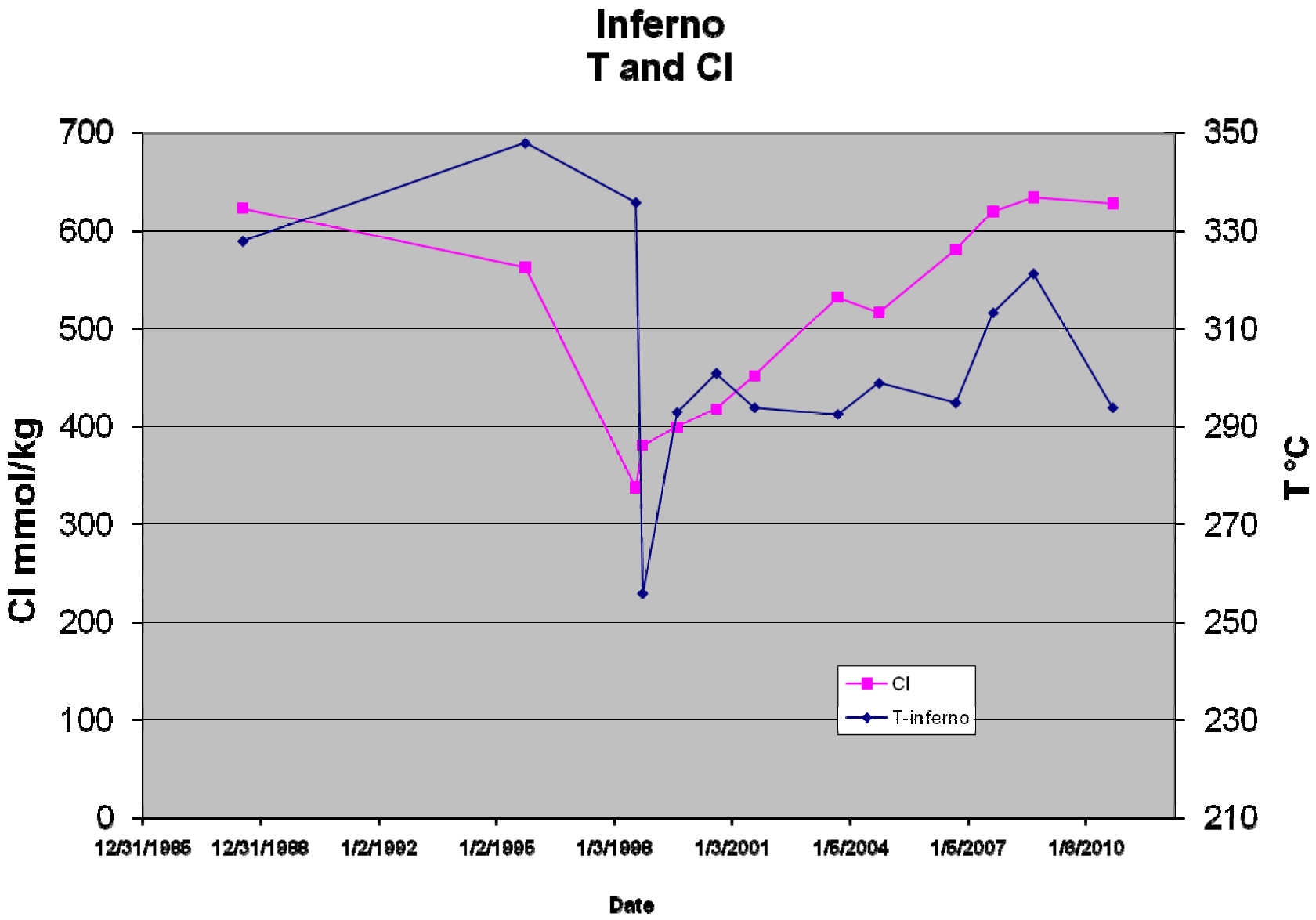
Inflation measurement results: see posters OS21C-1521 by Haxel et al. on Tuesday AM, and V33C-2399 by Nooner and Chadwick on Wednesday PM

