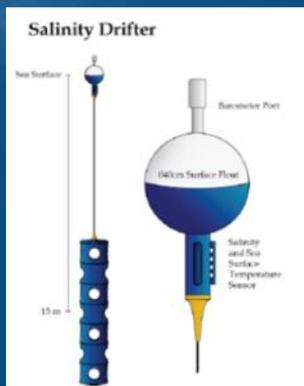
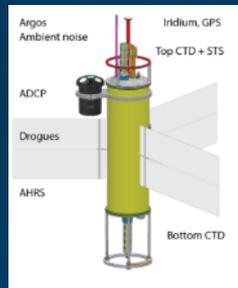
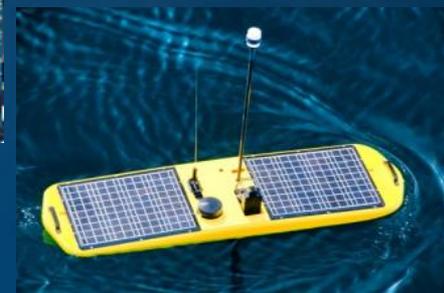
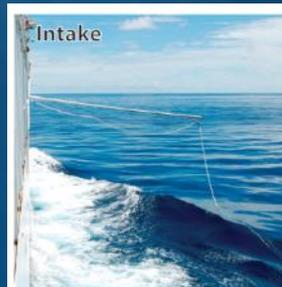
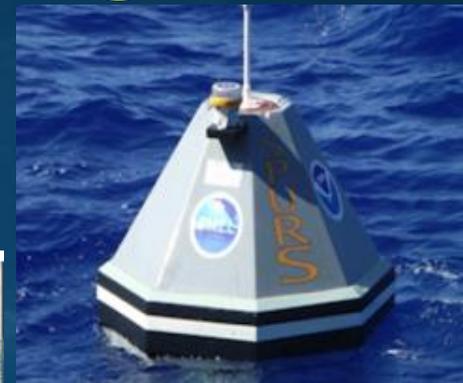
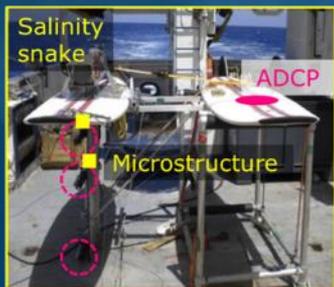




# SPURS-2 Planning Meeting

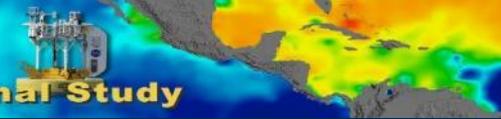
Ocean Science Meeting  
New Orleans, LA

Feb 25, 2016



# AGENDA

- Programmatic Information – Lindstrom
- Lady Amber plan and logistics – Rainville
- Revelle Cruise Logistics/Plan – Jessup
- Revise Science/Implementation Plan - Farrar



## Use of schooner *Lady Amber* for SPURS-2



A novel and flexible observational approach, motivated by a need to capture the highly dynamical oceanic circulation at the isolated SPURS-2 site.

**9 cruises, every 2 months for 1.5 years.**

Objectives for the *Lady Amber*:

- Deploy surface drifters and floats every 2 months, necessary to measure the rapidly evolving circulation.
- Conduct a light and inexpensive turn-around cruise: Recover, service, and redeploy autonomous instruments mid-program (Wave Glider, Seagliders, Mixed Layer Lagrangian Floats, ...).
- Carry additional near-surface and atmospheric measurements during regular visits to the site.
- Add safety: possibility to service instruments, replace sensors, recover platforms, etc. during the entire field program if problems occur.



# Countdown to RR1610

- Dec 2015: Thru-hull TSGs installed at 2 & 3 m
- 18 Feb 2016: Draft Cruise Plan distributed
- 25 Feb: PI Meeting at Ocean Sciences
- 20 Apr: Cruise Planning Meeting at Scripps
- 8 Aug: Mobilization
- 12 Aug: Departure
- 22 Sep: Return
- 24 Sep: Conclude Demobilization

# RR1610: Logistics

- Honolulu: Berthing location TBD
  - New UH Marine Center at Pier 35 (preferred)
  - Commercial berth at Pier 34
  - Ship's agent information available now on web site
- Meals & bunks
  - Available from 1200 on 7 Aug
  - Meals may be limited in port
- Mobilization
  - Start 1200 on Monday 8 Aug
  - End Thursday 11 Aug
- Cruise start: 1600 Friday Aug 12
  - All participants recommended to be on board night of 11 Aug
  - Latest arrival should be 0900 on 12 Aug for 1600 departure

# Revelle Sailing Requirements

- Passport – sailing in international waters
- TWIC (Transportation Workers Identification Card)
  - Required by Maritime Transportation Security Act for access to secure maritime facilities and vessels
  - Recommended by Scripps
- Required Forms for Sailing
  - Alcohol/Drug Policy
  - Physical Ability to Work at Sea
  - UC Waiver of Liability Questionnaire
- Scripps SIO Ship Portal Web site
  - Each science party member will be given account
  - Fill out profile (passport #) and submit forms

