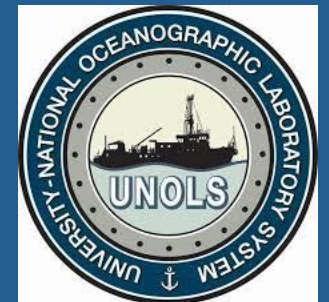

SIO Portable MCS System Overview

09 Dec 2023

Lee Ellett, Manager

Shipboard Technical Support

Scripps Institution of Oceanography



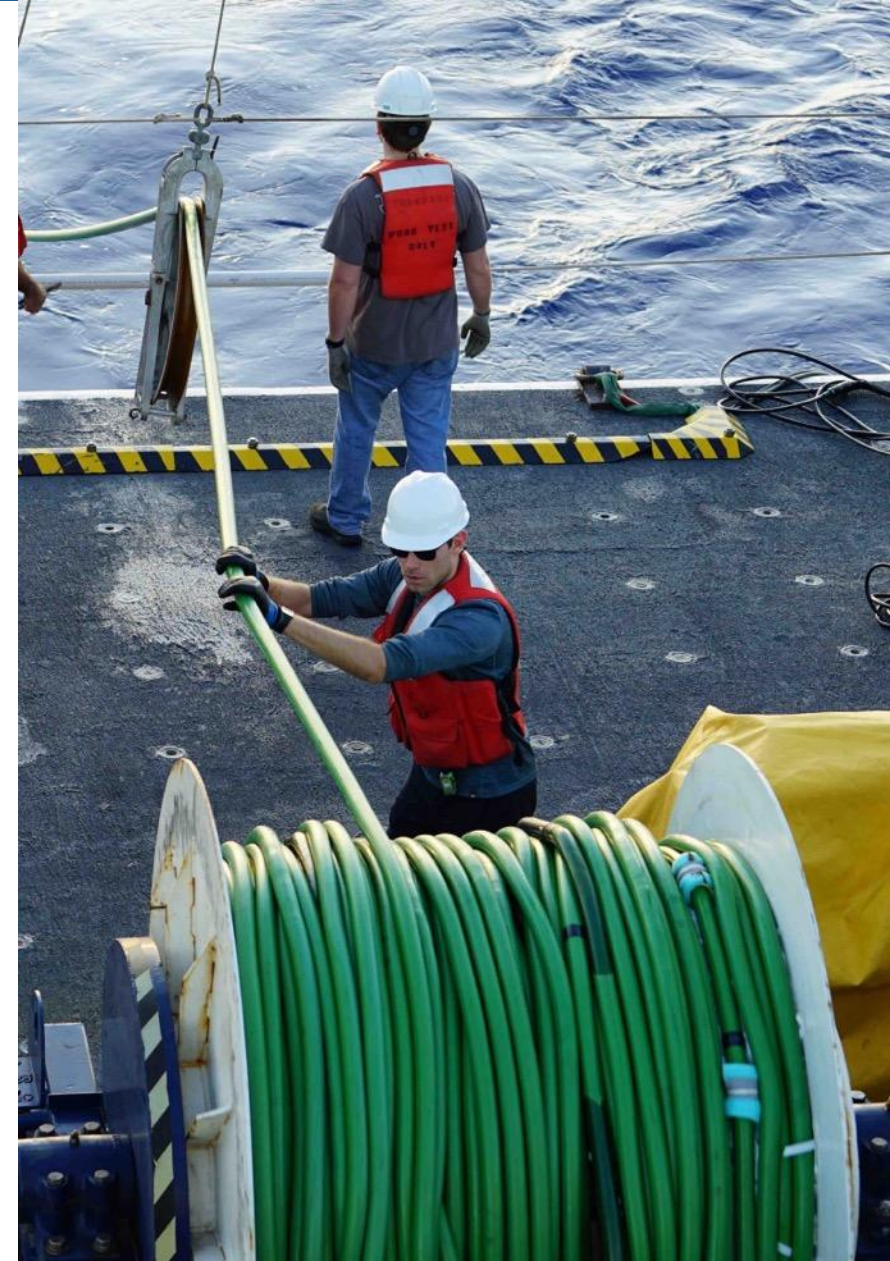
Deck Equipment

Hydrophone Streamer

- Geometrics GeoEel Solid
- 120 Channels, 15 active sections
- 6.25m group spacing
- Tail buoy passthrough module

