

APNA

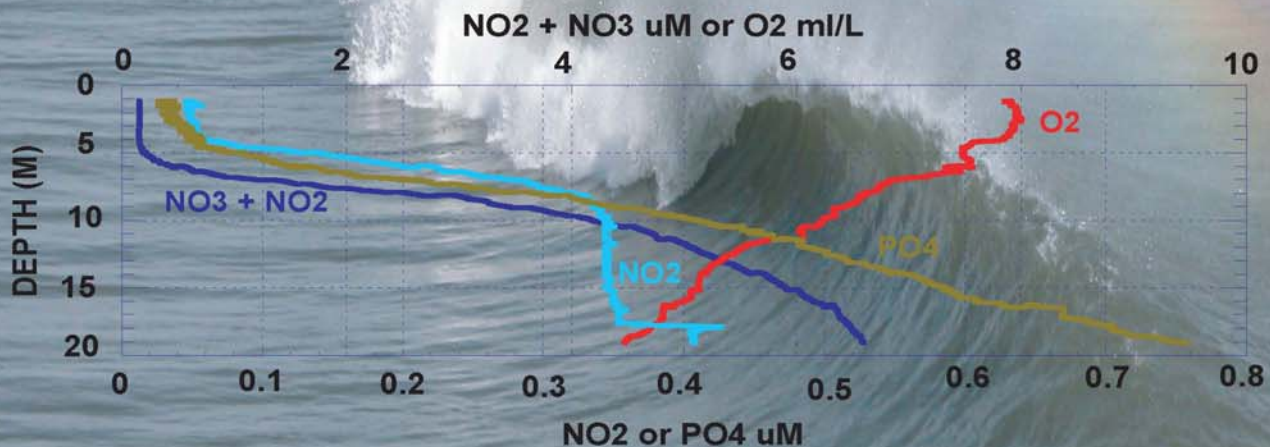
Autonomous Profiling Nutrient Analyzer

- Four to Six Channel Analyzer
- Multi-Chemical Capability
- Fast Response - Trace Concentrations
- Real-Time Data
- Programmable Controller
- Multi-Platform Adaptability



Autonomous or Cabled Multi-Mode Operation

- Autonomous Hi-Res Vertical Profiling
- Continuous Underway Surveying
- Intermittent Long-Term Sampling



Nitrate, Nitrite, Ammonium, Phosphate, Silicate, Iron



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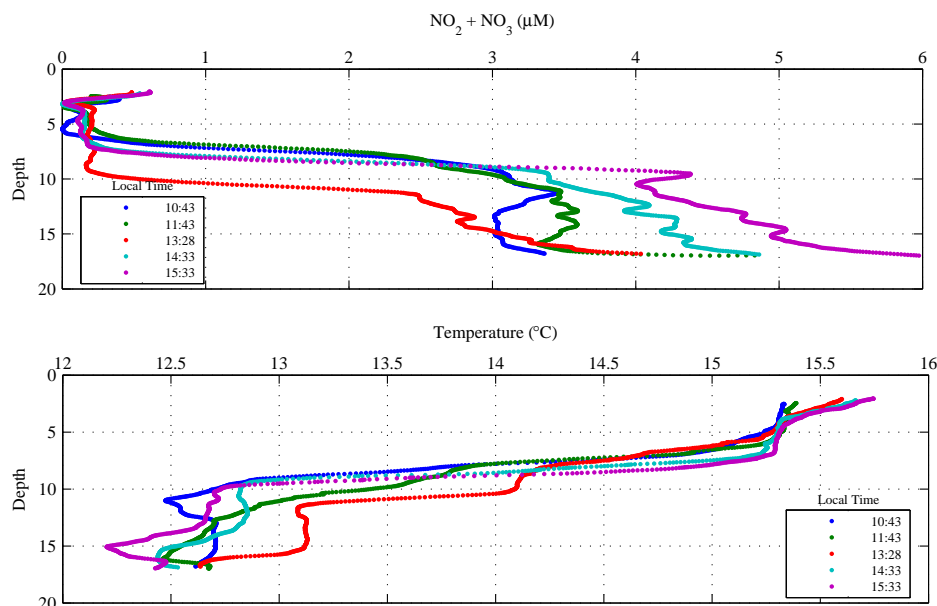
APNA SPECIFICATIONS