# Primary Activity

- Deploy three moorings
  - WHOI – Central, PMEL – North, PMEL – South
- Deploy autonomous Lagrangian and Maneuverable Assets
  - Lagrangian: Argo/APEX floats, Mixed-Layer Float, SVPS Drifters
  - Maneuverable: Seagliders, Wave gliders, Ecomappers
- Hydrographic Survey
  - Underway CTD
  - CTD stations to 1000 m
- Ship-based measurements of meteorology and rain events
  - Flux measurement package mounted on the jackstaff
  - Salinity Snake
  - SSP – Surface Salinity Profiler (surface towed body)
  - LTAIRS – Lighter-than-Air IR System (balloon)
  - Controlled Flux Technique: CO<sub>2</sub> laser heating surface viewed with IR

# RR1610 Cruise R/V *Roger Revelle*

- 5 Aug: R/V Revelle arrives Honolulu
- 8 Aug: Begin mobilization
- 12 Aug: Depart Honolulu
- 19 Aug: Arrive study site, begin scientific operations
  - Days 1-5: Mooring deployment
  - Days 6-18: 3x3 box survey, deploy Lagrangian/maneuverable assets
  - Days 19-26; 125 W survey
- 14 Sep: Conclude operations, depart study site
- 22 Sep: Arrive Honolulu 0800
- 24 Sep: Conclude demobilization

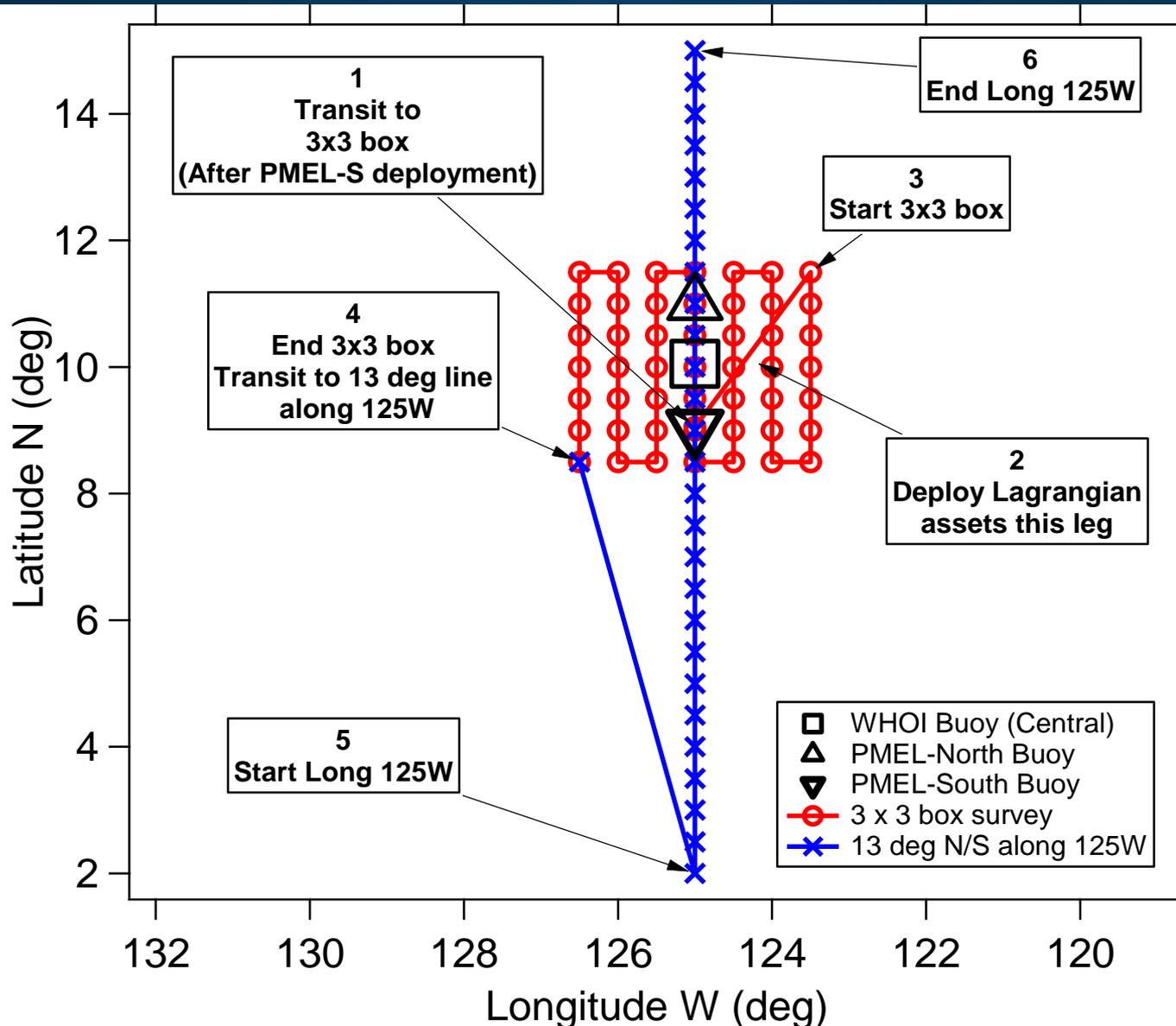
# Hydro Survey + Ship Sampling

- TAO rain data: Expect to encounter 3-6 rain events in 3 weeks
- Hydrographic Survey
  - Multiple meridional transects focused around 125 W, 10 N
  - One transect from 2 N to 15 N along 125 W
  - Underway CTD
  - CTD/LADCP stations every 0.5 deg
- Air-sea fluxes
  - Main constraint is pointing into the wind
- Towed Salinity Snake - Can operate underway at all speeds
- Towed Surface Salinity Profiler (SSP) and Lighter-than-Air IR System (LTAIRS)
  - Main constraint is towing at 4 knots

