

European Free Ocean Carbon Dioxide Enrichment Experiment

Design Review

Presented by

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at

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eFOCE

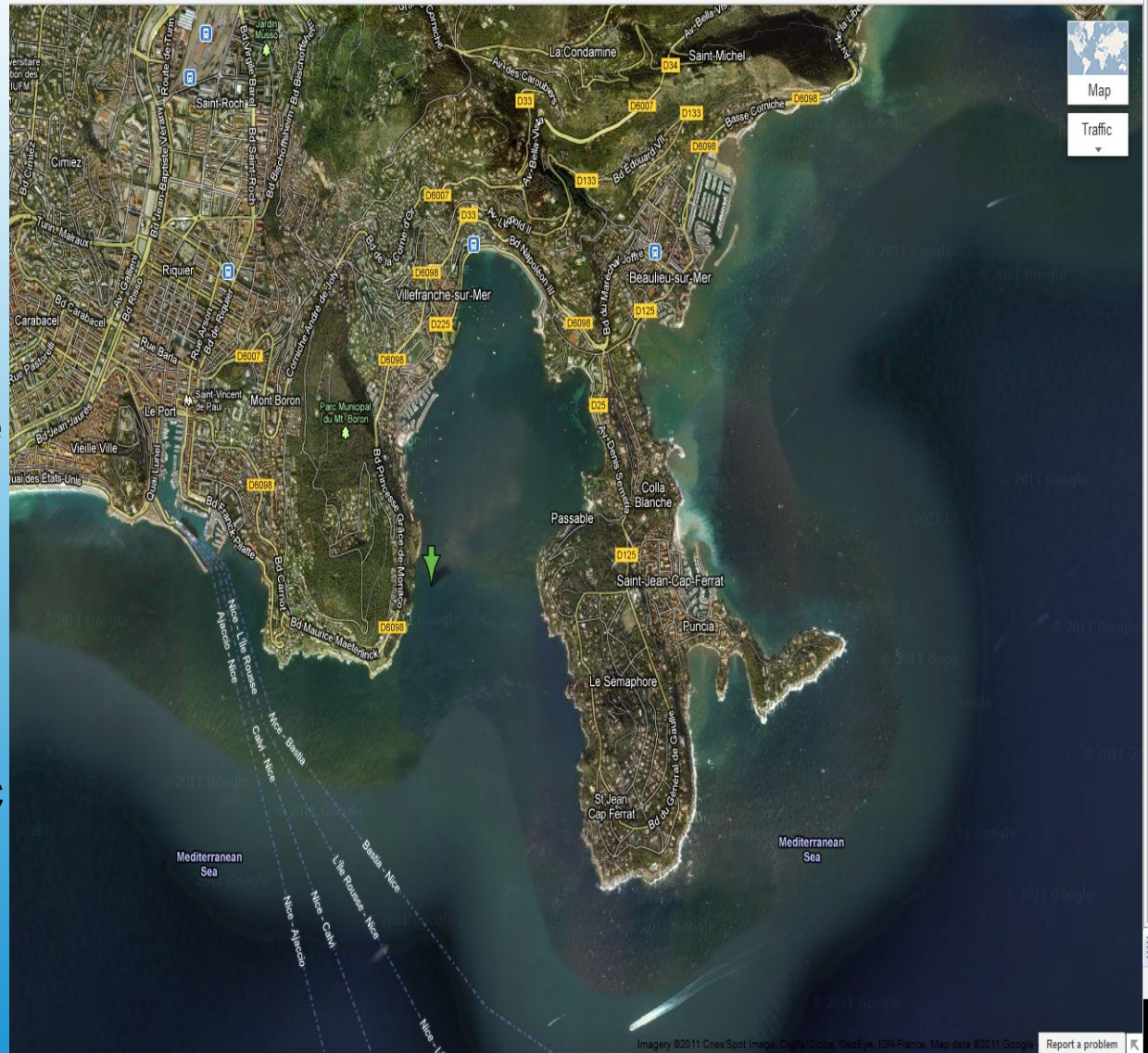