Digicourse Birds

- Typically, 5, 5011 Compass Birds



Deck Equipment



Acoustic Sources

- Sercel GI 210
- Typical 45/105, True GI
- 3 sources in inventory

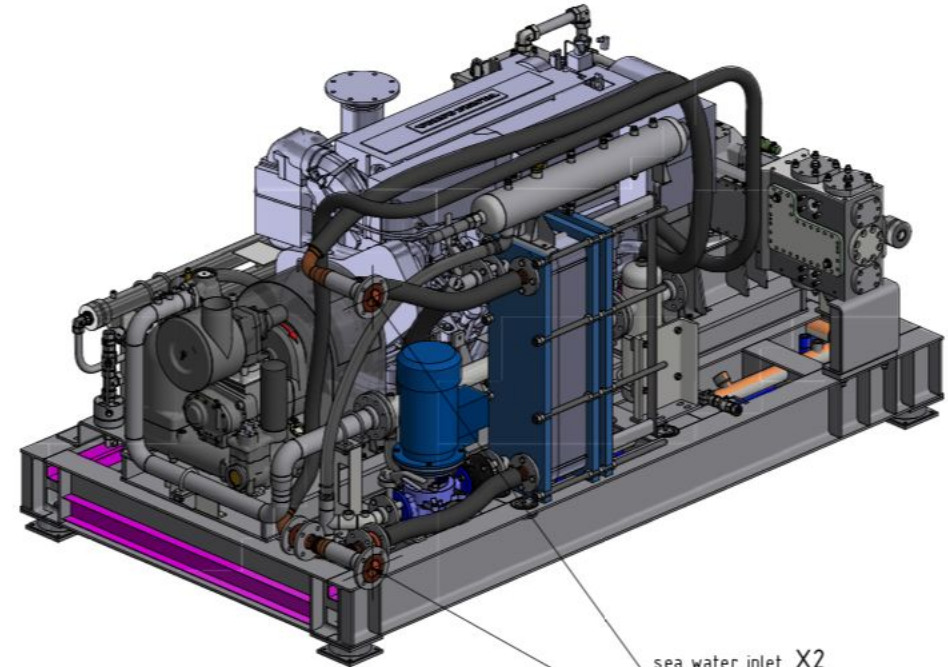
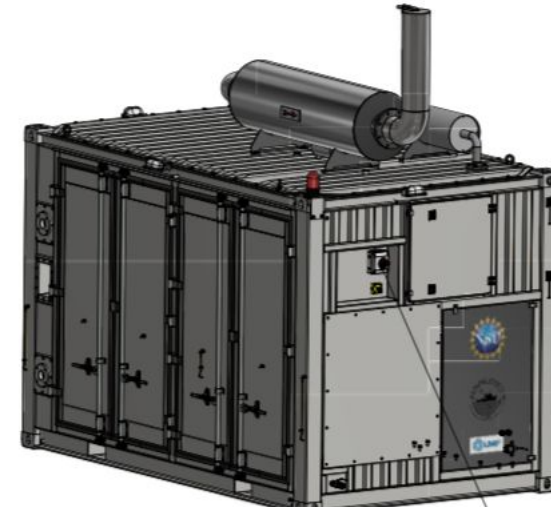


Deck Equipment



Compressors

- 2 Compressors
- Model LMF 11s
- 2000-3000 psi
- Output 385 scfm
- Commissioning in progress