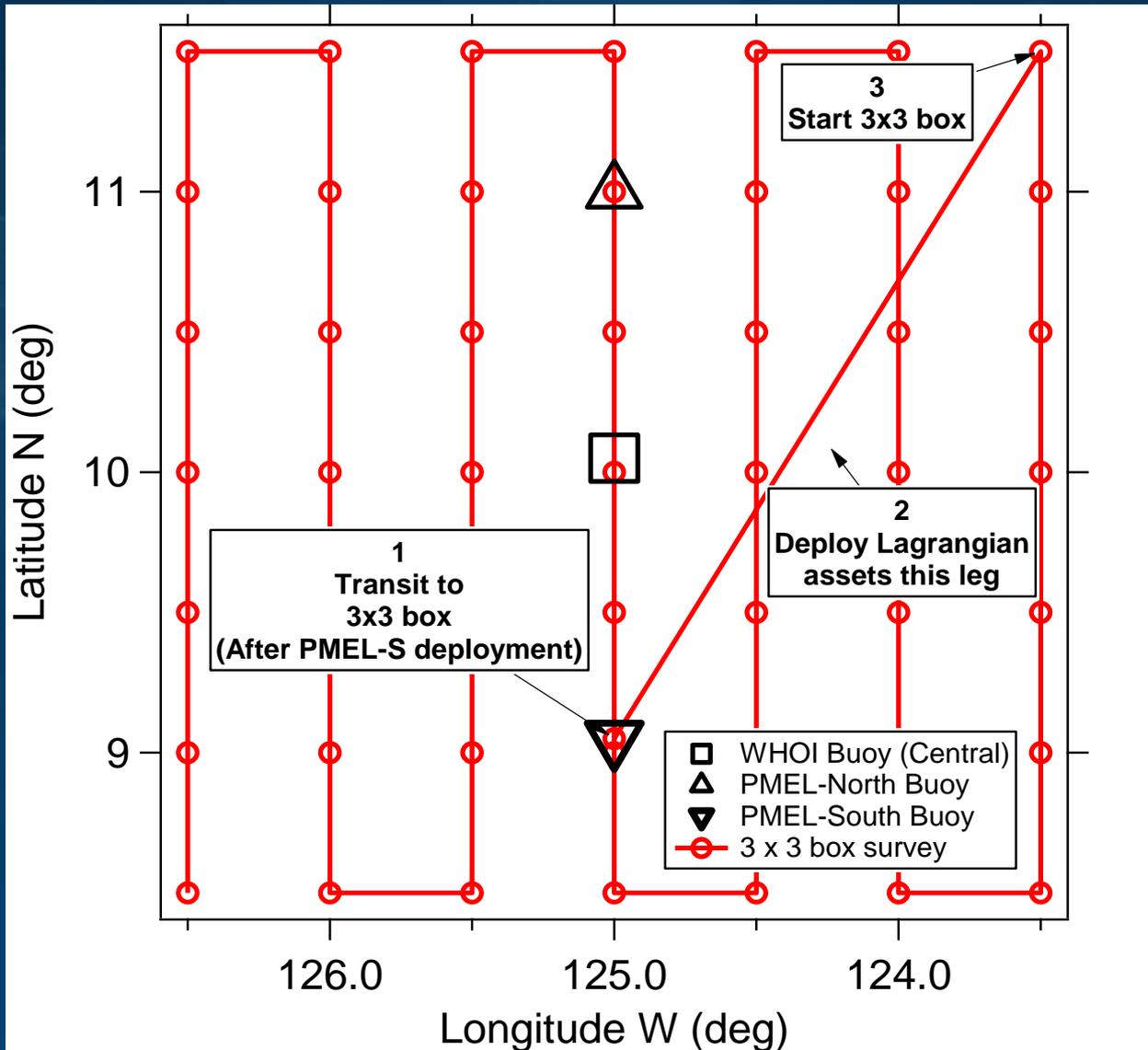
# Ship Sampling Strategy

- Conduct hydro survey as usual except when rain is present
  - When rain occurs
    - Stop ship to deploy SSP and balloon for duration of event
    - Tow SSP: Into the wind as possible, spatial survey as appropriate
    - Suspend CTD stations, uCTD deployment continues if OK with Captain
  - When rain event ends
    - Stop ship to recover SSP and balloon
    - Resume CTD survey (backtrack, account for delay)
- If rain is not encountered after several days, want to tow SSP between stations to sample "fossil" rain & background
- Time budget for hydro survey for planning purposes
  - 75% of distance at 10 kts
  - 25% of distance at 4 kts