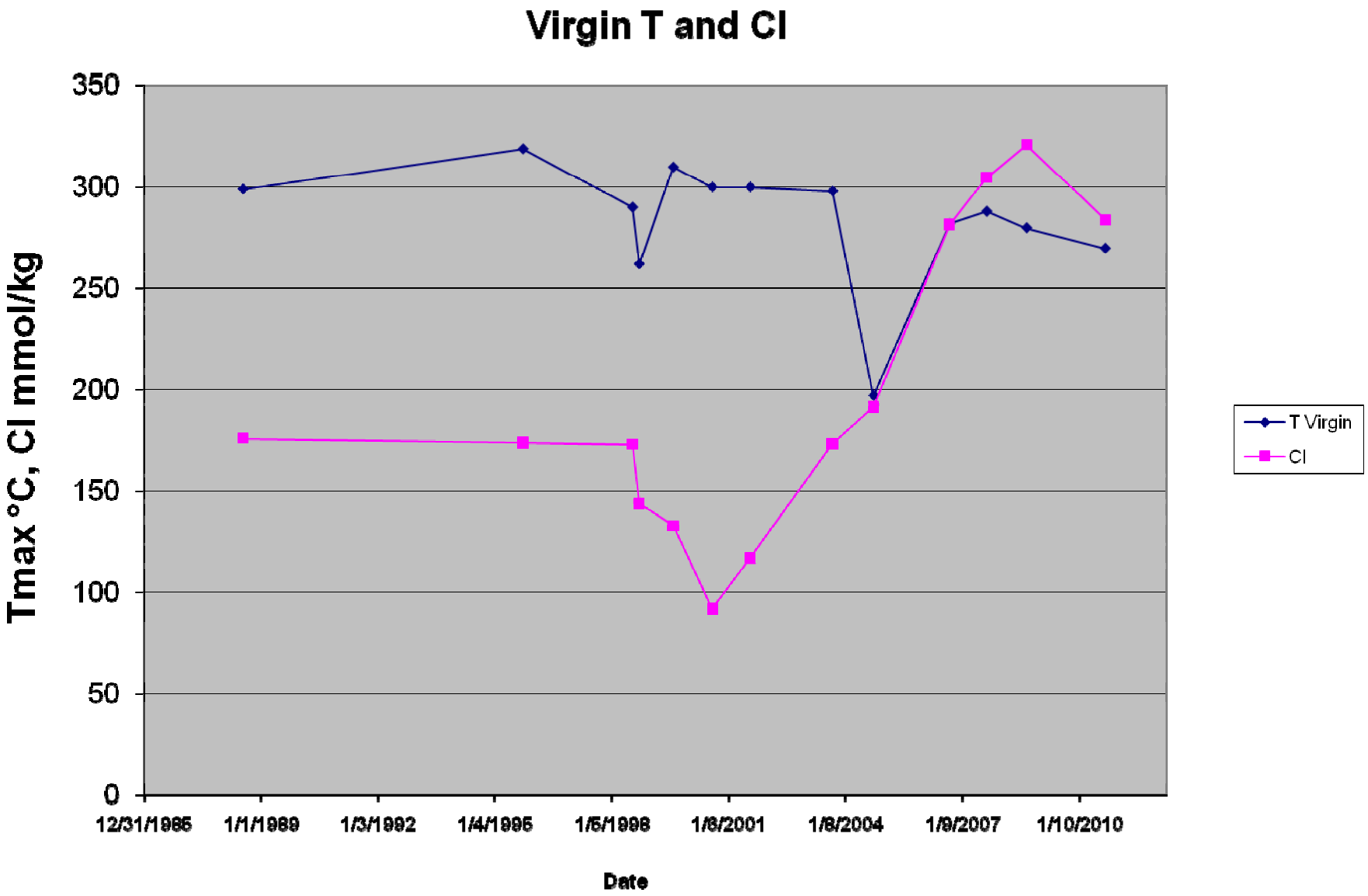
15 cm/year

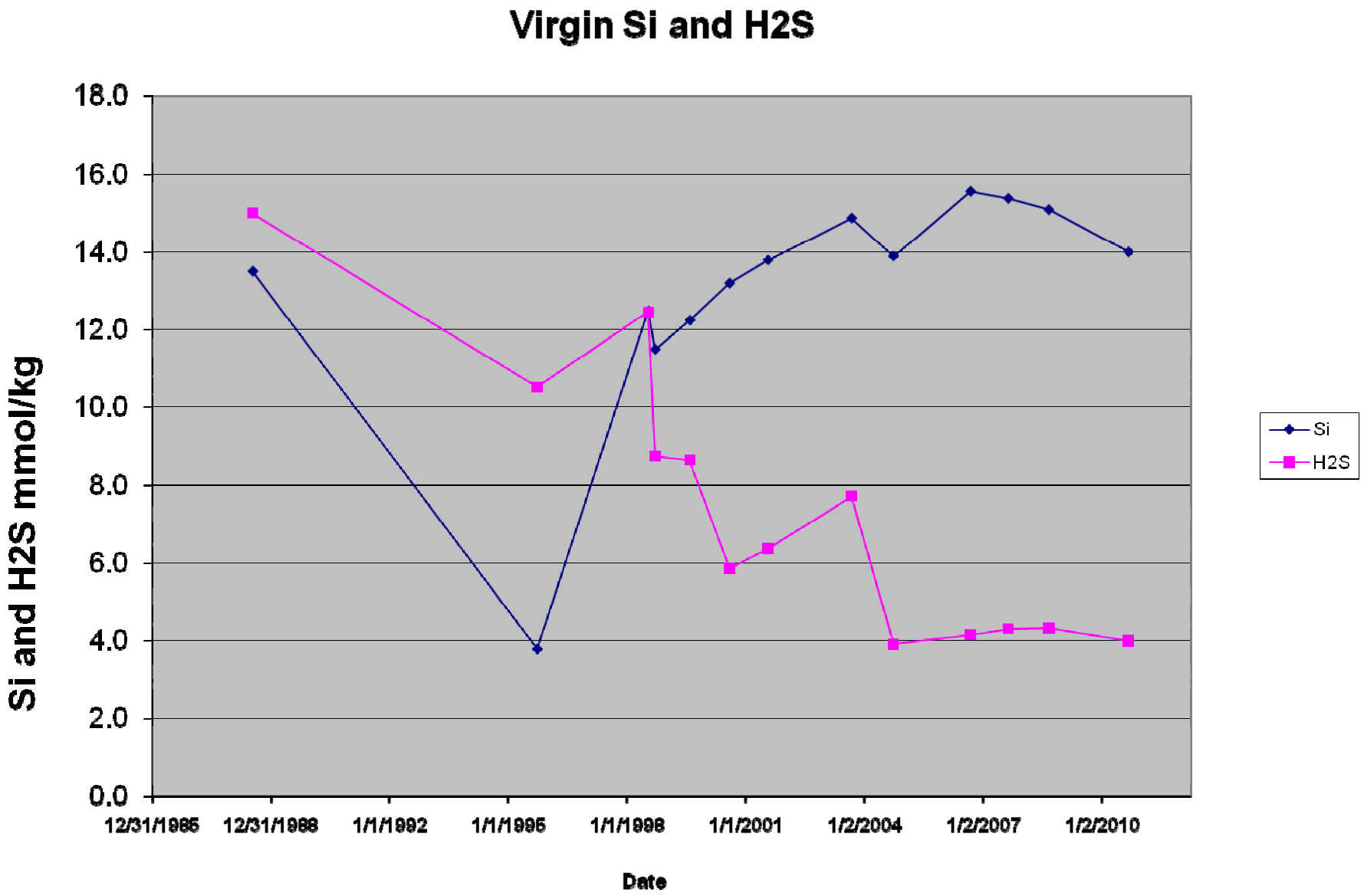
Linear fit better

Inflation will match previous eruption level in 2016

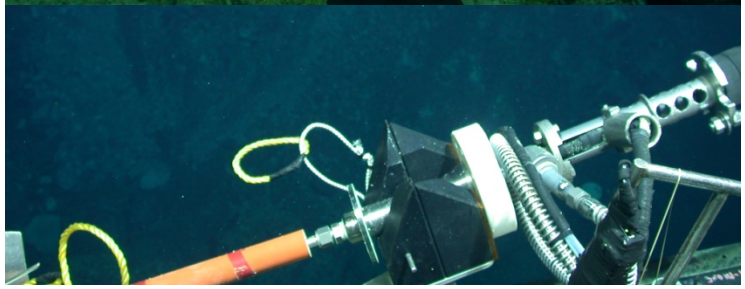



Inferno
T and Cl
Cl mmol/kg
T °C
Date
700
600
500
400
300
200
100
0
350
330
310
290
270
250
230
210
12/31/1985
12/31/1988
1/2/1992
1/2/1995
1/3/1998
1/3/2001
1/6/2004
1/6/2007
1/6/2010
Cl
T-inferno


Virgin T and Cl
Tmax °C, Cl mmol/kg
350
300
250
200
150
100
50
0
12/31/1985
1/1/1989
1/3/1992
1/4/1996
1/6/1998
1/8/2001
1/8/2004
1/9/2007
1/10/2010
Date
T Virgin
Cl