Personnel



Technical Personnel

- 2x Geophysical Engineers
- 2x Geophysical Technicians
- Compressor Technician

Protected Species Mitigation

- Big eyes
- Night vision devices
- Reticule binoculars
- 3 or more observers

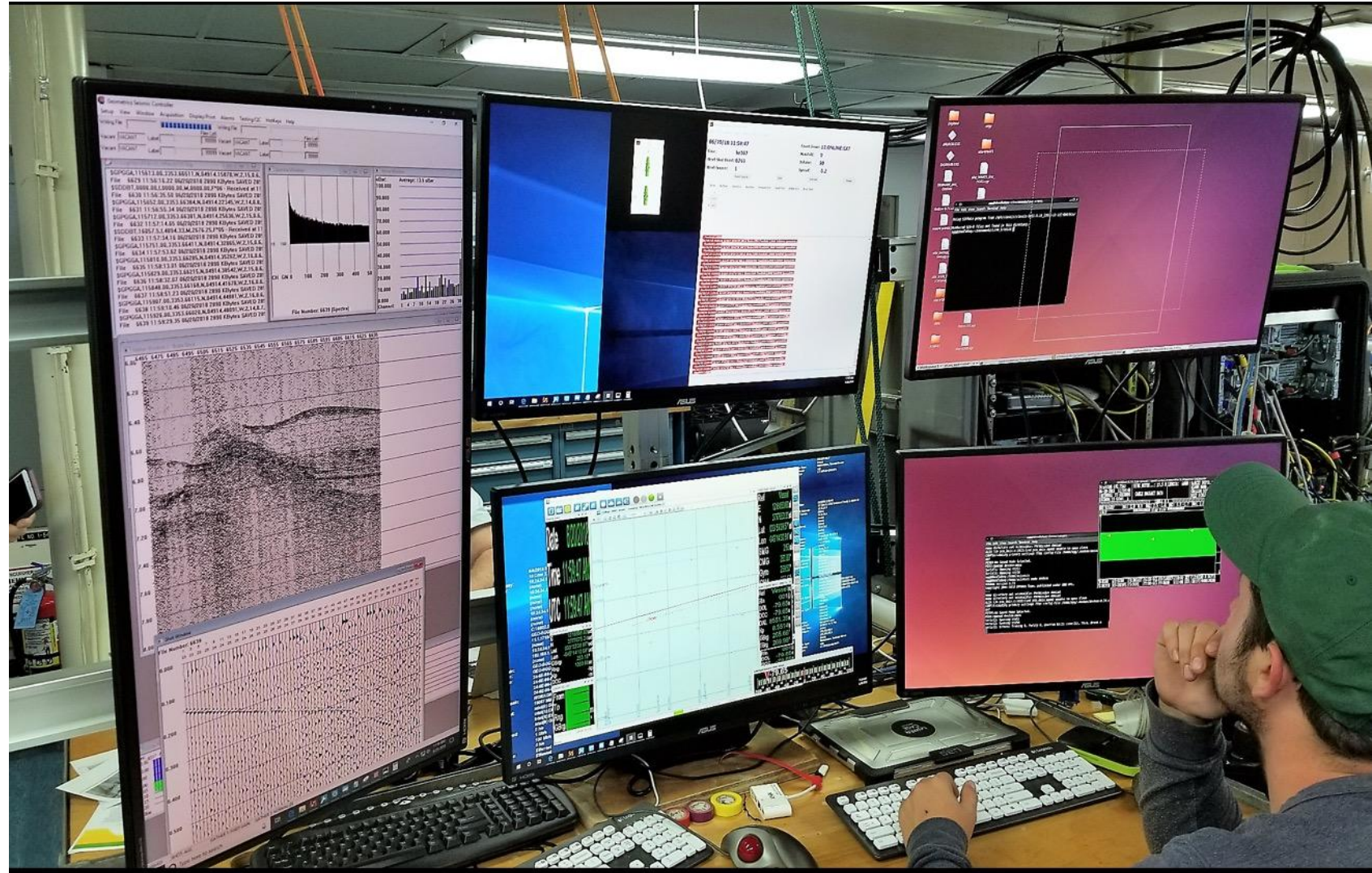


Equipment

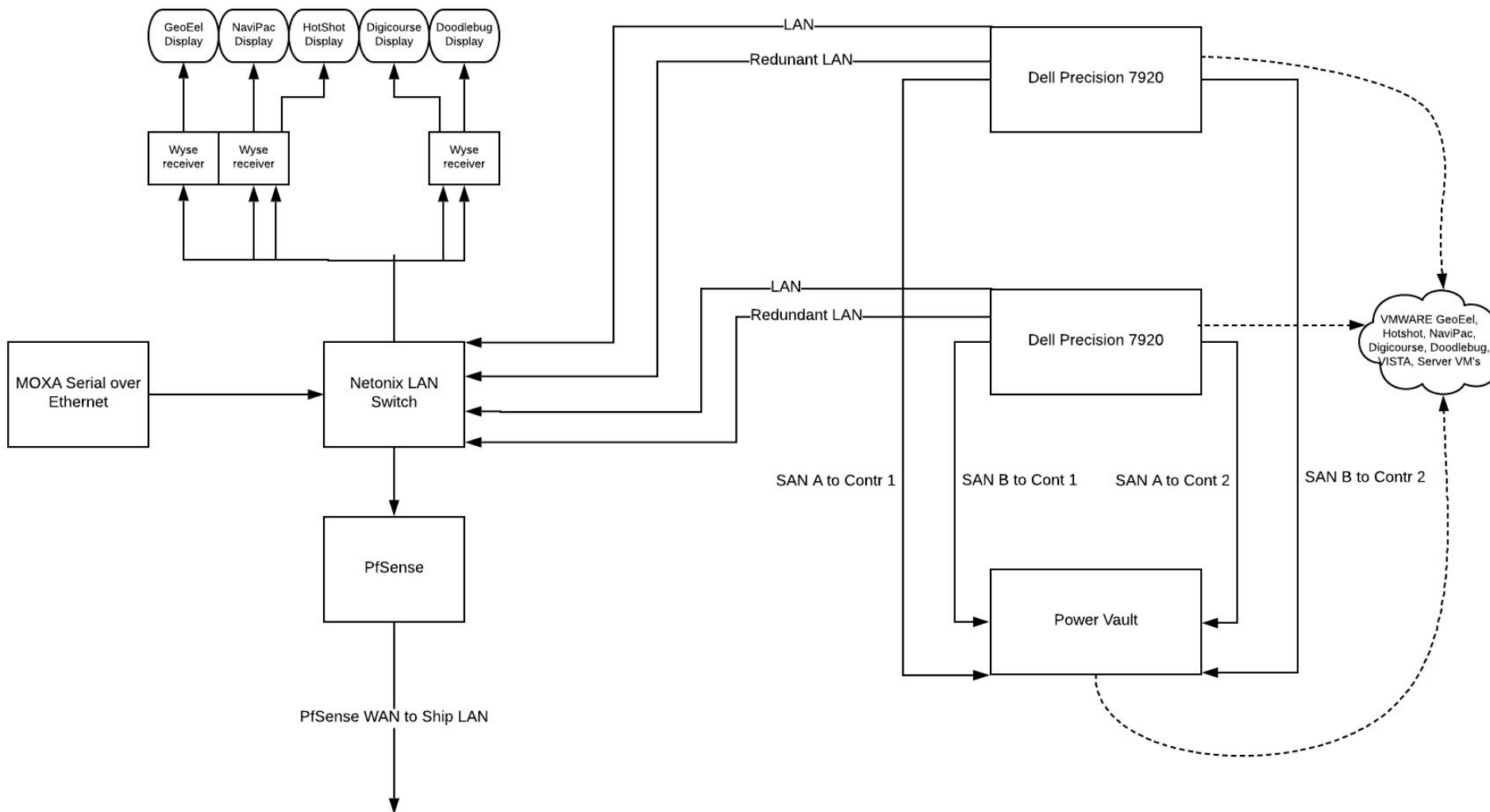


Data Acquisition System

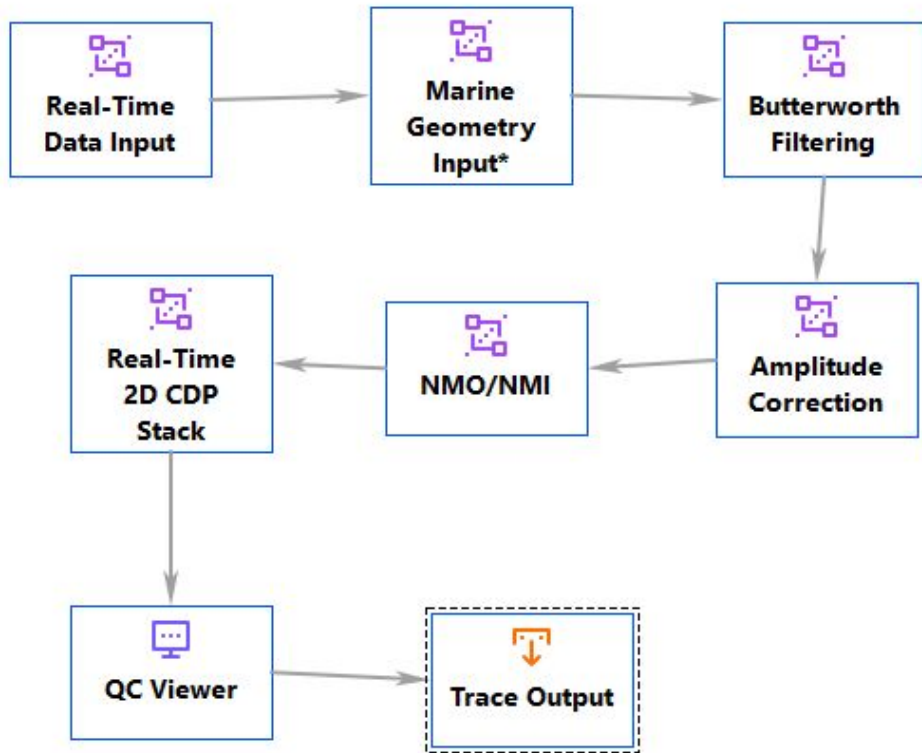
- Streamer Recorder
- Source Controller
- Bird Controller
- Navigation
- Realtime QA/QC