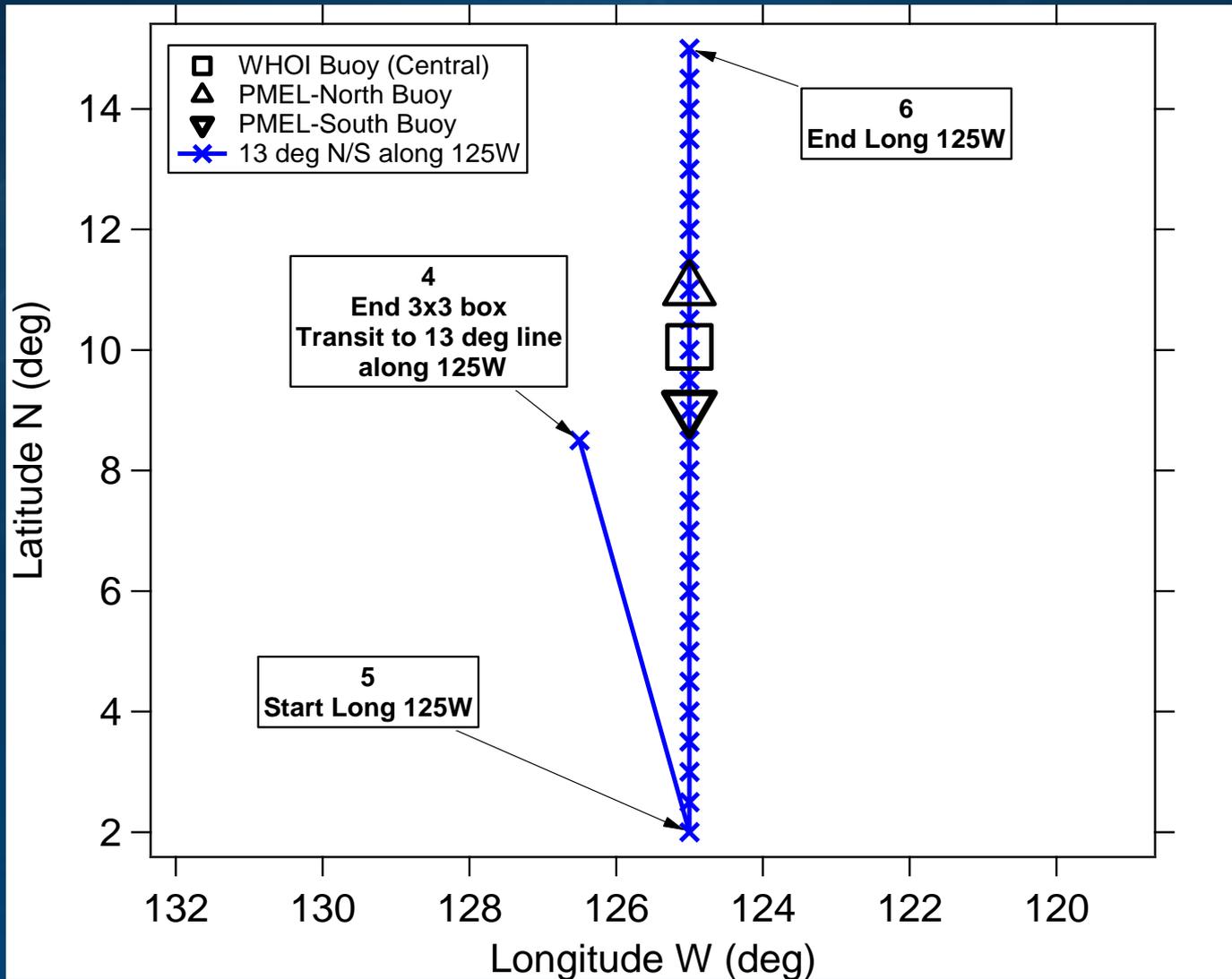
# Hydrographic Survey



# 3 x 3 Box Survey



# 125 W Transect

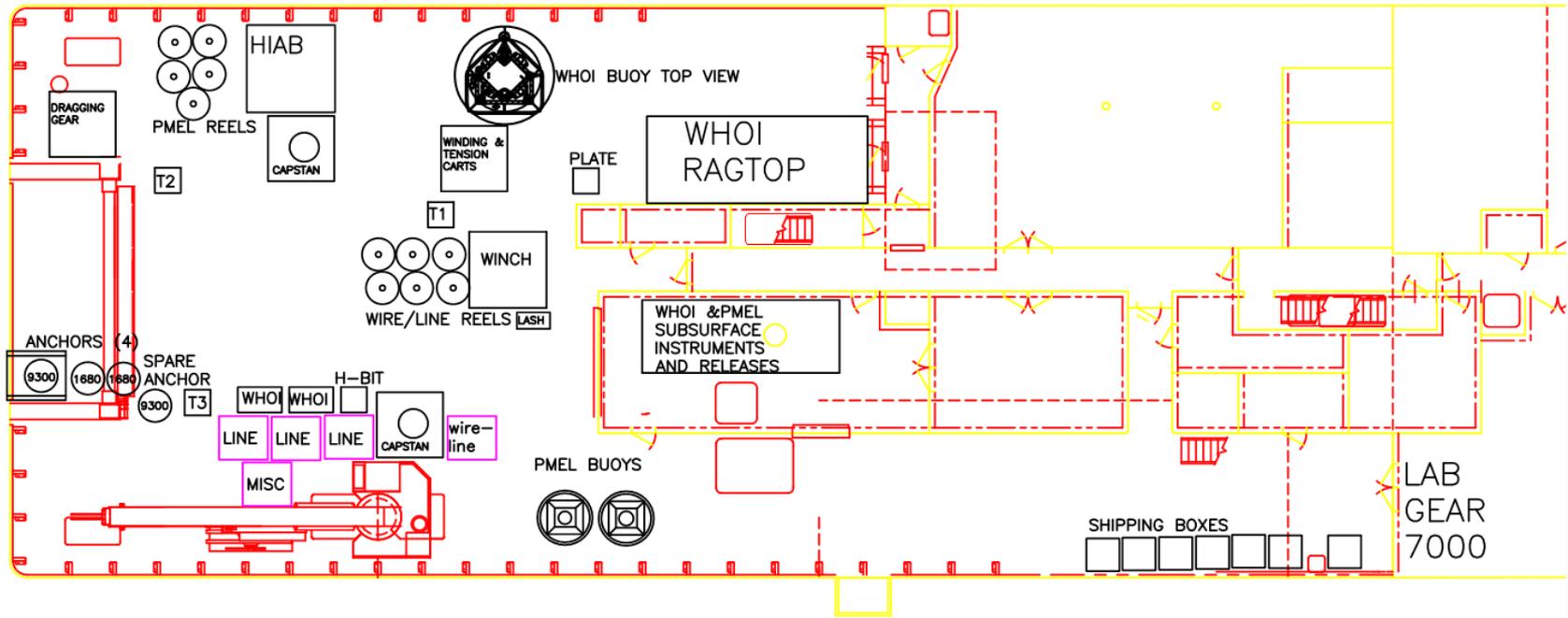


# Mooring Deployment

- Mooring deployment time
  - WHOI: 9 hours
  - PMEL (2): 4 hours each
- Additional requirements
  - Full depth CTD to check depths and sensors
    - 4 hours
    - Can be done at night or days after deployment
  - Anchor survey
    - 2 hours
    - Square, 2 miles per side, 10 min each location, avg speed 6 kts
  - Met sensor check
    - 24 hours standby WHOI central mooring pointed into the wind
    - Could this be combined with a SSP/LTAIRS butterfly survey

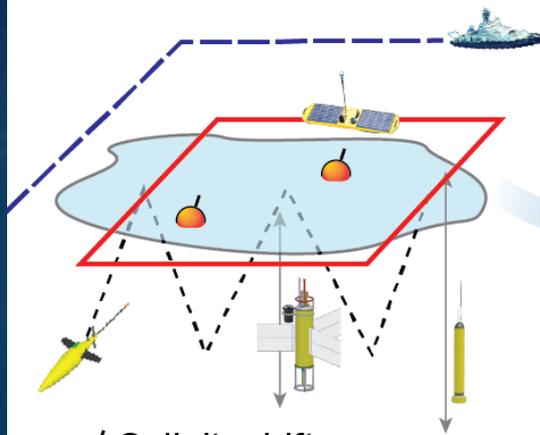
# Mooring Deck Layout

R/V ROGER REVELLE REV A DECK PLAN  
SPURS II



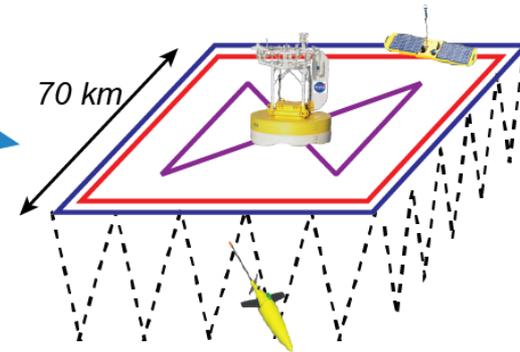
# Lagrangian Component

Lagrangian component



200-300 km  
