Training on Sea going measurements and sampling

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Profiling

What is a profile and why do we want one?

Profiling = measuring a parameter from surface to bottom depth

Parameter = **salinity**
temperature
oxygen concentration
turbidity
light/chlorophyll a/pH/….

Ocean currents based on density profile

Boundaries of water masses eg. upwelling & sediment transport

Transport of pollutants in coastal areas

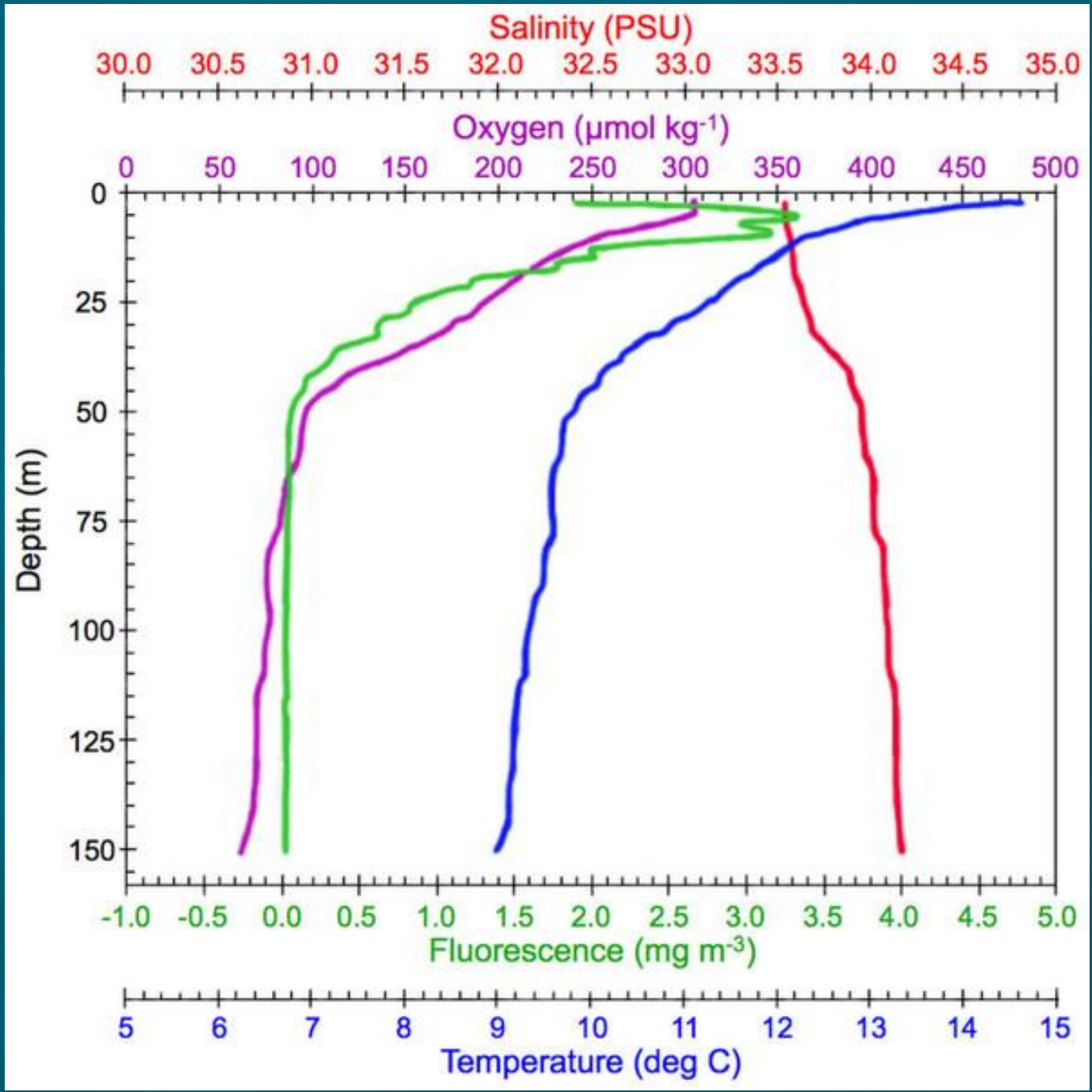
Sharp changes mean chemo-biological processes

Anoxic layers

Sound velocity profiles for acoustic instrumentation

VLIZ

Profiling



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Oceanographic terms

Stratification

Mixed Layer : surface of the ocean well mixed (<200m depth)

Deep Layer : separated from top layer by a region of change in density

Thermocline : drop in temperature

Halocline : increase in salinity

Pycnocline : increase in density

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Oceanographic Parameters

Measure : Conductivity, Temperature and Pressure

Measure : Oxygen conc., turbidity, fluorescence,……..