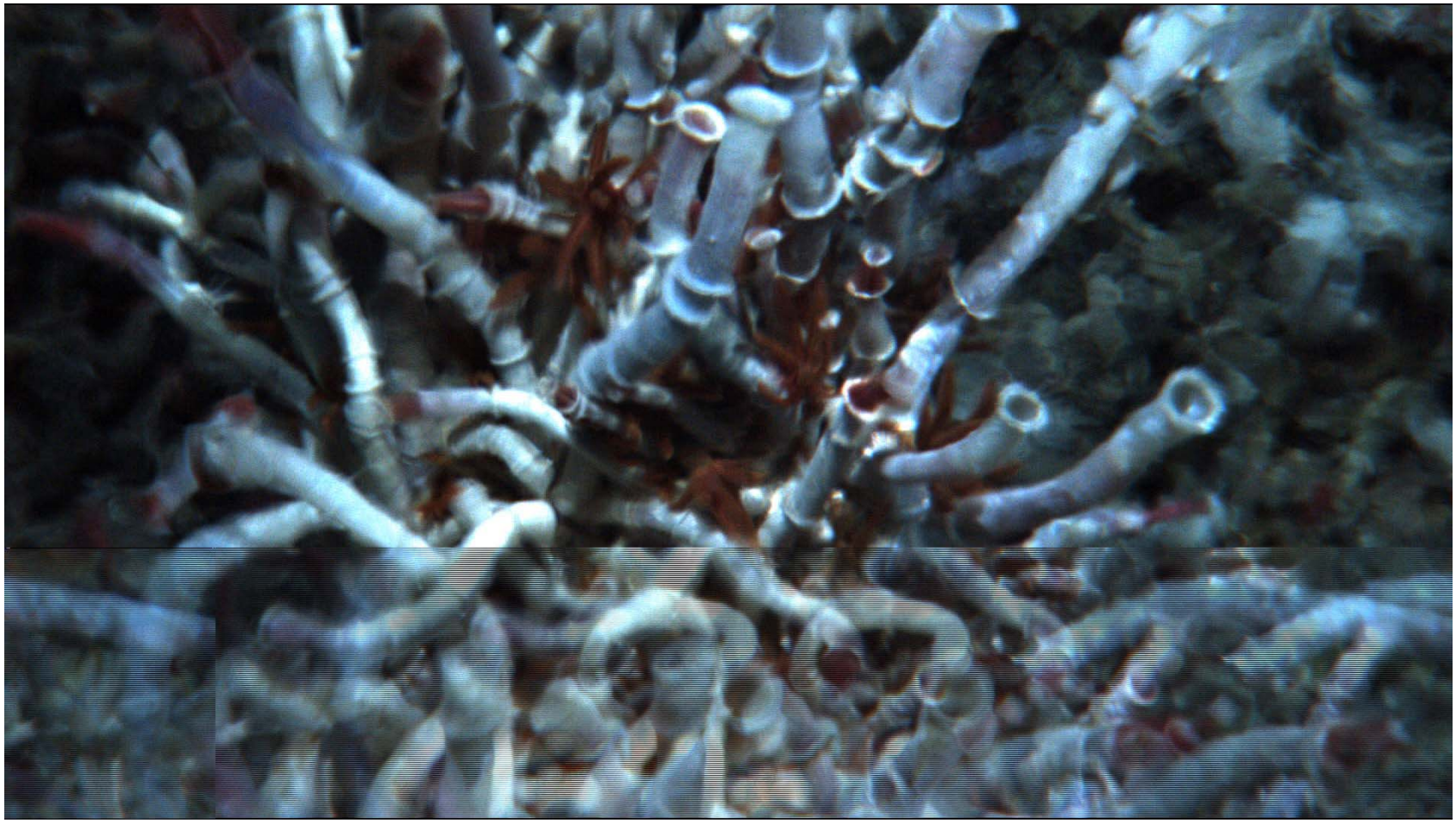

Virgin Si and H2S
Si and H2S mmol/kg
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
12/31/1985
12/31/1988
1/1/1992
1/1/1995
1/1/1998
1/1/2001
1/2/2004
1/2/2007
1/2/2010
Date
Si
H2S