10-20 km per day

Eulerian component



- Salinity drifters
- Lagrangian float (MLF)
- Profiling (APEX) floats
- Seaglider\*
- Waveglider\*
- Shipboard/SSP surveys

\* return to mooring after ~2 weeks

- Moorings
- Seagliers
- Wavegliders

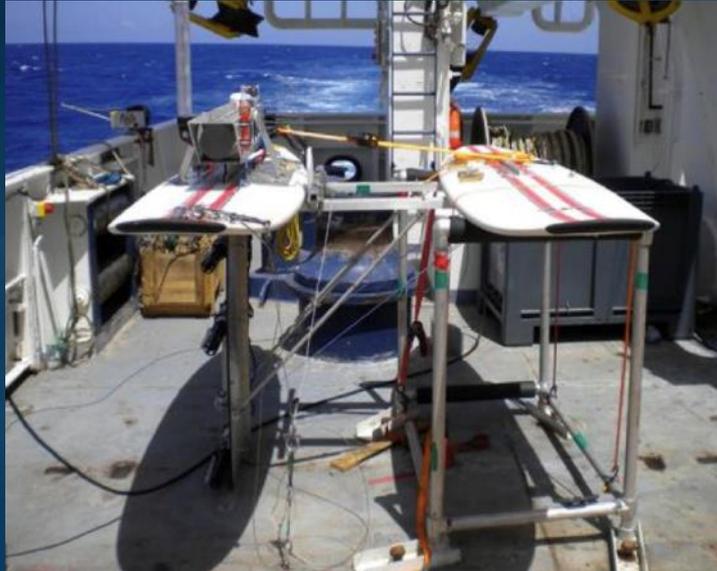
# Lagrangian Deployment Strategy

- Search for suitable location from PMEL-S to start of 3 x 3 box
- Deploy assets: 9-10 hrs
  - MLF (2 h), SVPS drifters (1-2 h), Argo/APEX
  - Wave glider (4 h), Seaglider (2 h)
- SSP/LTAIRS survey: 12-24 hrs
- Continue to 3 x 3 box survey
- Seek to encounter later in survey

# Air-Sea Flux Measurements

- Direct Covariance - 2 systems on jackstaff
- Rain gauges, radiometers, skycam: 02/03 decks
- Sea snake – surface temperature sensor
- Can Sea snake and Salinity snake be combined?
- Rawinsonde Launches
  - Twice daily
  - Launch from fantail