Location
Structure
Fluidics
Power systems
Data map

Introduction

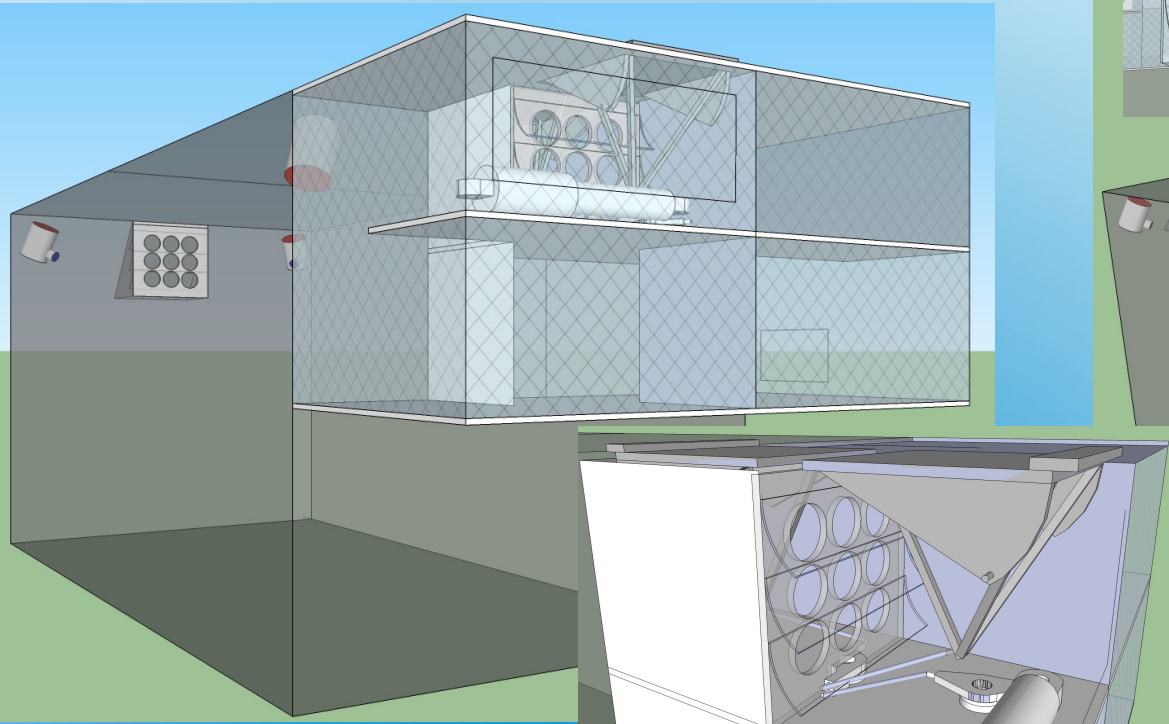
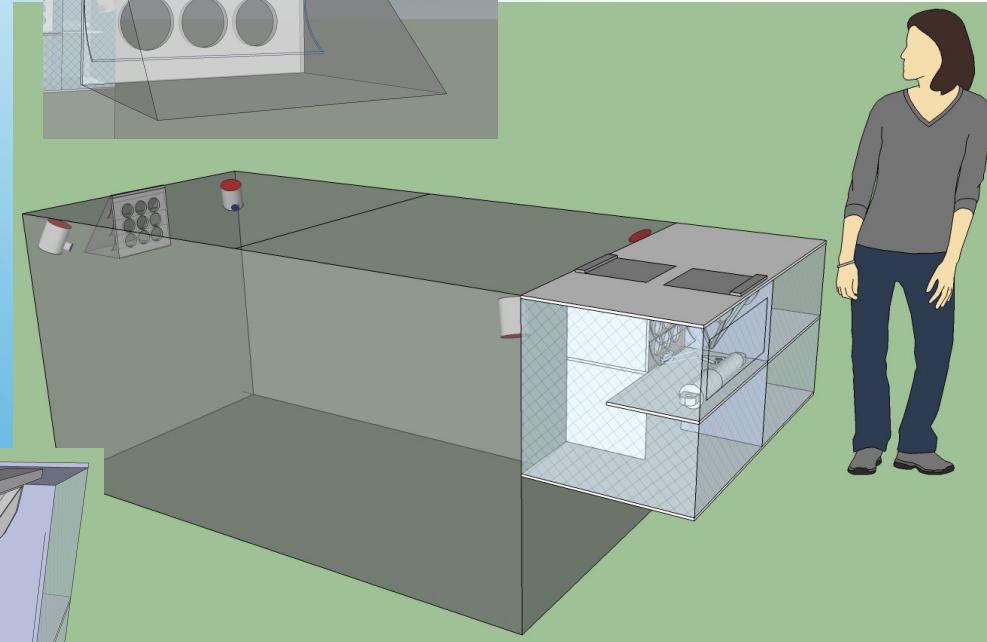
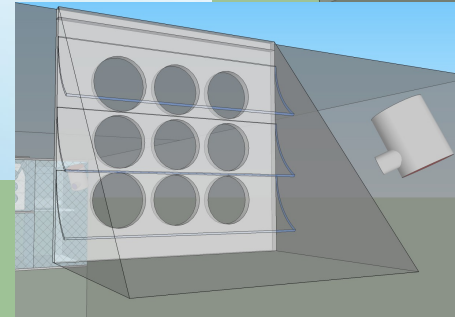
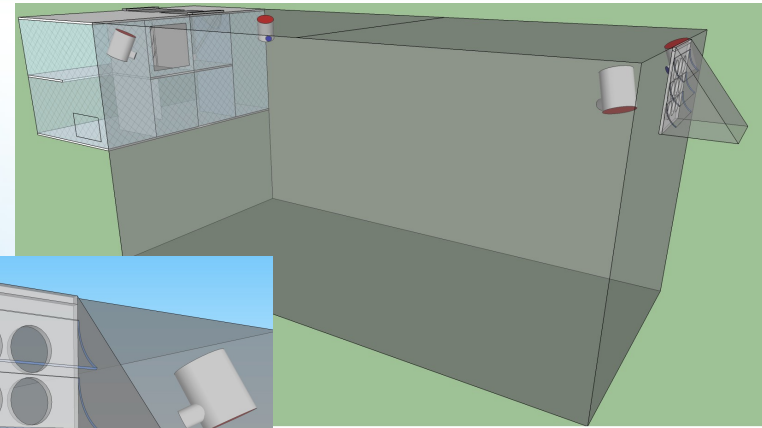