Calculate :

- Depth : using Pressure & Latitude (and Atm. Pressure)
- Salinity : using C, T & P
- Density : using S, T & P
- Sound Velocity = using S, T & P

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Oceanographic Parameters

Salinity = amount of salts in one liter of water

Salinity cannot be measured in situ

Composition of seawater not fully equal worldwide

Conductivity = material's ability to conduct an electric current

Conductivity is a function of temperature

Salinity is not depending on temperature

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Oceanographic Parameters

Conductivity, Temperature & Pressure is measured

Salinity is calculated using C, T & P according to the Pratical Salinity Scale of 1978 PSS78

PSS78 uses International Temperature Scale 1968

ITS90 must be converted to ITS68

PSS78 only valid between -2 & 35°C

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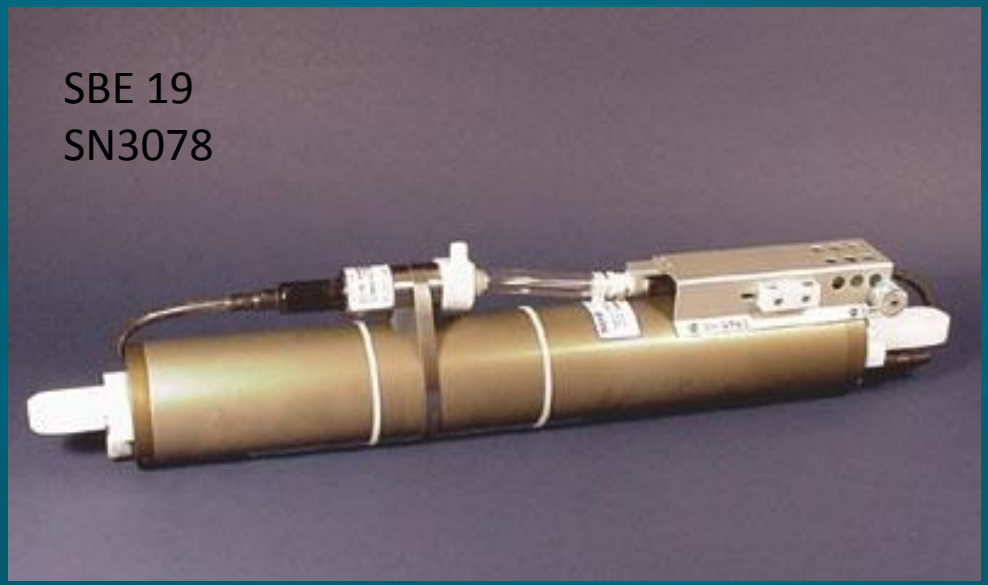
CTD

Profiling Equipment

CTD = **C**onductivity, **T**emperature & **D**epth

Electronic equipment that reads and stores C, T & P data

Evt. also data of integrated sensors (turbidity)