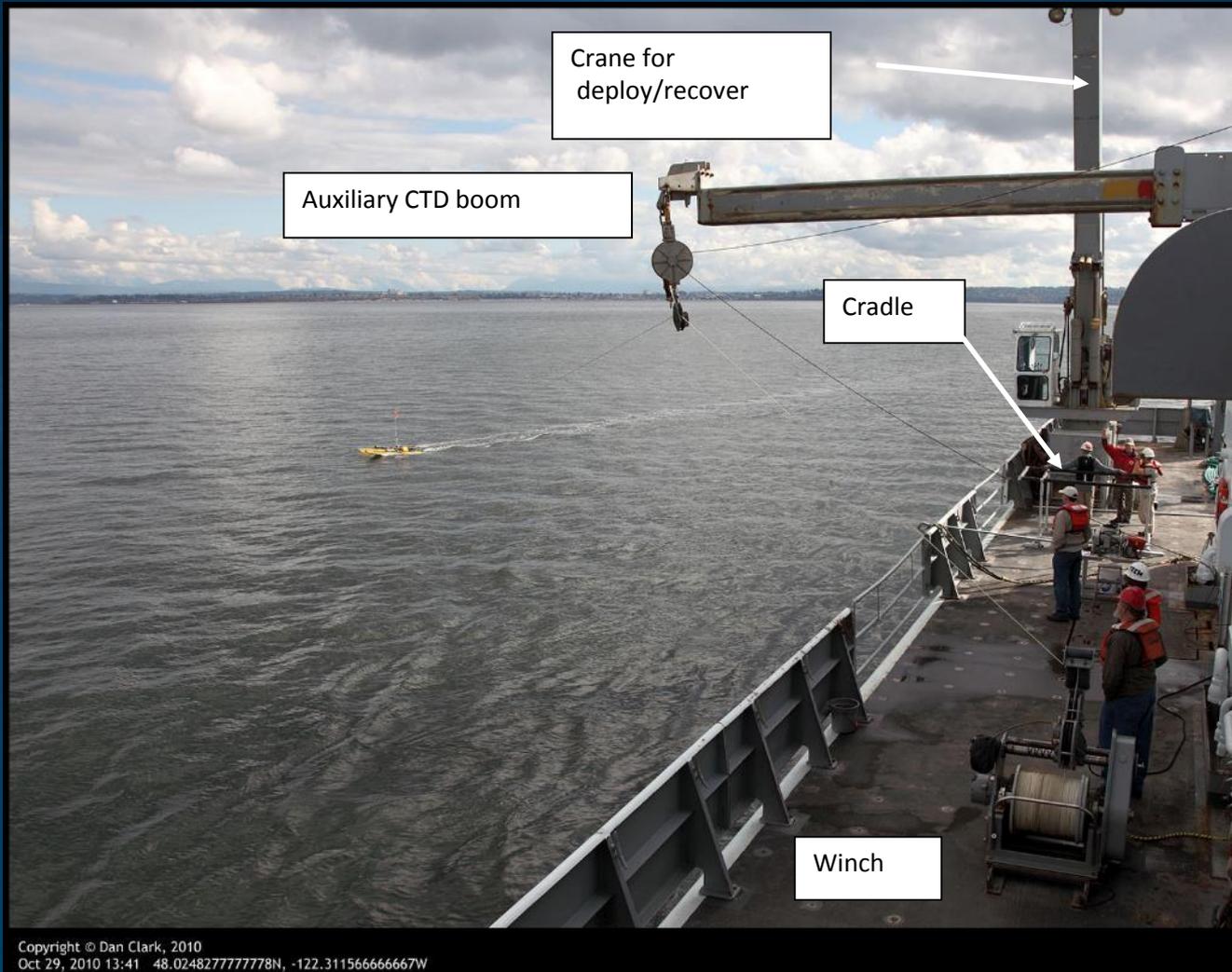
# SSP: Surface Salinity Profiler



- Sea Snake
- 3 x SBE-49 FastCTD (0.1, 0.5, 1.0 m)
- Turbulence probe
- ADCP



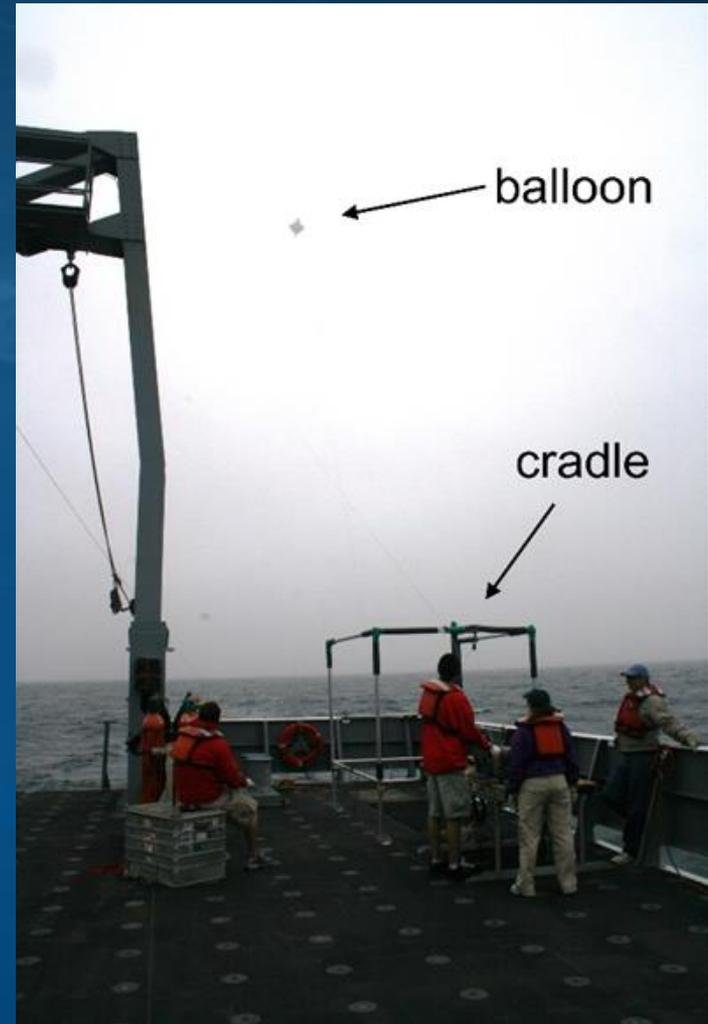