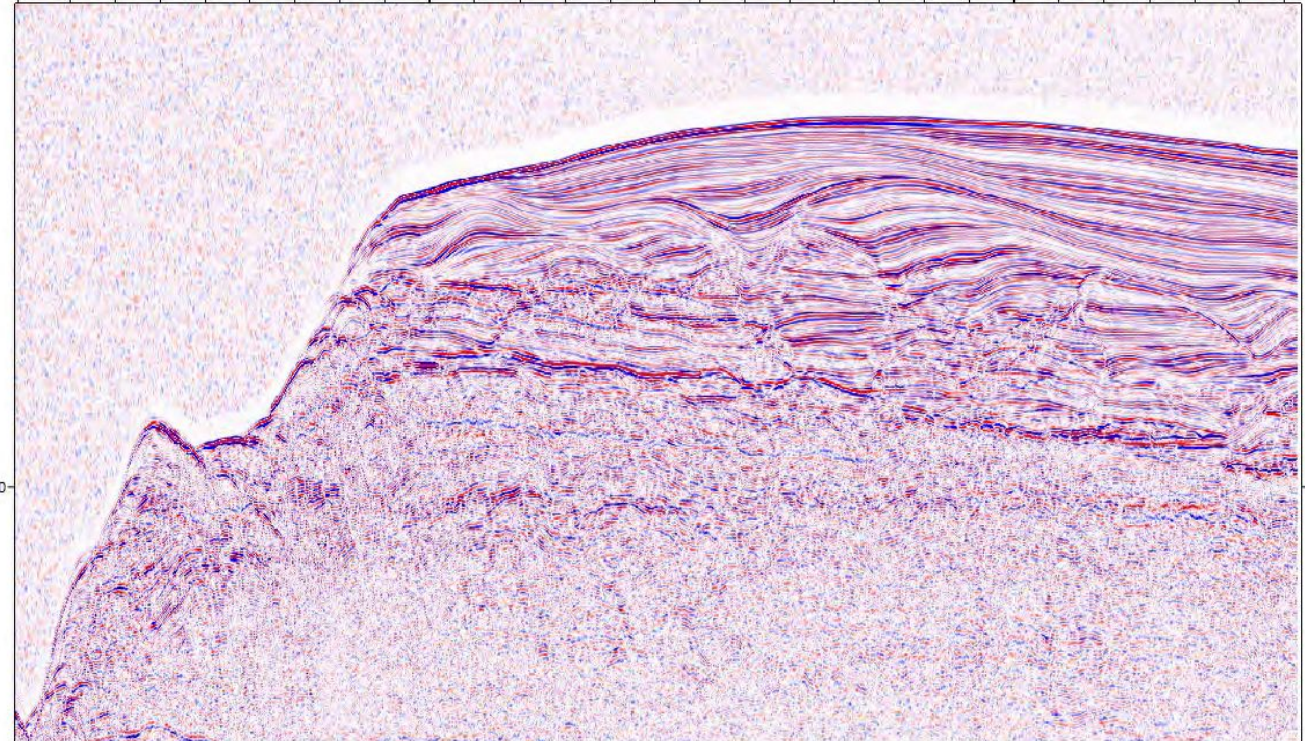
Acquisition Hardware Overview



QA/QC Tools



CDP 58920 59420 59820 60220 60620 61020 61420 61820 62220 62620 63020 63420 63820 64220 64620 65020 65420 65820 66220 66620 67020 67420 67820 68220 68620
TRACENO 970743 980485 988142 995766 1003950 1012694 1021405 1030116 1038897 1047678 1056389 1065123 1073778 1082522 1091233 1099944 1108725 1117506 1126217 11349
FFID 8357 8407 8451 8494 8538 8582 8626 8669 8713 8757 8801 8844 8888 8932 8976 9019 9063 9107 9151 9194 9238 9282 9326 9369 9413 9457 9501 9544 9588



Vessel Considerations



R/V Roger Revelle (SIO)

R/V Melville (SIO)

R/V Thomas G. Thompson (UW)

R/V Atlantis (WHOI)

R/V Hugh R. Sharp (UD)