- South-East corner of Villefranche bay
- Minimal tide changes (~20cm)
- Protected from most wave action
- Target depth 3-30 meters (wave driven)
- Average current 10cm/sec
- Average winds of 4m/s



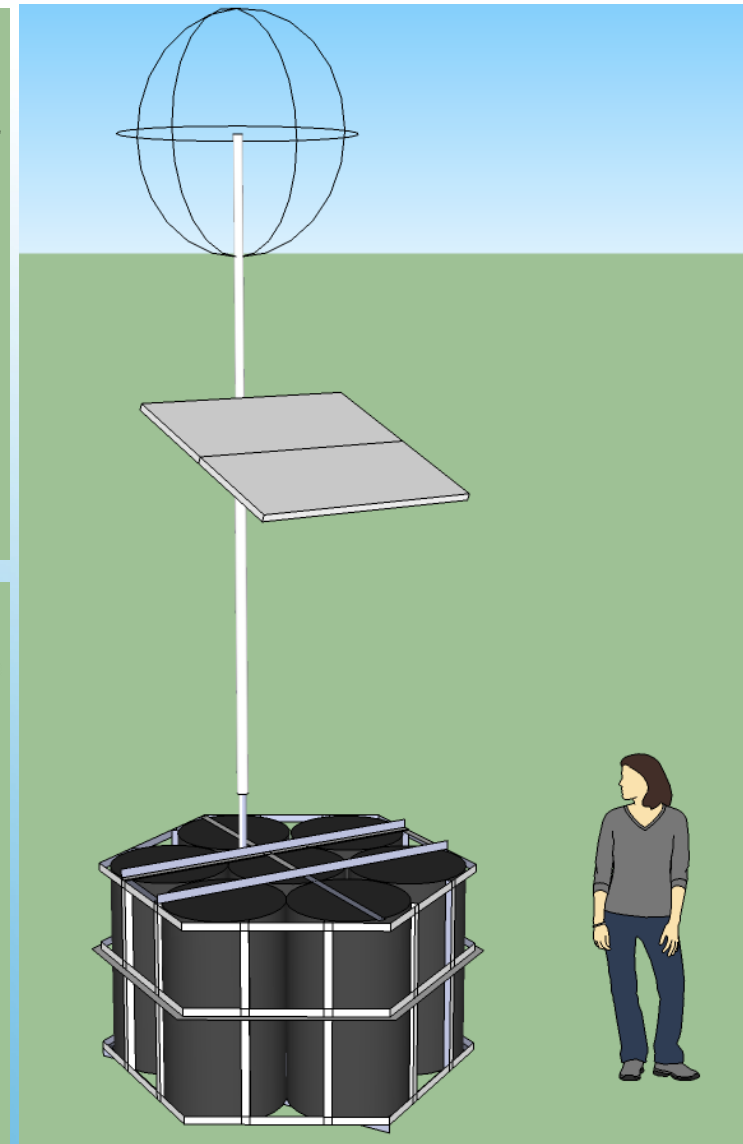
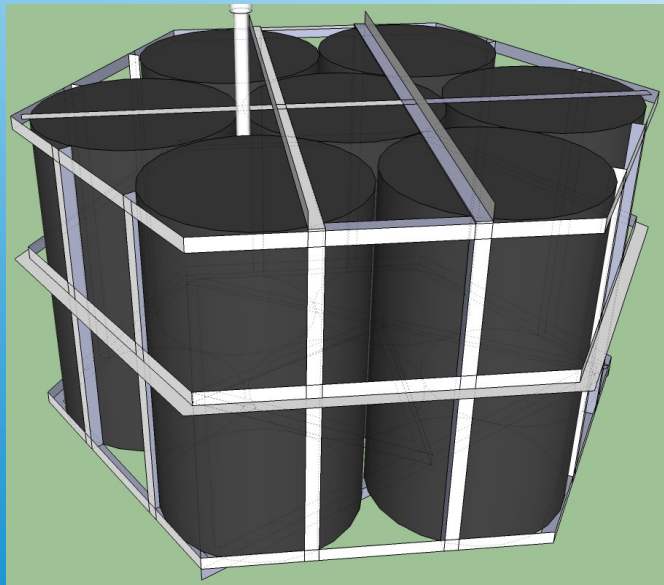
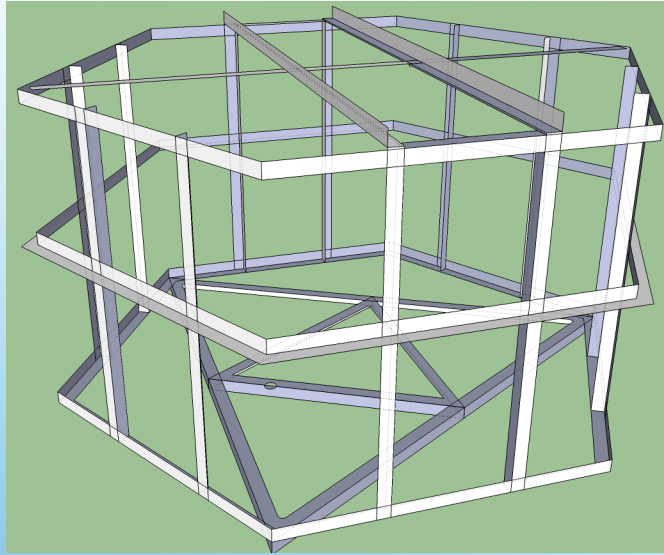
Location