# SSP Deployment



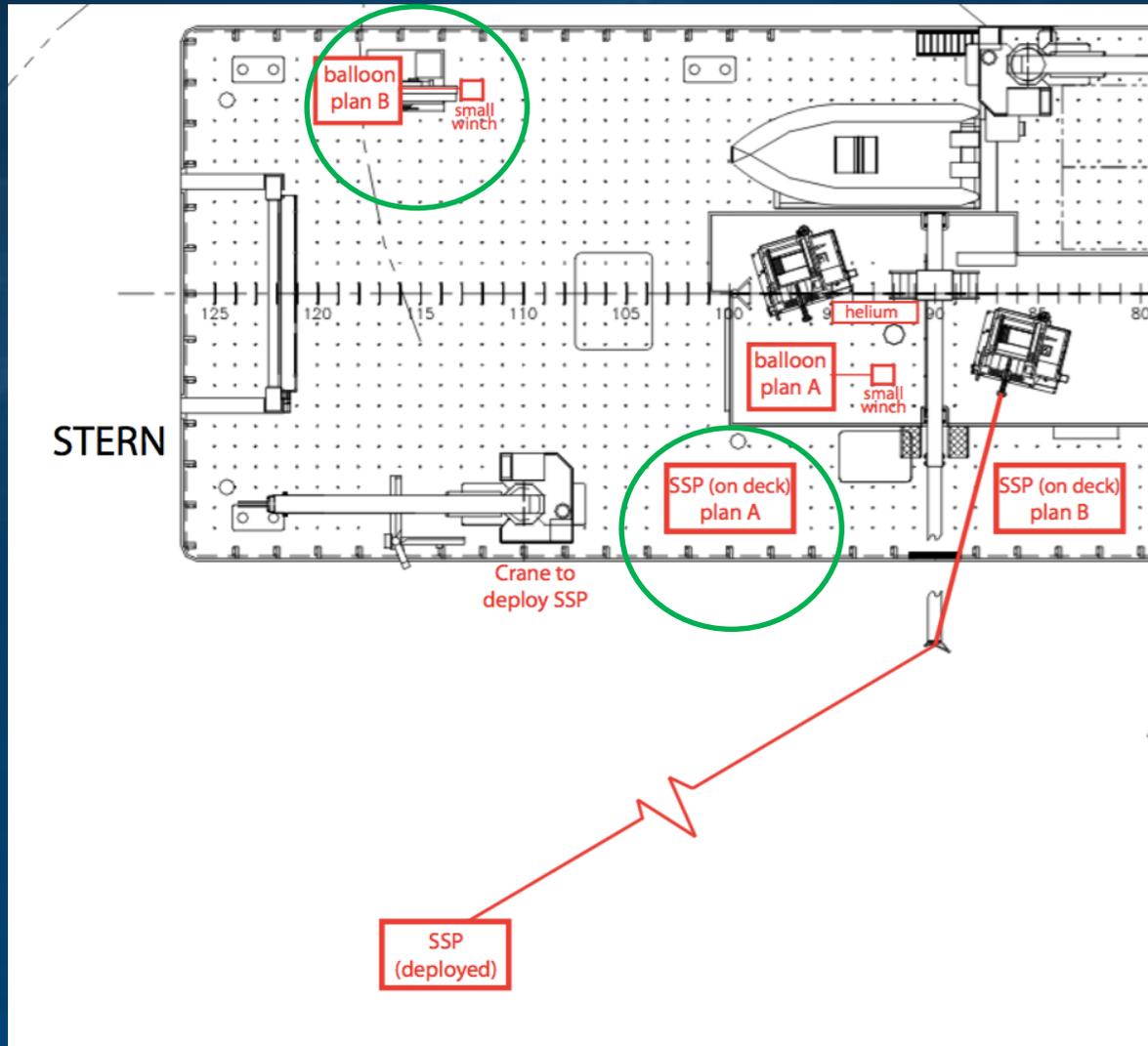
# LTAIRS – Lighter-than-Air IR System



- Stabilized 2-axis gimbal
- Digital IR and video cameras
- Imagery monitored from ship