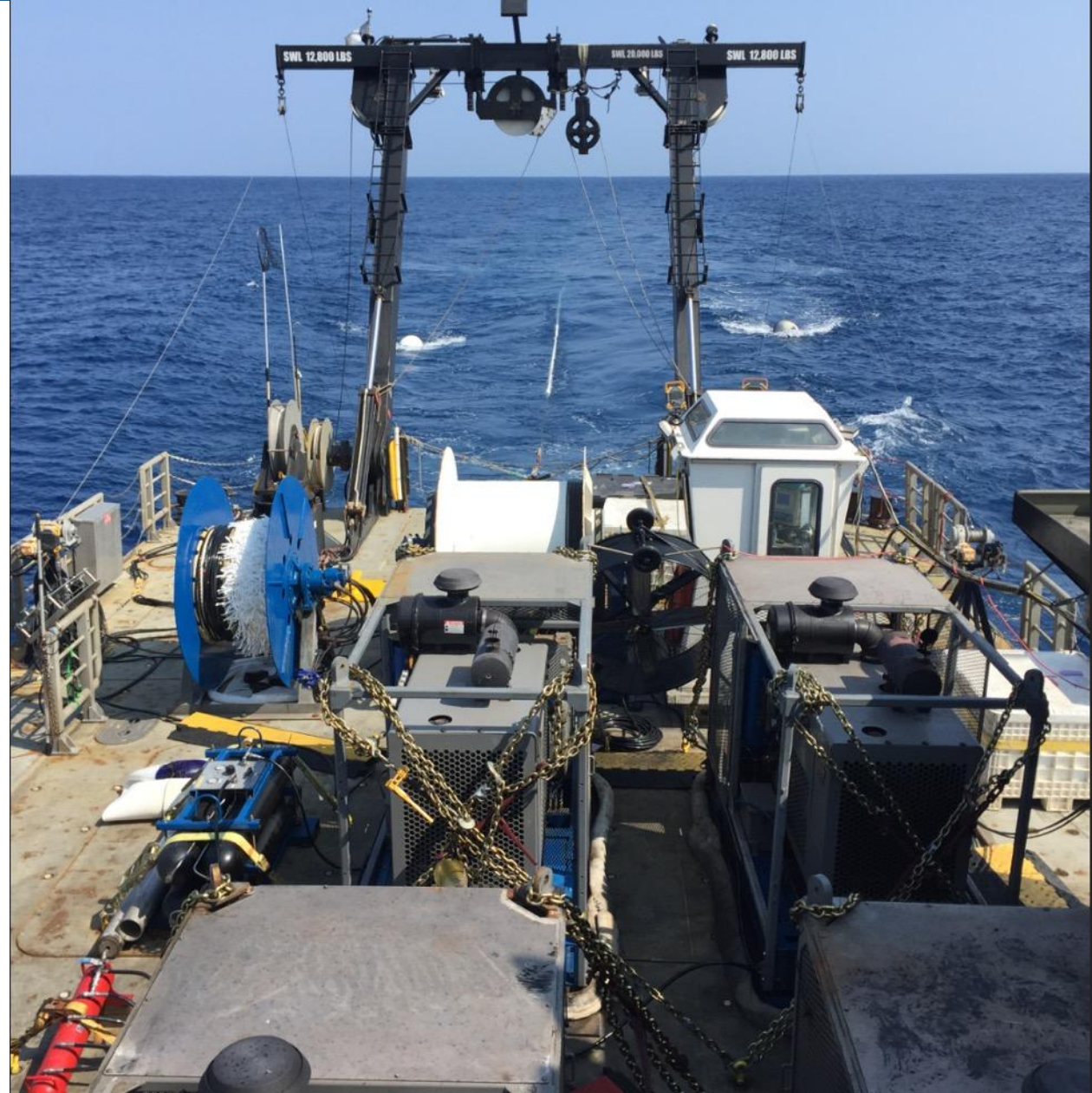
R/V Endeavor (URI)

R/V Wecoma (OSU)

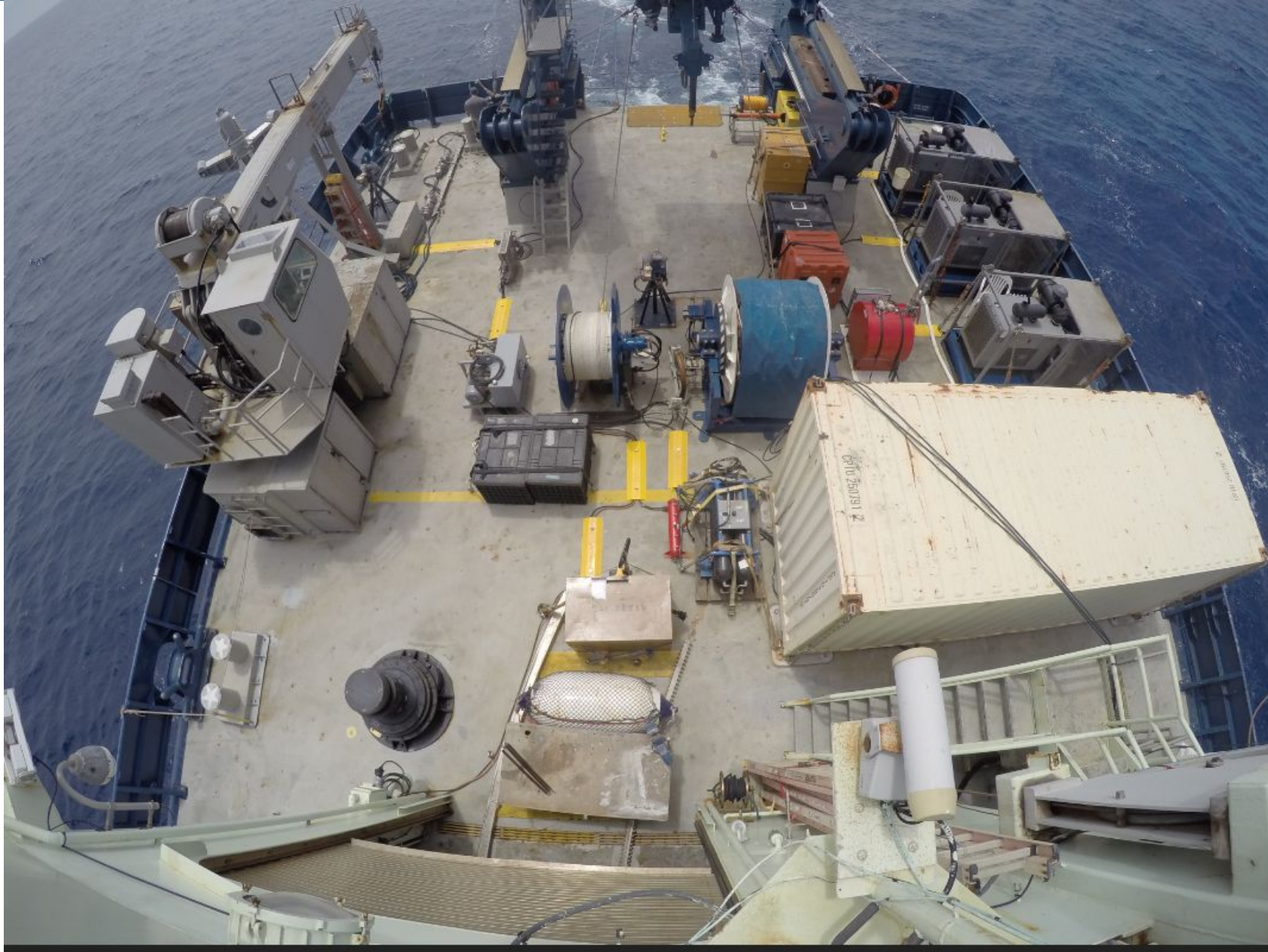
RRS James Cook (NERC)