- Acrylic panels 8mm thick
- Bilge pumps for circulation (Atwood/Rule)
- Twin actuated scoops to control flow
- Trim tab actuator (pressure compensated)
- Mixing box ~3.5 m run
- Tall and short versions

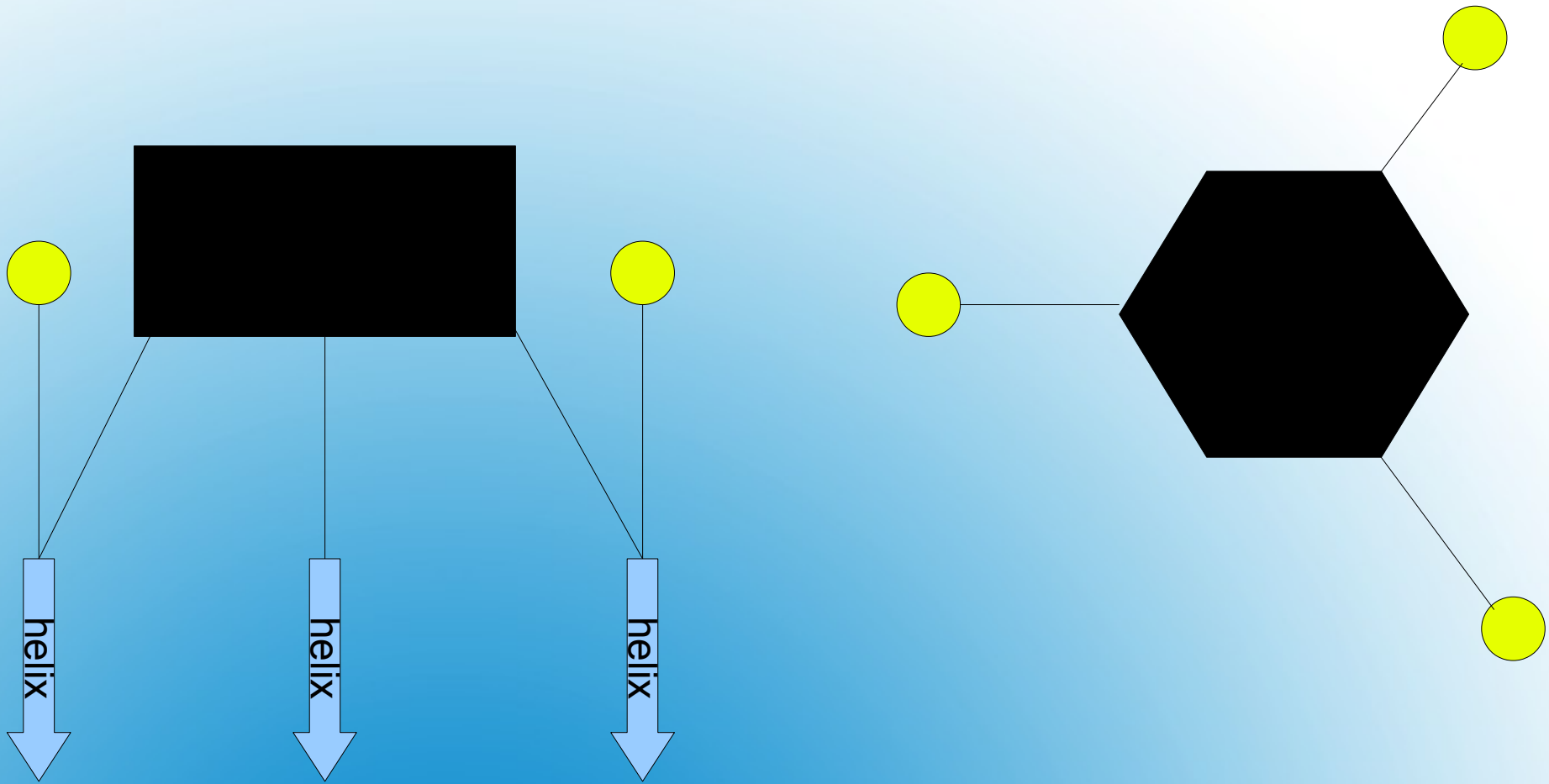


Structure (subsea)