Hydrothermal Fluid and Particle Sampler Changes

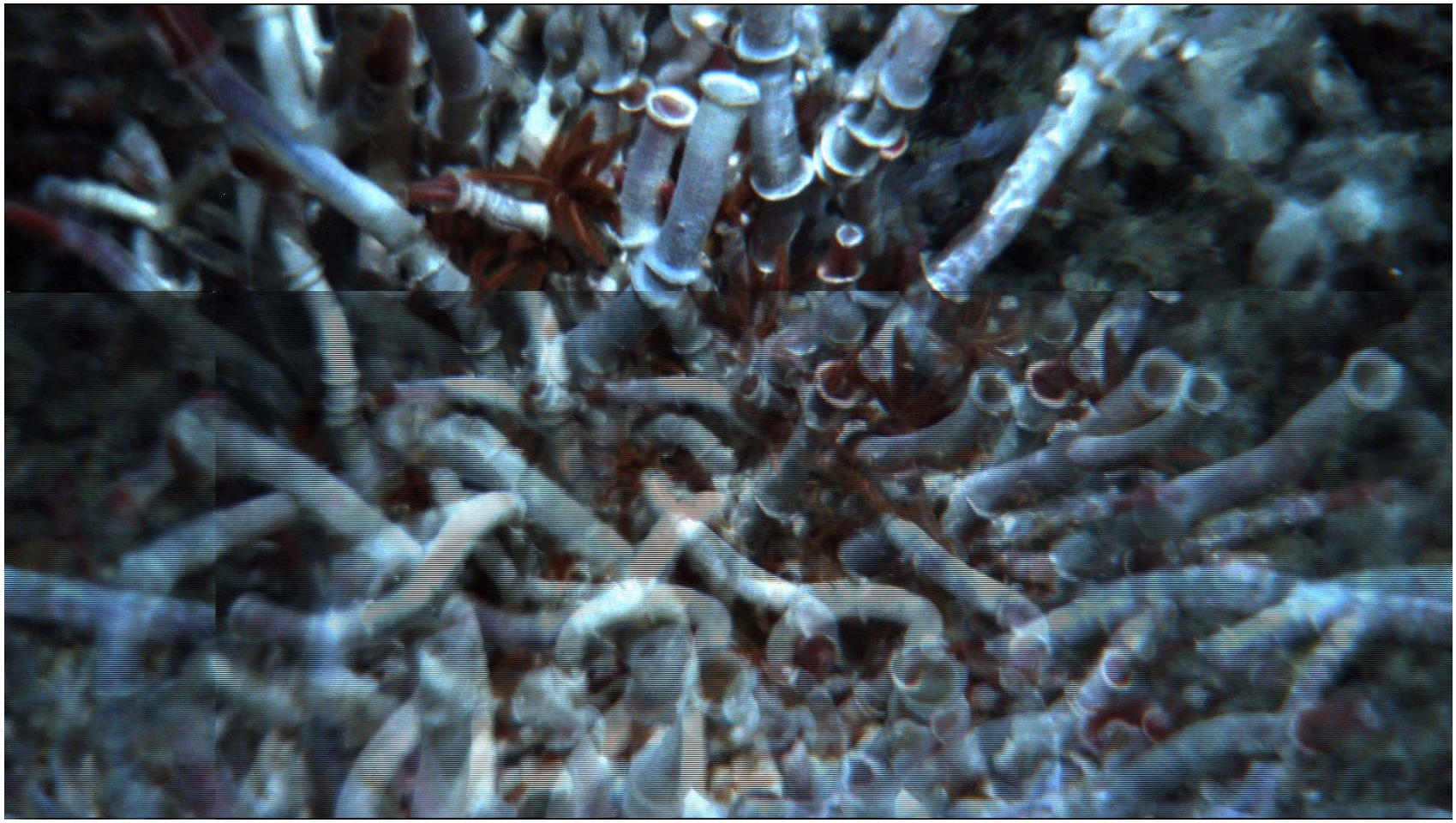


Also added in-situ RNA preservation in 2010

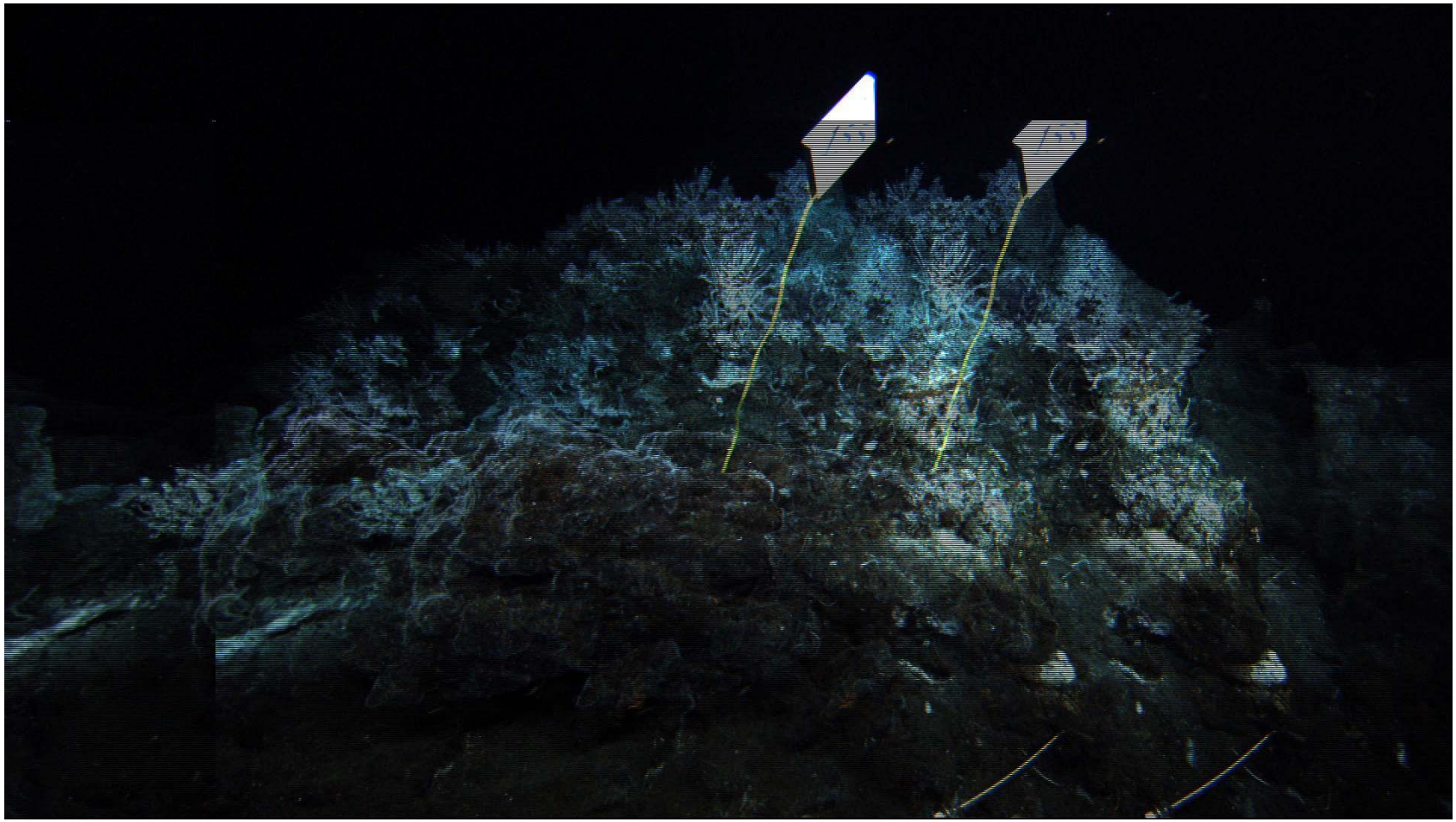
Sample of “Flickering” HD recorded video



Frequency of flicker ~1frame/min on first dive



Increased to ~1 frame/sec at worst



Video Flicker Sample

Some major metabolic energy sources

- Methanogenesis
  - $CO_2 + 4H_2 = CH_4 + 2H_2O$
- Sulfide oxidation
  - $H_2S + ½\ O_2 = H_2O + S^0$
  - $H_2S + 2O_2 = H_2SO_4$
- Sulfate reduction
  - $SO_4^{=} + 4H_2 + 2H^+ = H_2S + 4\ H_2O$ (autotrophic)
  - $SO_4^{=} + CH_3COO^- + H^+ = H_2S + 2HCO_3^-$ (hetero)

Cruise Accomplishments

- ROV-based pressure measurements were repeated at an array of seafloor benchmarks inside Axial caldera to monitor volcanic inflation since its 1998 eruption.
- Results show the center of the caldera uplifted 50 cm since 2007 (15 cm/yr) and the total uplift since 1998 is at least 2.3 m. At this rate, Axial will have recovered the 3.2 m of subsidence observed during the 1998 eruption in 6 more years (2016), and presumably will be ready to erupt again (just in time for the OOI).
- For more info see posters OS21C-1521 by Haxel et al. on Tuesday AM, and V33C-2399 by Nooner and Chadwick on Wednesday PM.