B/O Francisco de Ulloa (CICESE)

B/O Justo Sierra (UNAM)



Deck Configuration Considerations



Data Example R/V Thompson 2019



Seismic Stratigraphy of Valdivia Bank, Walvis Ridge, South Atlantic Ocean: Sedimentation on a Thermally Rejuvenated Plateau

Edgar Contreras, William Sager, Hua-Wei Zhou
Earth and Atmospheric Sciences, University of Houston



Introduction

- Valdivia Bank (VB) is an oceanic plateau that is part of the Walvis Ridge (WR), a seamount chain formed by hotspot volcanism at the MAR.
- Dating of dredge and core samples on WR suggests formation in the Late Cretaceous (<84 Mya); however, Eocene volcanic rocks have been recovered.
- Bathymetric investigations suggest that VB evolution is complex, as rift, fan and recent sediment transport have shaped the edifice, and a late magmatic pulse uplifted the summit to sea-level (Contreras et al., 2022).
- Core age of VB is limited geophysically data is limited (Figure 1).
- Seismic data offer glimpses into the stratigraphy and of a plateau rejuvenated by secondary volcanism (Figure 1). Three drill sites from IODP Expedition 391 provide insights into the sedimentology and age.

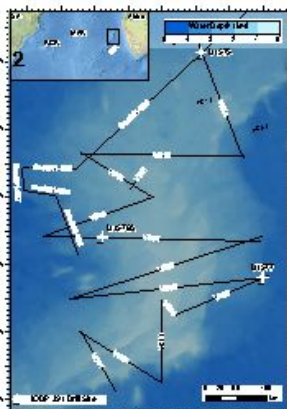


Fig. 1. Bathymetric map of the Walvis Ridge and Valdivia Bank region. VB = Valdivia Bank, WR = Walvis Ridge, CP = Central Plateau, SP = Southern Plateau, MTD = Mid-Tertiary Drift. Data from Contreras et al., 2021, available by doi:10.26434/chemrxiv-2021-03-01-100000

Objective

Implement principles of seismic stratigraphy and results from IODP 391 drill sites to understand the depositional history of VB and provide insights into the evolution of a thermally rejuvenated oceanic plateau.

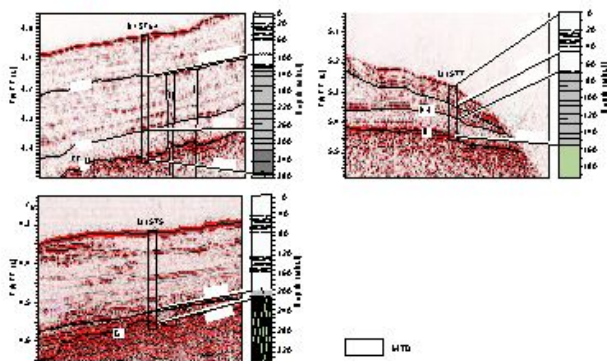


Fig. 2. Seismic stratigraphic correlation charts. Top: IODP 391 sites U1575, U1576, U1577. Bottom: IODP 391 sites U1575, U1576, U1577. Legend: MTD = Mid-Tertiary Drift, VB = Valdivia Bank.