- Fiberglass frame (GRP)
- HDPE recycled screw top food grade barrels
- (UV stabilized but cover is preferred)
- Stainless hardware
- Keyed padlock hinged top
- 3 piece stayed mast (GRP)
- Spreco 400W turbine
- 2x 80W BP solar panel



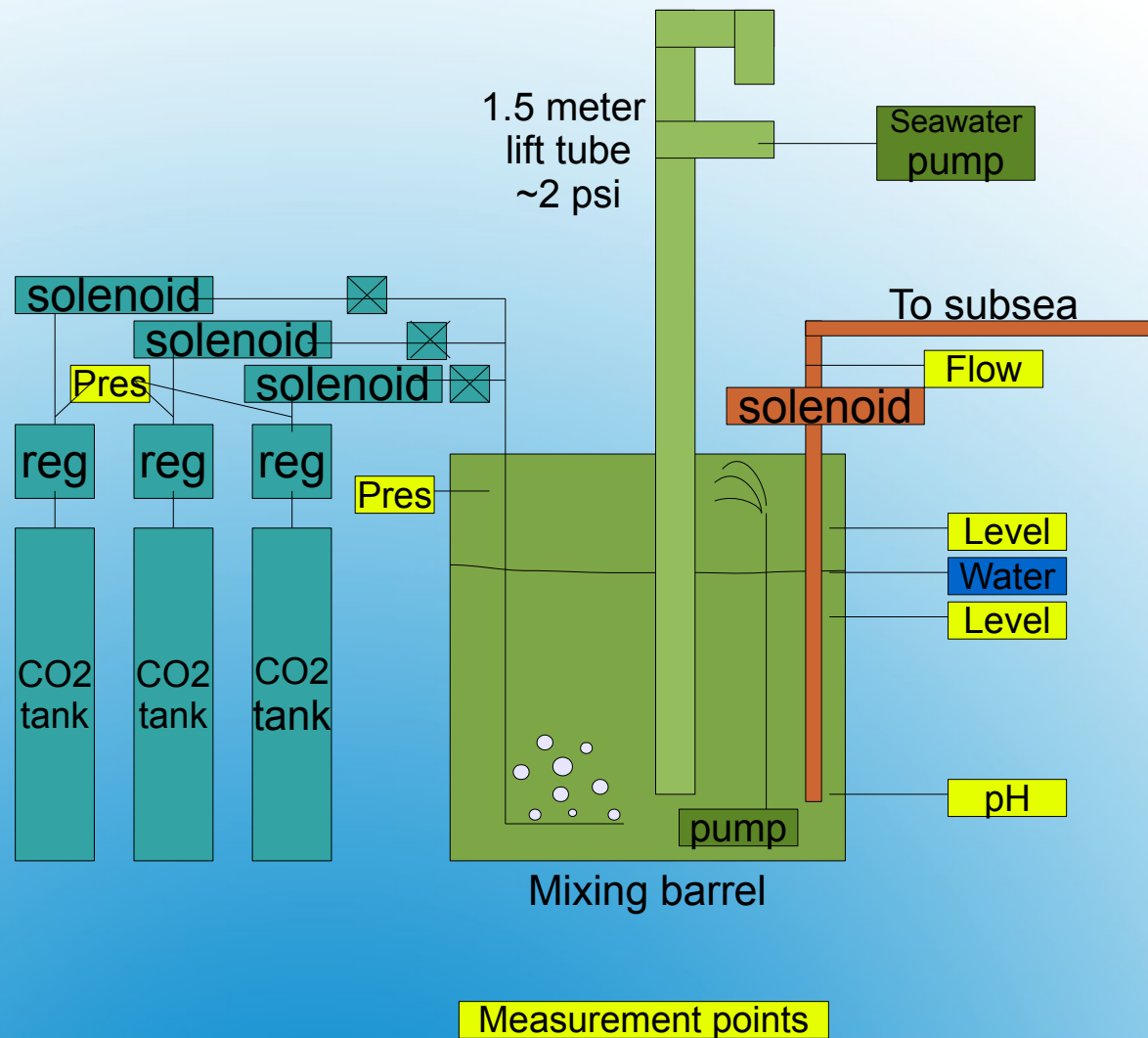
Structure (topside)