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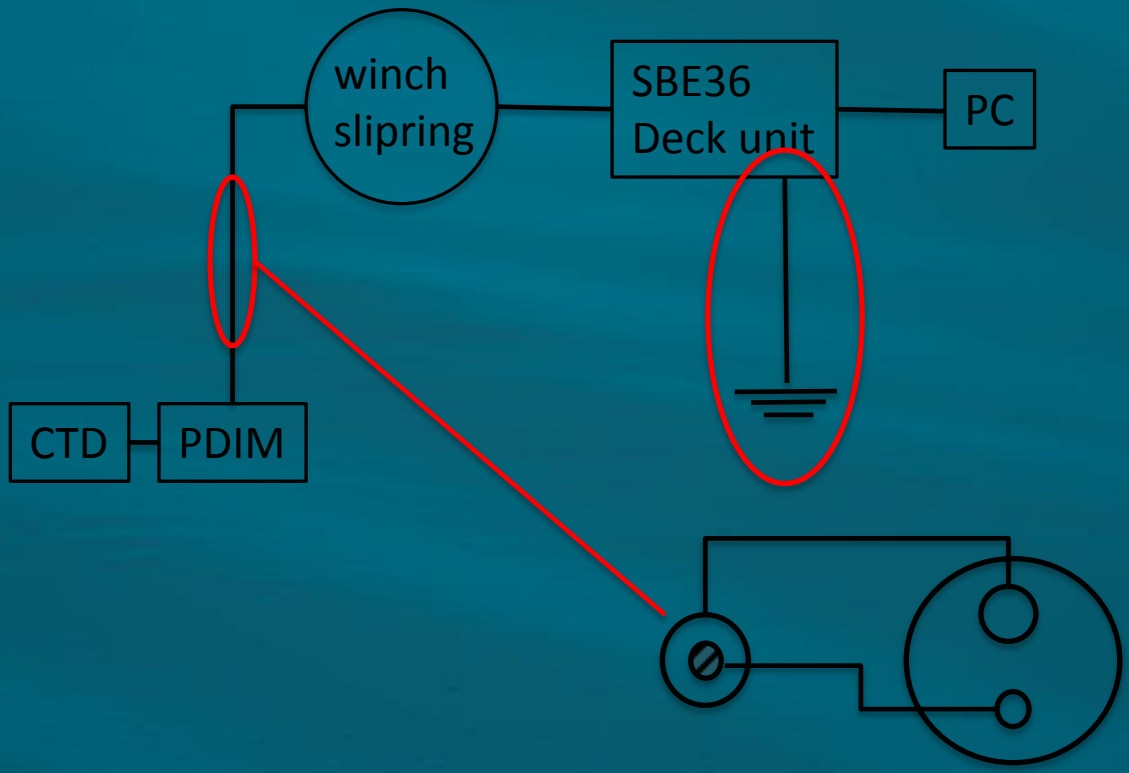
CTD

Profiling Equipment

Real time deployments

= winch + slipring, termination on the sea-end of the cable, PDIM (power interface data module) & deckunit plus PC