Observations

The subsurface on VB can be subdivided into three seismic units (SUI – SUI3) of similar sediment character (e.g., reflection amplitude and geometry).

- Seismic Unit 1 (SUI1): an upper interval of transparent, variably coarsely to finely clastic reflections. Its inferred age is Miocene-Pliocene (Figure 2).
- Seismic Unit 2 (SUI2): a middle sequence of continuous, subparallel moderate amplitude reflections. To a first order, intervals of moderate and low amplitude sub-parallel reflections. Also contains a volcanic subunit (SUI2v) comprising discontinuous to chaotic, high amplitude reflections. Inferred Miocene-Pliocene in age (Figure 2).
- Seismic Unit 3 (SUI3): a lower, acoustically transparent interval that is conformable to the basement reflector. Its inferred age is Campanian (Figure 2).

Additionally, several large-scale features are observed (Figure 3)

Fig. 3. Seismic stratigraphic correlation chart of VB. Legend: MTD = Mid-Tertiary Drift, VB = Valdivia Bank, CP = Central Plateau, SP = Southern Plateau, MTD = Mid-Tertiary Drift, VB = Valdivia Bank, CP = Central Plateau, SP = Southern Plateau.

Sediment Cap

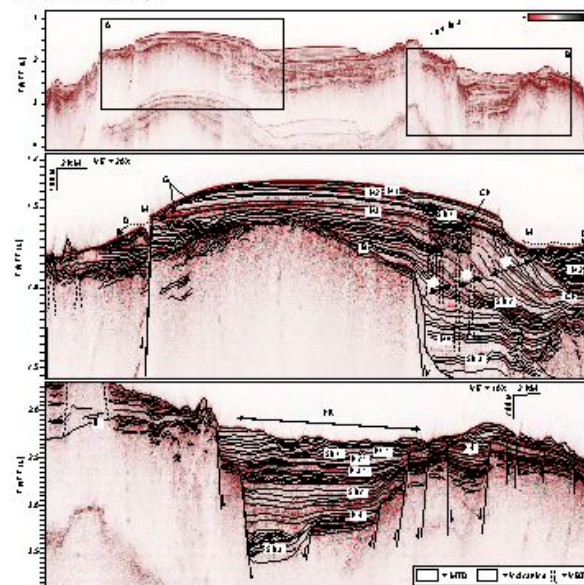


Fig. 3. Seismic stratigraphic correlation chart of VB. Legend: MTD = Mid-Tertiary Drift, VB = Valdivia Bank, CP = Central Plateau, SP = Southern Plateau, MTD = Mid-Tertiary Drift, VB = Valdivia Bank, CP = Central Plateau, SP = Southern Plateau.

Evidence of Late-Stage Volcanism

Fig. 4. Portion of seismic MTD showing stratigraphic truncation and late-stage volcanism. Circle to the right of the profile. Core recovered from the east-west core site (U1575) is shown in red. The MTD is truncated by the volcanic flow. The volcanic flow is dated to the Eocene (U1575) and is dated to the Eocene (U1575).

Fig. 4. Portion of seismic MTD showing stratigraphic truncation and late-stage volcanism. Circle to the right of the profile. Core recovered from the east-west core site (U1575) is shown in red. The MTD is truncated by the volcanic flow. The volcanic flow is dated to the Eocene (U1575) and is dated to the Eocene (U1575).

Conclusions

VB seismic stratigraphy and IODP 391 drill site results provide insights into the evolution of a thermally rejuvenated oceanic plateau, capturing changes in response to plateau paleoheight.

- Campanian
 - Following emplacement, VB experienced relatively uniform sedimentation as evidenced by a consistent sediment thickness of SUI3.
- Miocene to Eocene
 - Rifting and differential subsidence promoted sediment accumulation in local depocenters formed in response to structural changes, as SUI2 sediments are locally truncated.
 - The onset of an eroded volcanic flow, which likely represents a single volcanic event underlying the volcanic flow, is dated to the Eocene (U1575).
 - Clinalines formed in response to subsidence and subsequent uplift related changes in plateau paleoheight (Figure 4). The plateau was uplifted to sea-level and subsequently eroded.
- Eocene to Present
 - Following renewed subsidence periods of non-deposition and erosion formed features within the same section of SUI1 likely due to reduced clastic productivity in the Miocene and Eocene.
 - Sedimentation resumed in response to paleoceanographic changes reworked and redistributed sediments on VB, creating mounds and drift on the summit areas and potentially triggering submarine landslides.

How to Request, Questions



Marine Facilities Planning Tool

- Ship-time and Marine Equipment Request Form
- Pooled and Portable Equipment
- Portable Seismic System



Contacts

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