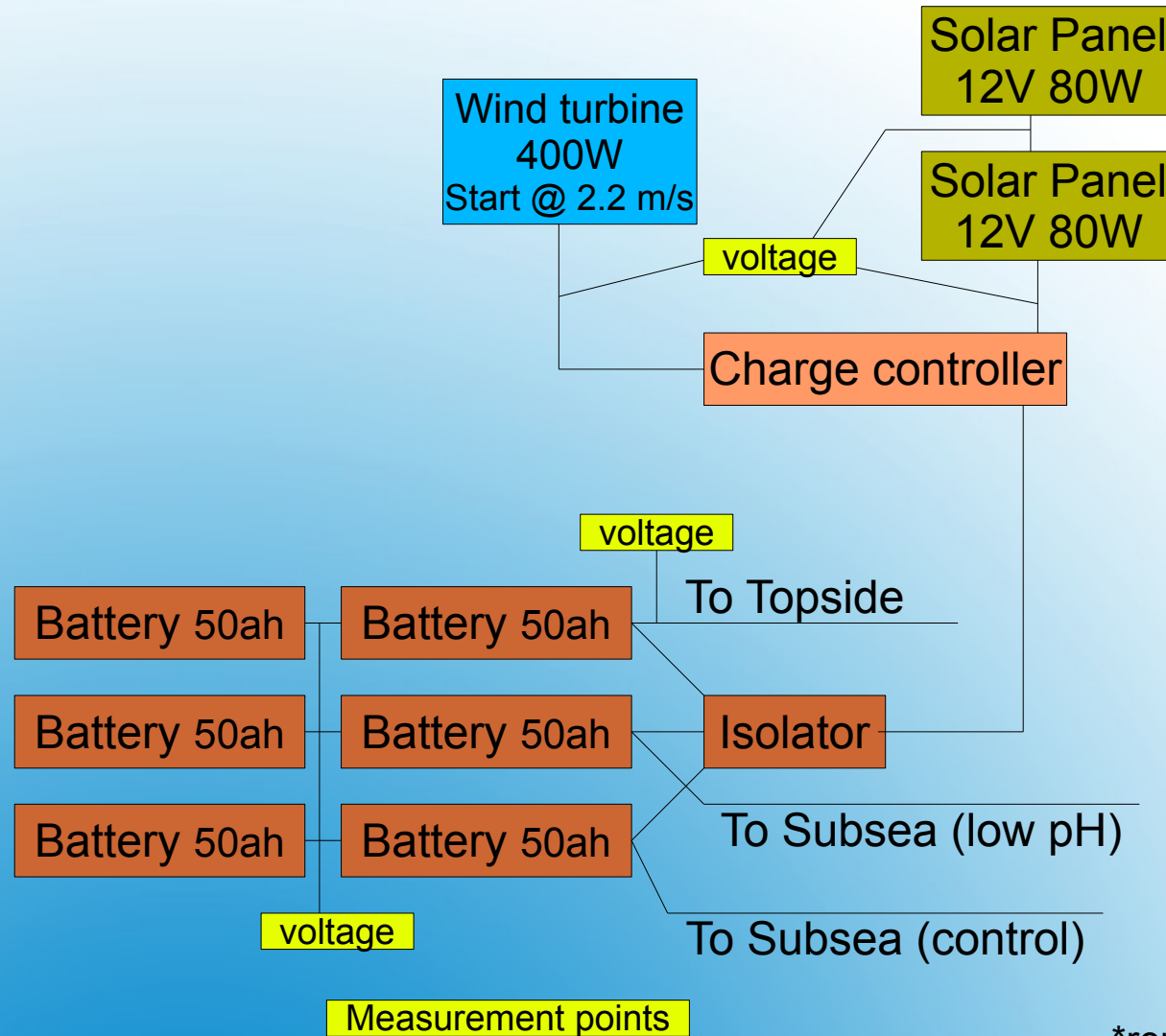
Structure (topside)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
			Input			Output								
	h	w	area	Flow rate	pCO2 change	linear flow rate	Total water volume	Water mass	Water mass	CO2	CO2 saturated water			
			<i>m^2</i>	<i>cm/s</i>	Δ <i>uatm</i>	<i>m/day</i>	<i>m^3/day</i>	<i>kg/day</i>	<i>kg/hr</i>	<i>kg/day</i>	<i>kg/day</i>	<i>l/hr</i>	<i>l/min</i>	
	0.05	0.2	0.01	10	350	8640	86.4	88560	3690	0.3	209	8.5	0.1	
	0.1	0.2	0.02	10	350	8640	172.8	177120	7380	0.6	419	17.0	0.3	
	0.15	0.2	0.03	15	350	12960	388.8	398520	16605	1.3	942	38.2	0.6	
	0.1	0.2	0.02	10	400	8640	172.8	177120	7380	0.7	479	19.4	0.3	
	0.05	0.2	0.01	10	400	8640	86.4	88560	3690	0.3	239	9.7	0.2	
	0.1	0.2	0.02	15	400	12960	259.2	265680	11070	1.0	718	29.1	0.5	
	0.05	0.2	0.01	10	700	8640	86.4	88560	3690	0.6	419	17.0	0.3	
	0.1	0.2	0.02	10	700	8640	172.8	177120	7380	1.2	838	34.0	0.6	
	0.15	0.2	0.03	10	700	8640	259.2	265680	11070	1.8	1257	51.0	0.8	
	0.15	0.2	0.03	15	700	12960	388.8	398520	16605	2.6	1885	76.5	1.3	