Number of Analytical Channels	3, 4, or 5					
Nutrients	Nitrite	Nitrate	Phosphate	Silicate	Iron(II)	Ammonium
Wavelengths (nm)	A 540	A 540	A 820	A 820	A 560	F 370/460 ex/em
Path lengths (cm)	1, 5	1, 5	1, 5	1, 5	1,5	N/A
Range-1 (μM)	0.05-50	0.05-50	0.05-50	0.15-170	0.05-50	0.01-15
Range-5 (μM)	0.02-11	0.02-11	0.02-14	0.05-45	0.02-13	0.1-100
Precision (% range)	2	2	2	3	2	1

Deployment Mode	Continuous	Intermittent Profiling	Intermittent Sampling
Endurance (max)	~7 Days (1 reading/sec)	~400 Profiles (20 m depth– 20 min ea.)	~2000 Measurements (2-3 months at 24/day)
Reagent volume (max)	~1 Liter/channel	~1 Liter/channel	~1 Liter/channel
Battery Usage (max)	~60 Amp-Hr	~60 Amp-Hr	~60 Amp-Hr

Power Supply/Range	12 volt DC / 12-75 volt DC
Power consumption	Analysis: 28 W, Sleep: 33 μW
Dimensions	Length: 12.9 in (32.6 cm), Diameter: 6.6 in (16.8 cm)
Weight	Air: 19.5 lbs (8.8 kg), Water: 3 lbs (1.4 kg)
Displacement	460 cubic in (7.5 liters)
Depth Capability	200 meters, pressure compensated
Instrument Control	Programmable microcontroller with 1-8 Gb compact flash memory
Communications	RS232/485-ACII, 9.6-115.2 kBAUD, Ethernet
Materials	Peek, PVC, Nylon, Aluminum, Delrin, AcetalGP
Multi-mode Deployment Platforms	Ship-deployed vertical or towed profilers, autonomous moored profilers, autonomous underwater vehicles, or fixed-depth on piers or moored buoys.
Optional Capabilities and Extras	Real Time Data Telemetry (Acoustic/RF/cellular/Wi-Fi/Iridium/LAN) External server with local FTP site, web data display Integrated peripheral sensors (CTD, O ₂ , Chl, etc)

A time series of five hourly high-res vertical tot. nitrate and temperature profiles that were obtained in Monterey Bay, CA with the APNA multi-nutrient analyzer deployed on an autonomous bottom-up profiler.



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ChemFIN Nutrient Analyzer



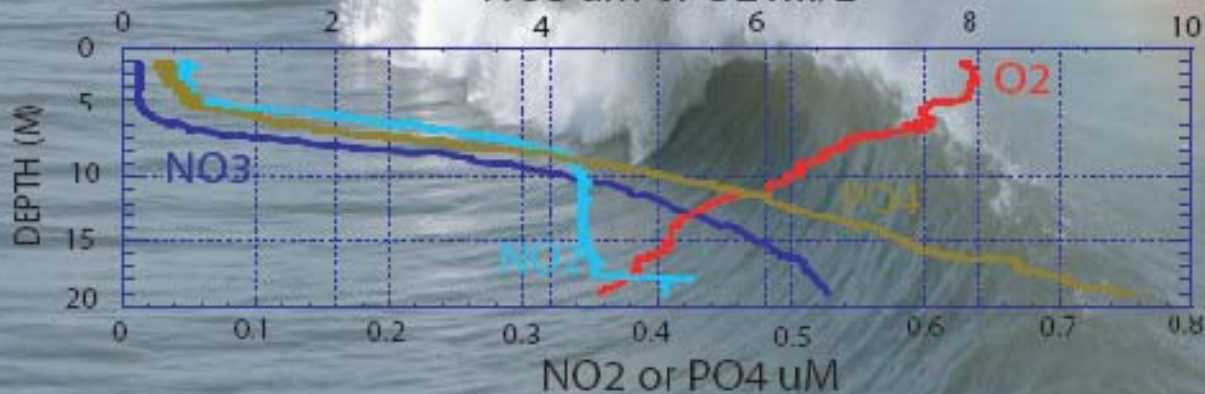
Autonomous Profiling Nutrient Analyzer

- Single Channel Analyzer
- Multi-Chemical Capability
- Fast Response - Trace Concentrations
- Real-Time Data
- Programmable Controller
- Multi-Platform Adaptability