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CTD Profiling Equipment

Deckunit

SWITCH OFF WHEN (DIS)CONNECTING CTD

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CTD

Profiling Equipment

SeaTerm

= communicating with your instrument

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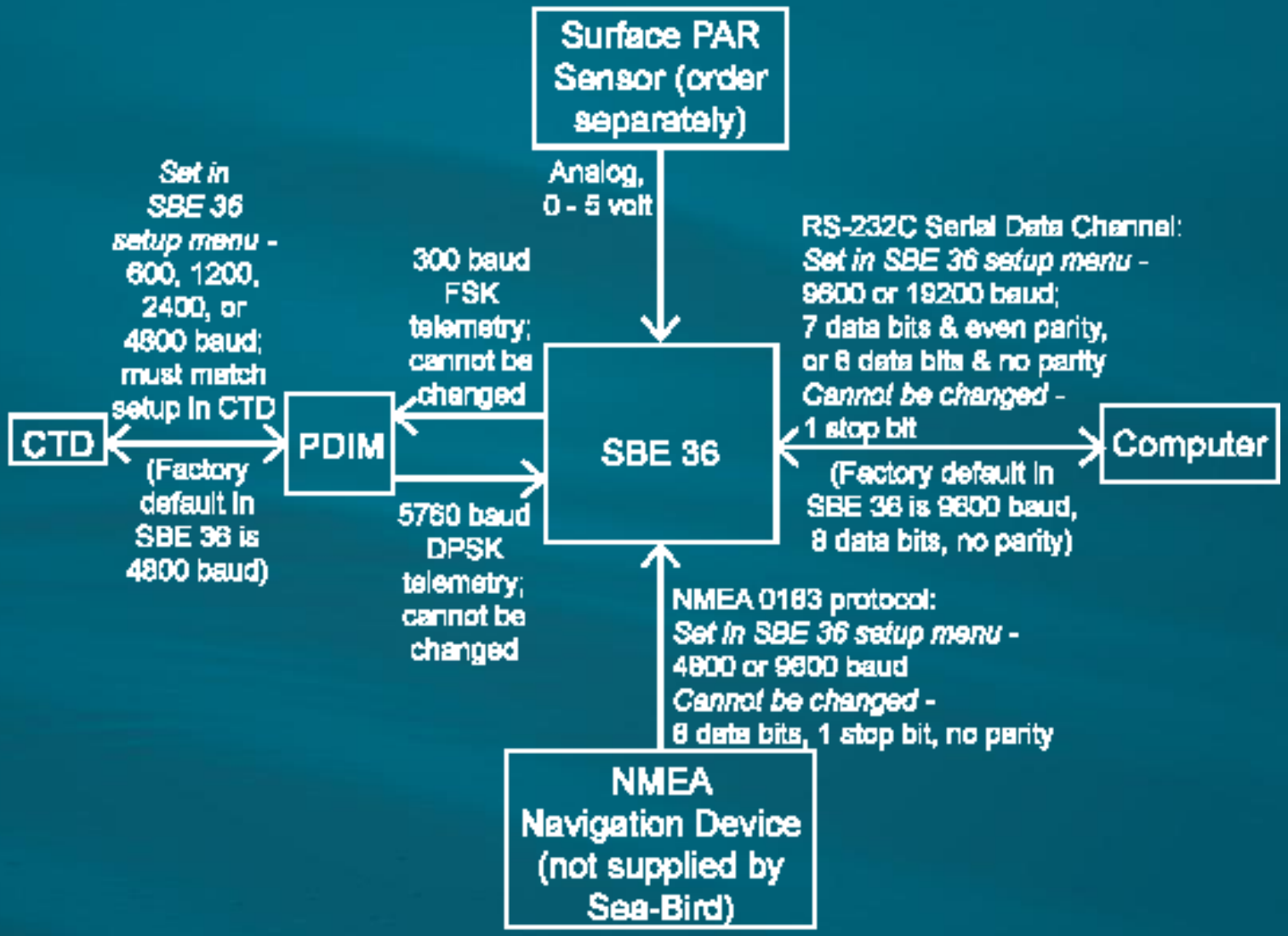
CTD Profiling Equipment



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Profiling Equipment

SeaSave

= communicating with your instrument in realtime mode

= realtime data acquisition

= visualising profiles

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Files

= YYMMDD-3078.con = calibration values of instrument

= YYMMDD-station.hdr = header file

= YYMMDD-station.hex = raw data file

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CTD

Profiling Equipment

Preparation

= Check communication / take a bench cast

= Check memory

= Check batteries

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CTD

Profiling Equipment

Preparation

= Check communication / take a bench cast

= Check memory

= Check batteries

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Taking a cast

Conductivity cell (& thermistor) only provide good data when water is pumped at constant flow through the cell

Plumbing

= tubing allows to air within the system to escape. Keep tubes clear

Mating connectors

= use silicon grease to watertight & lubricate

= mate correctly to keep pins in good condition

= always cover pins with dummy plug or connecting plug

Check cables : clear of sensors, well tied

Taking a cast

SBE19 sampling rate = 2Hz (2times per second)

Profiling rate

= descend/ascend rate =1m/sec (winch specs)

= 2 readings / m

= 1m resolution !!

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Taking a cast

Soak CTD before starting

- Allow air to vent
- Allow sensors to equilibrate
- Allow pump to start
- Allows to check readings

Soaking in surface waters

- 3m, 2min in shallow water
- 10m, 10min in deep water

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Taking care of sensors

Temperature sensors are very resistant to shock, drift will be caused by exposure to heat.

Drift is usually <0.0002°C/month

(equal for SBE3)

Conductivity sensors are very sensitive to coatings inside cell

Drift is usually 0.0003 S/m /month

keep the cell clean!!

A thin layer of .002mm causes a drift of .035 PSU

Don’t lower the CTD in oilfilms

Regularly clean/soak with Triton-X (soap)

Never use a brush to clean the cell

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Taking care of sensors

Pressure sensors drift can be checked ‘in air’

Pressure on deck should read zero

Offset can be entered in the con.file if needed

DON’T LOWER YOUR CTD BELOW 600m Depth

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Underway data

What are underway data and why do we want them?