CO2 usage budget



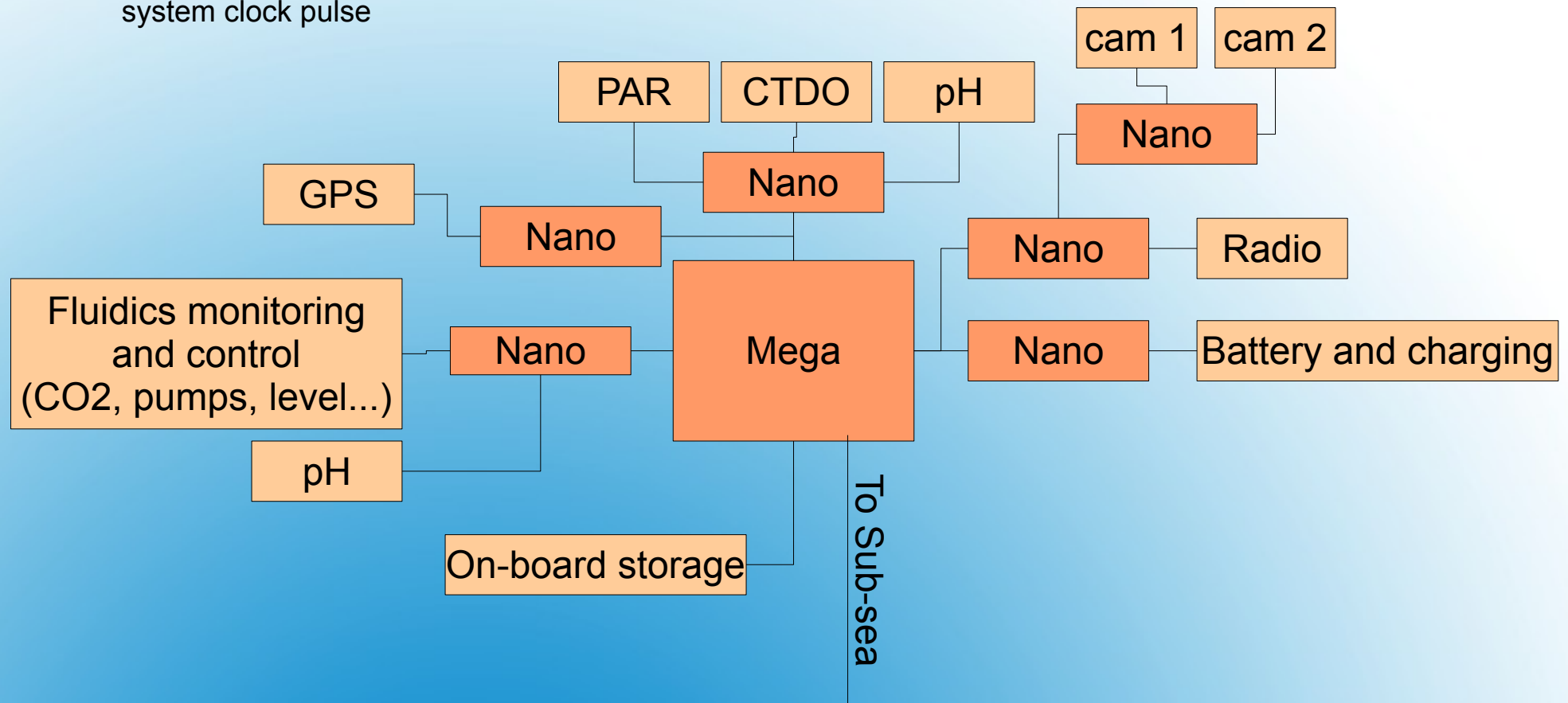
Fluidics (topside mixing)