Autonomous or Cabled Multi-Mode Operation

- Autonomous Hi-Res Moored Vertical Profiling
- Continuous Underway Surveying
- Intermittent Long-Term Moored Sampling

NO₃ μ M or O₂ ml/L



Nitrate, Nitrite, Ammonium, Phosphate, Silicate, Iron



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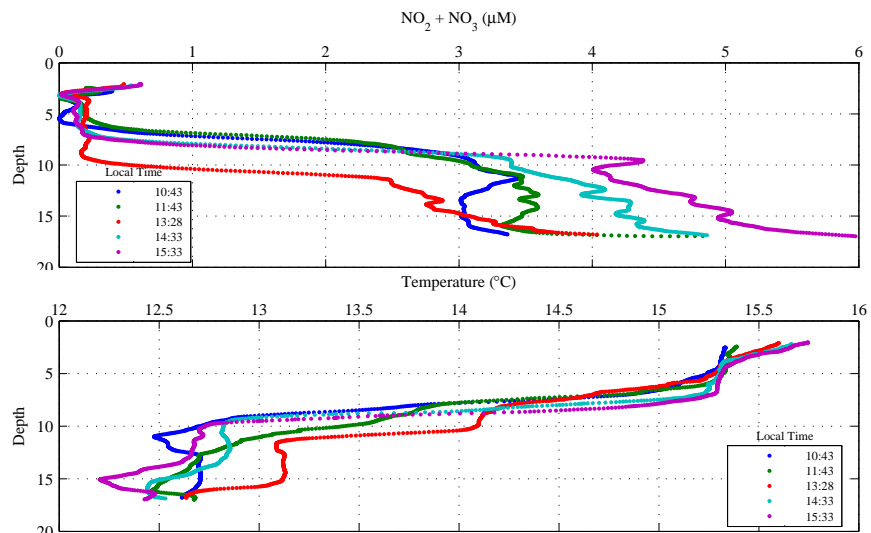
ChemFIN SPECIFICATIONS

Number of Analytical Channels	1 or 2 channel instrument				
Nutrients	Nitrite	Nitrate	Phosphate	Silicate	Ammonium
Wavelengths (nm)	A 540	A 540	A 820	A 820	F 370/460 ex/em
Path lengths (cm)	1, 5	1, 5	1, 5	1, 5, 15	N/A
Range-1 (µM)	0.05-50	0.05-50	0.05-50	0.15-170	0.01-15
Range-5 (µM)	0.02-11	0.02-11	0.02-14	0.05-45	0.1-100
Precision (% range)	2	2	2	3	1

Deployment Mode	Continuous	Intermittent Profiling	Intermittent Sampling
Endurance	~2 months (1 reading/sec)	~2,340 Profiles 6 profiles/day for 13 mo. (from 200 m depth – 33 min ea)	~10,080 Measurements (48/day for 7 mo.) Fixed Depth
Reagent volume	~2 Liter	~2 Liter	~2 Liter
Estimated Battery Usage (Amp-Hr/Day)	5.5	3.3	1.7

Power Supply/Range	12 volt DC / 12-72 volt DC
Power consumption	Analysis: 3 W, Sleep: 33 µW
Dimensions	ChemFIN L: 13" Dia.: 4.0", Reagent Reservoir. L: 6.0" Dia. 6.0"
Weight	6.4 lbs. Air, Neutral in Water:
Displacement	165 cubic in (2.7 liters)
Depth Capability	600 meters, pressure compensated
Instrument Control	Programmable microcontroller with 8 Gb compact flash memory
Communications	RS232/485-ACII, 9.6-115.2 kBAUD, Ethernet
Materials	Non metallic, Acetal
Multi-mode Deployment Platforms	Ship-deployed vertical or towed profilers, autonomous moored profilers, autonomous underwater vehicles, or fixed-depth on piers or moored buoys.
Optional Capabilities and Extras	Real Time Data Telemetry (Acoustic/RF/cellular/Wi-Fi/Iridium/LAN External server with local FTP site, web data display Integrated peripheral sensors (CTD, O2, Chl, etc)

A time series of five hourly high-res vertical nitrate and temperature profiles that were obtained in Monterey Bay, CA with a SubChem nutrient analyzer deployed on an autonomous bottom-up profiler.