Underway = measuring time stamped and geo-referenced parameters at regular time intervals

Parameter = **time UTC**
LAT/LON
Seawater Surface Temperature & Conductivity

Collecting basic environmental data while sailing/sampling

Keeping track of cruise whereabouts

Supply research on ocean currents, global warming, deep ocean overturning,… with large areal coverage data

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TSG

Thermo**S**alino**G**raph SBE21

Pumped system installed on the ship

Takes water from approx. 3m depth

Flow rate should >0.8 <1.2 l/sec

Sampling interval 5sec (minimum)

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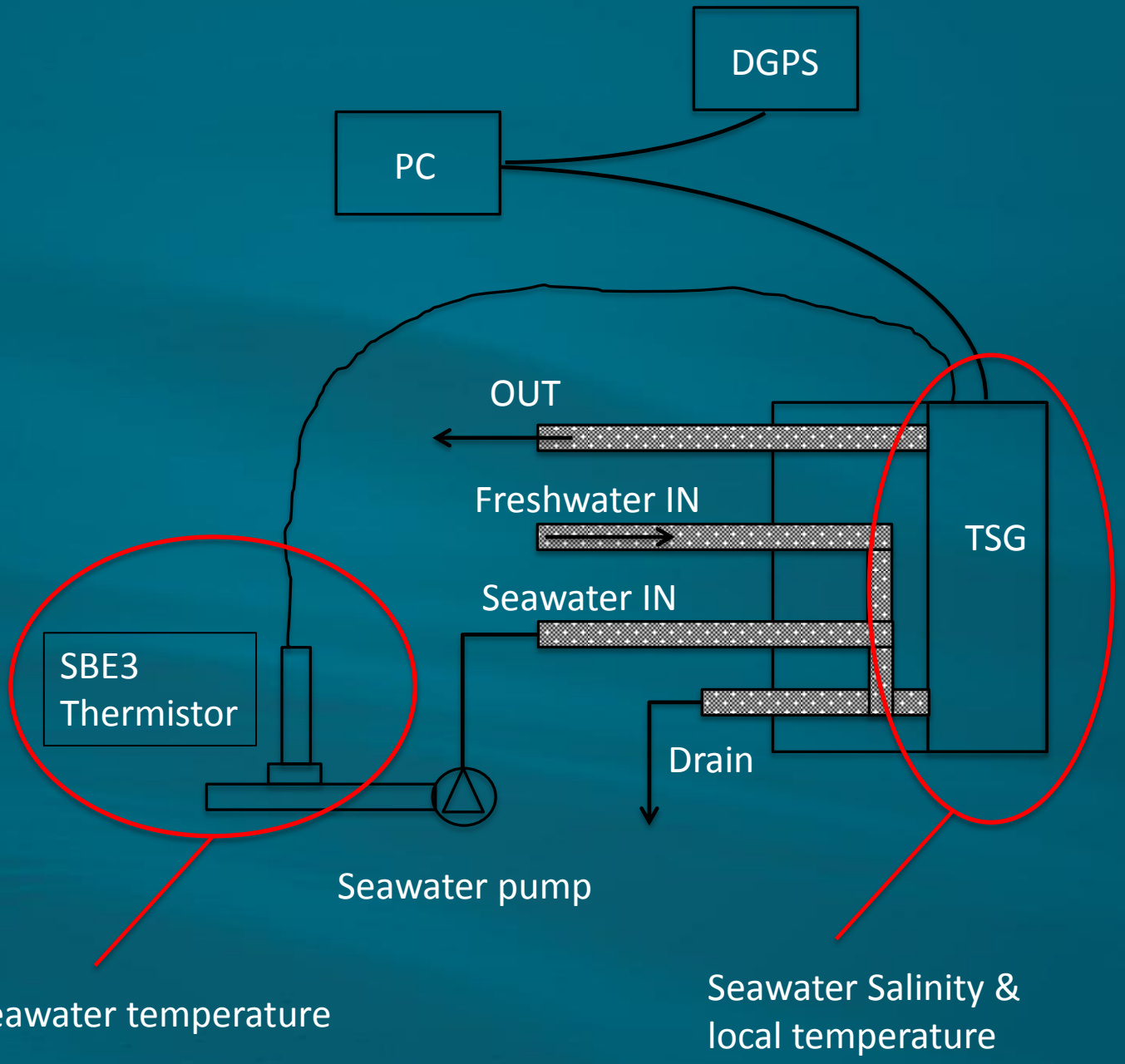
TSG


DGPS
PC
OUT
Freshwater IN
Seawater IN
Drain
TSG
SBE3
Thermistor
Seawater pump
Seawater temperature
Seawater Salinity &
local temperature

TSG

Maintain the SBE21

flush with freshwater at end of cruise

store with freshwater

rinse with non-ionic detergent (Triton-X) regularly

pumped systems are little critters heavens & sediment traps

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Problem shooting

My system doesn't work!! What now?