*remote switching on banks

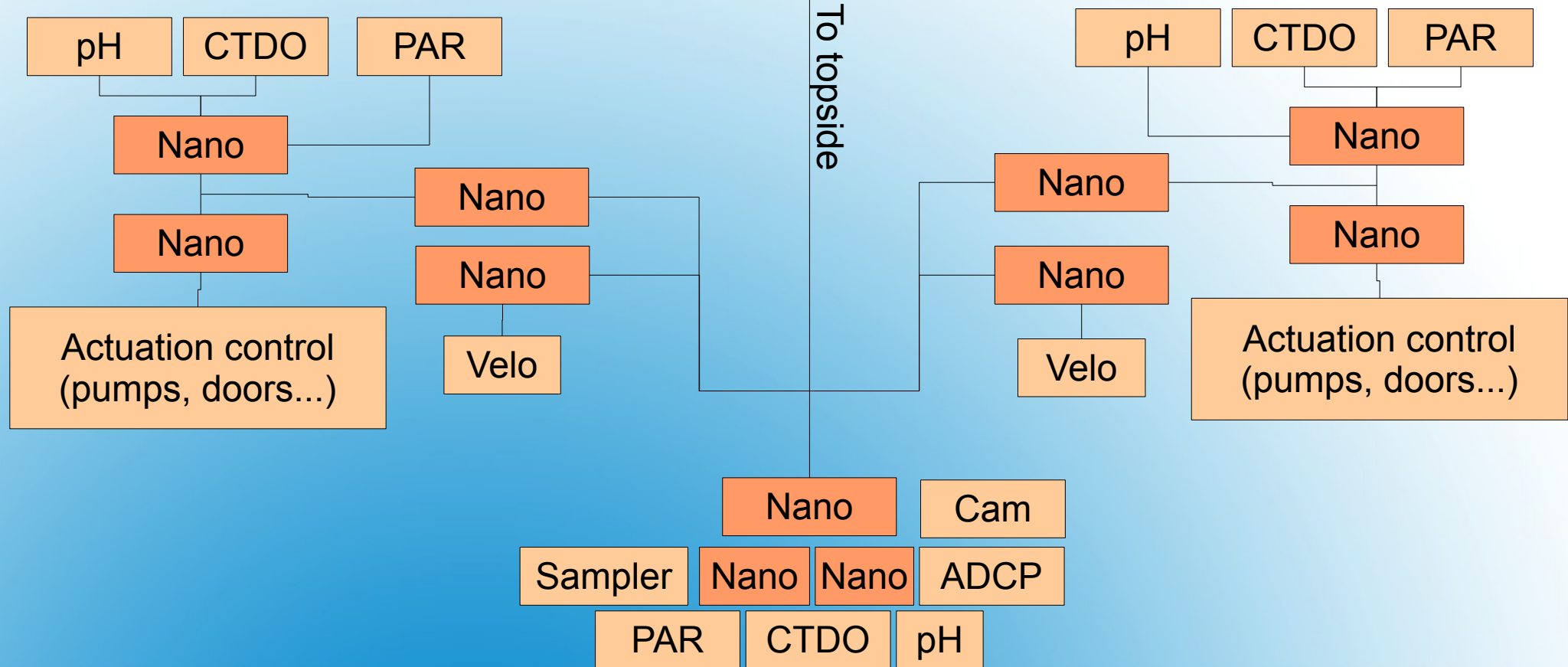
Power (topside)

*GPS used to generate
system clock pulse

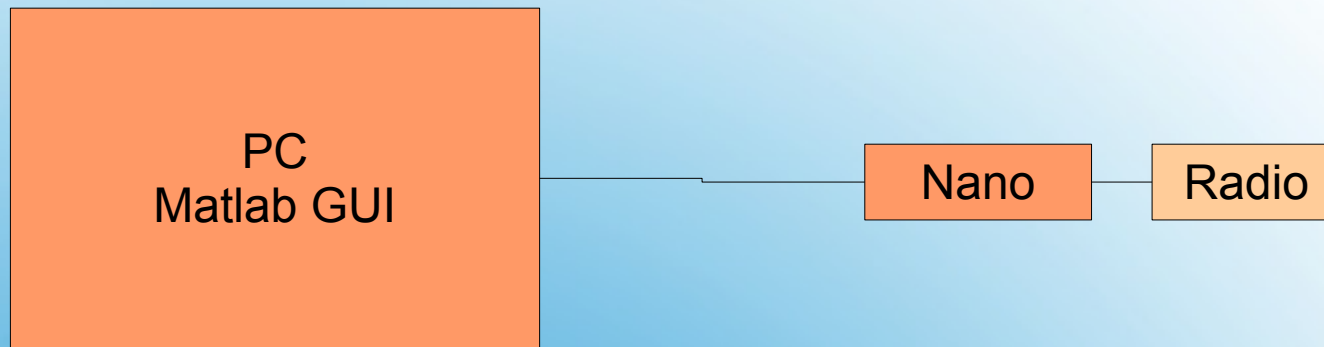


Data map (Topside)

4x 2.5 mm²
10x STP



Data map (Sub-sea)



Data map (Shore side)

ADCP

- Teledyne Sentinel Express

NortekMed Aquadopp

Hocer RDCP

PAR

- Li-Cor 192SA

Biospherical QSP-2100

PH

- Sea Bird pH-18 (digital)

Satlantic SeaFET

SAMI2

VELO

- NortekMed Vectrino

Sontek ADV

CTDO

- SBE 37 SMP ODO

Water Sampler

- KC Denmark 36x 500ml

McLane RAS

Hardware selection (science)

U-processor

Atmega2560 (Arduinio Mega 2560)

Atmega328 (Arduino Nano 3.0 / Pro Mini)

Persistor

Parallax

Gumstix (OMAP)

Technologic (arm)

Radio

Adeunis (ARF 53-PRO)

6km 500mW 863-870MHz (EU unlicensed)

Satel

Wind turbine

Solar panels

Acrylic

Grp

Barrels

Software

MatLab (serial I/O w/GUI)

Bulk data storage on-board with basic health and status data transfer over radio.

Hardware selection

Time line