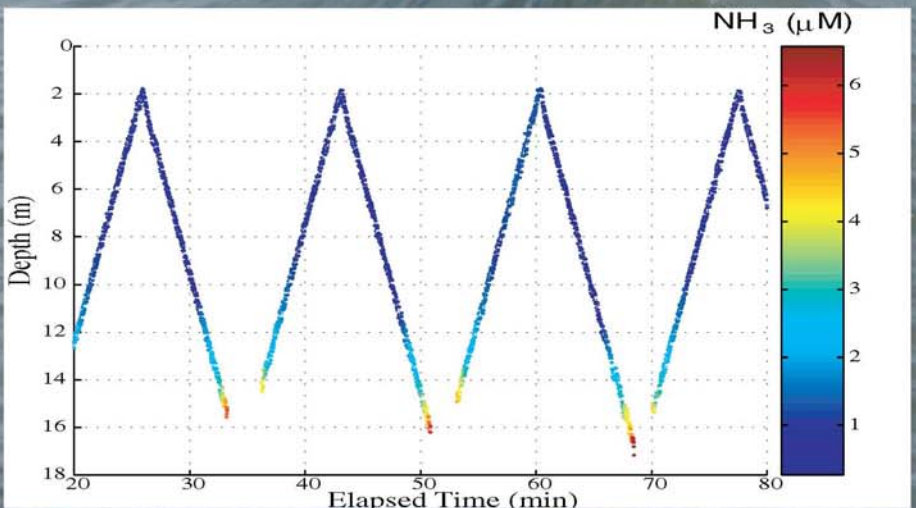
MARCHEM Analyzer

Micro AUV Ready Chemical Analyzer

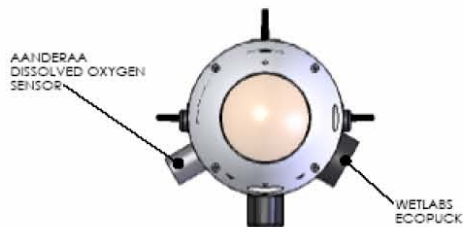
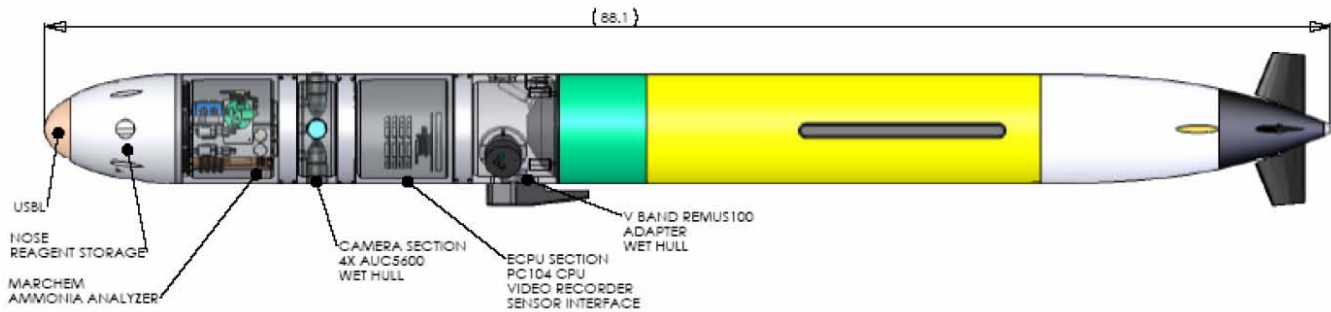
- Two Channel Analyzer
- Continuous Underway Surveying
- Fast Response - Trace Concentrations
- Real-Time Data
- Programmable Controller



Ammonia concentrations measured underway while undulating between near the surface and near the bottom in Monterey Bay, CA during a sixty minute autonomous REMUS mission with the MARCHEM Analyzer payload.



MARCHEM ANALYZER - REMUS CONFIGURATION



Graphs showing the ammonia concentrations and other parameters (depth, chlorophyll and light scattering by particles) measured while underway undulating between near the surface and near the bottom in Monterey Bay, CA during a sixty minute autonomous REMUS mission with the MARCHEM analyzer payload.