1. Check power source (power supply & batteries)
2. Does the CTD/SBE21 receive power?
3. Check fuse of SBE21
4. No data received : check sensor, check cable
5. Check baud rates
6. Test with datacable

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Water Sampling

Niskin Bottle

Mount the bottle above the CTD

Messenger to close the bottle

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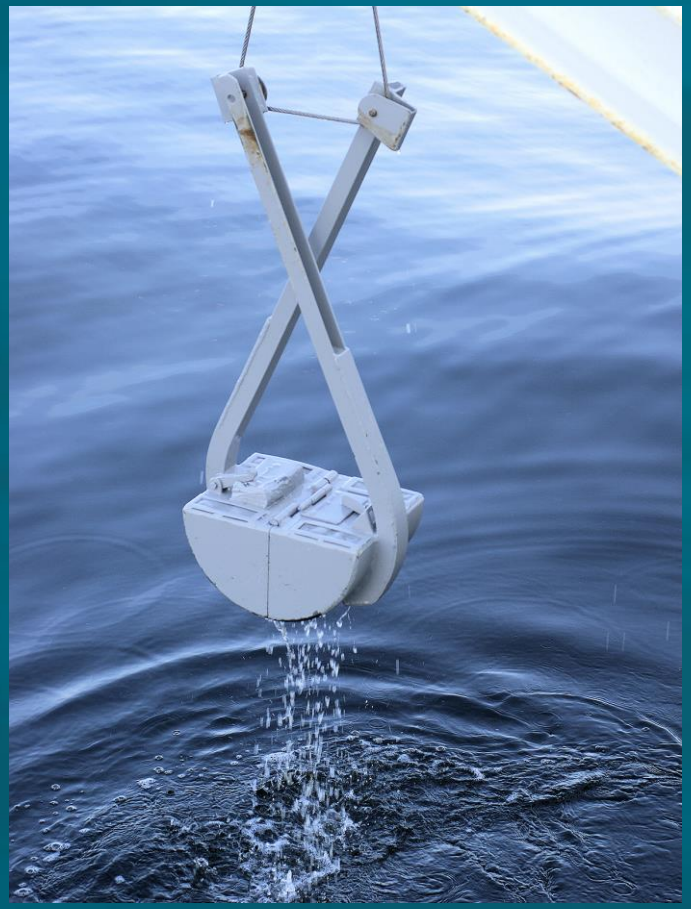
Van Veen grab