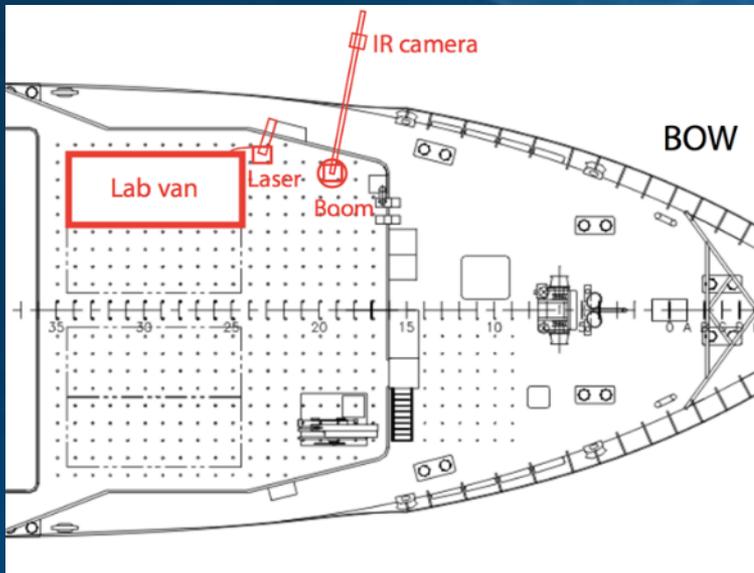


# Stern Deck Layout

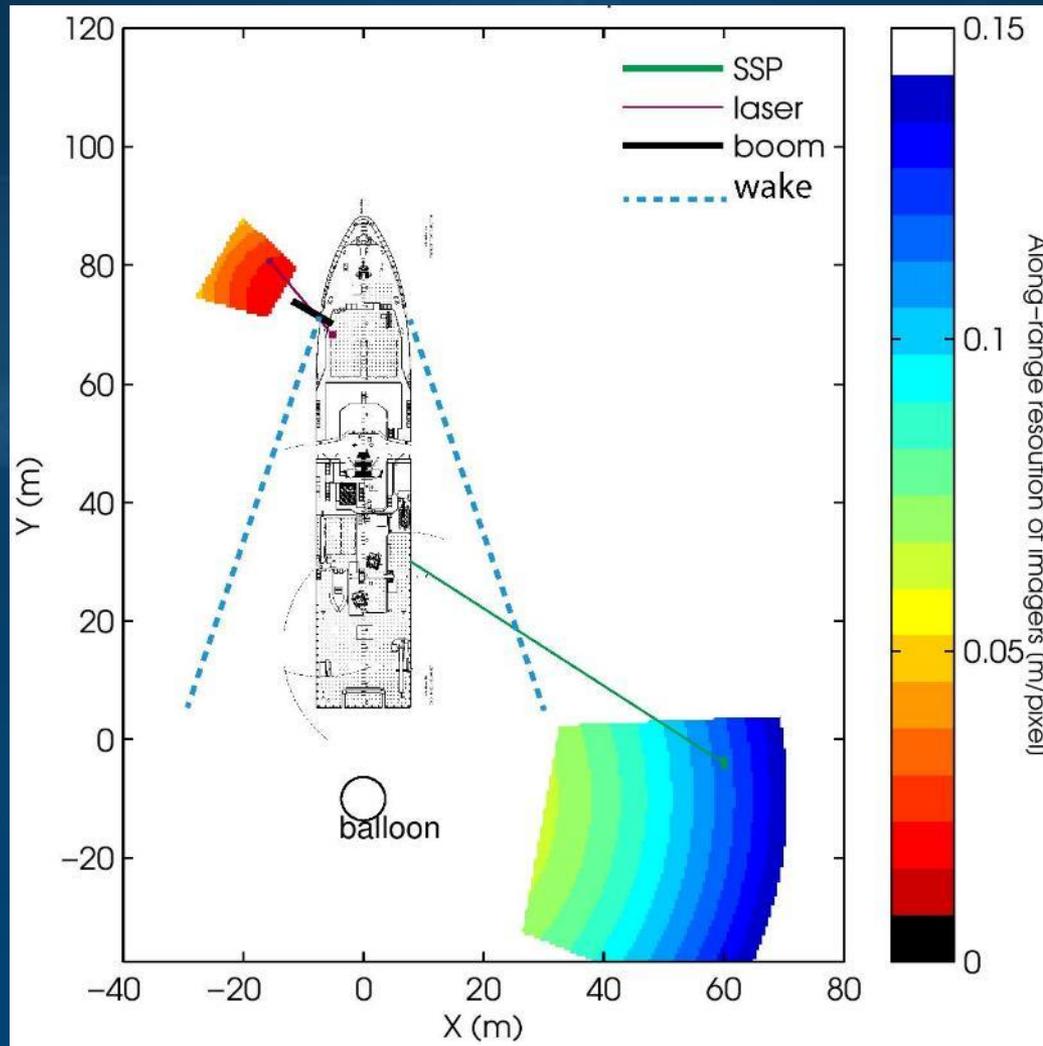


# Controlled Flux Technique

- CO<sub>2</sub> laser heats small spot on ocean surface
- IR camera used to measure decay time
- Van on forward O2 deck
  - CO<sub>2</sub> laser and cooling system on deck
  - Boom to hold IR camera



# SSP, LTAIRS, and CFT Deployed



# Information System Field Support

- Routine in situ observations: Argo, drifter, TAO
- Satellite Observations
  - AVISO SSH & currents
  - GPM Precipitation
  - SST
  - ASCAT and/or RapidSCAT winds
- 72-hour forecasts of
  - Wind and rain from GFS model + wave height
  - SSS, SST, velocity at surface and depth from ROMS
- Daily briefing
- File containing all SSS observations plus map

# Forecasts of Interest

- What forecast products would PIs onboard like?
- This depends on the internet bandwidth of Revelle. Limited during DYNAMO.
- Do you want routine daily weather report via email, or direct download of weather info from a website?
- What is priority if bandwidth is an issue?