Standard sampling tool for macrobenthos & sediment



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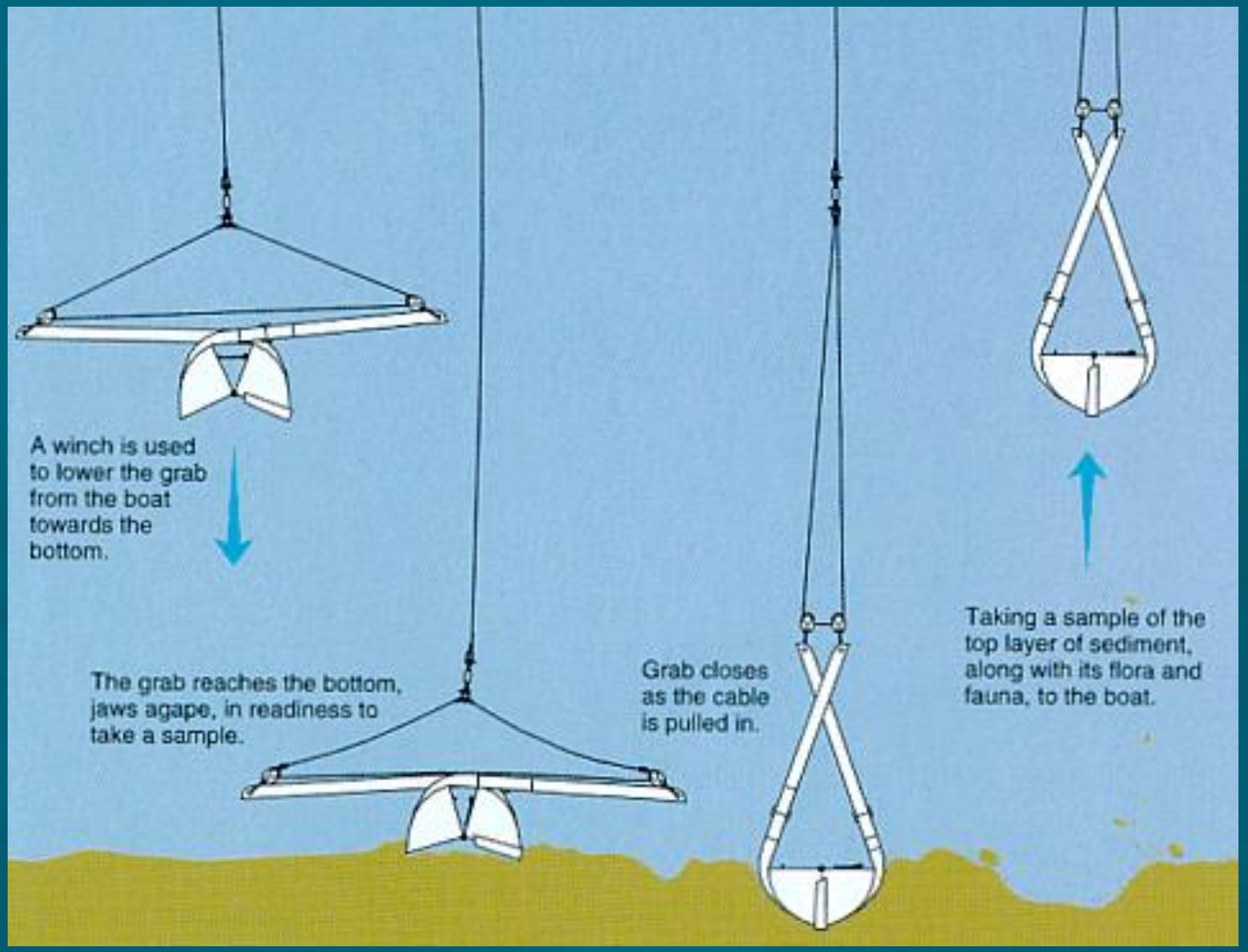
Sediment Sampling

Van Veen grab



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Van Veen grab

Chemistry/sedimentology sampling : volume depends on research needs

Biology sampling :

- full grab desirable (equal sample size)
- sieve over 1 of 0.5mm sieve
- sieve onboard or on land

Plankton Sampling

Plankton Net

Group	Size range	Examples
Megaplankton	> 20 mm	metazoans; *e.g.* jellyfish, ctenophores, pelagic tunicates, cephalopds, amphipods, pelagic tunicates, fish larvae…
Macroplankton	2→20 mm	Metazoans *e.g.* Pteropods, chaetognaths, krill, ctenophores, jellyfish, pelagic tunicates, amphipods, fish larvae, fish eggs, crustacean larvae
Mesoplankton	0.2→2 mm	Metazoans *e.g.* copepods, jellies, cladocerans, ostracods, chaetognaths, pteropods, tunicates, Pteropods, crustacean larvae
Microplankton	20→200 µm	Large eukaryotic protists, most phytoplankton, Protozoa; Foraminifera, ciliates, rotifers, juvenile metazoans (nauplii, echinoderm larvae)
Nanoplankton	2→20 µm	small eukaryotic protists; small diatoms, small flagelallets, unicellular algae
Picoplankton	0.2→2 µm	small protists & bacteria, smallest phytoplankton
Femtoplankton	< 0.2 µm	marine viruses

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Vertical Plankton Net Sampling

WP2 Closing Net
Net ring 57 cm diam. Net length 260 cm

WP3 Indian Ocean Standard Net
Net ring with 113 cm diameter Net length 470 cm.

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Horizontal Plankton Net Sampling

Ring Trawl Net (Calcofi Net)
Net ring 100 cm diameter, net of 400 cm length, PVC net bucket, 200µm mesh size