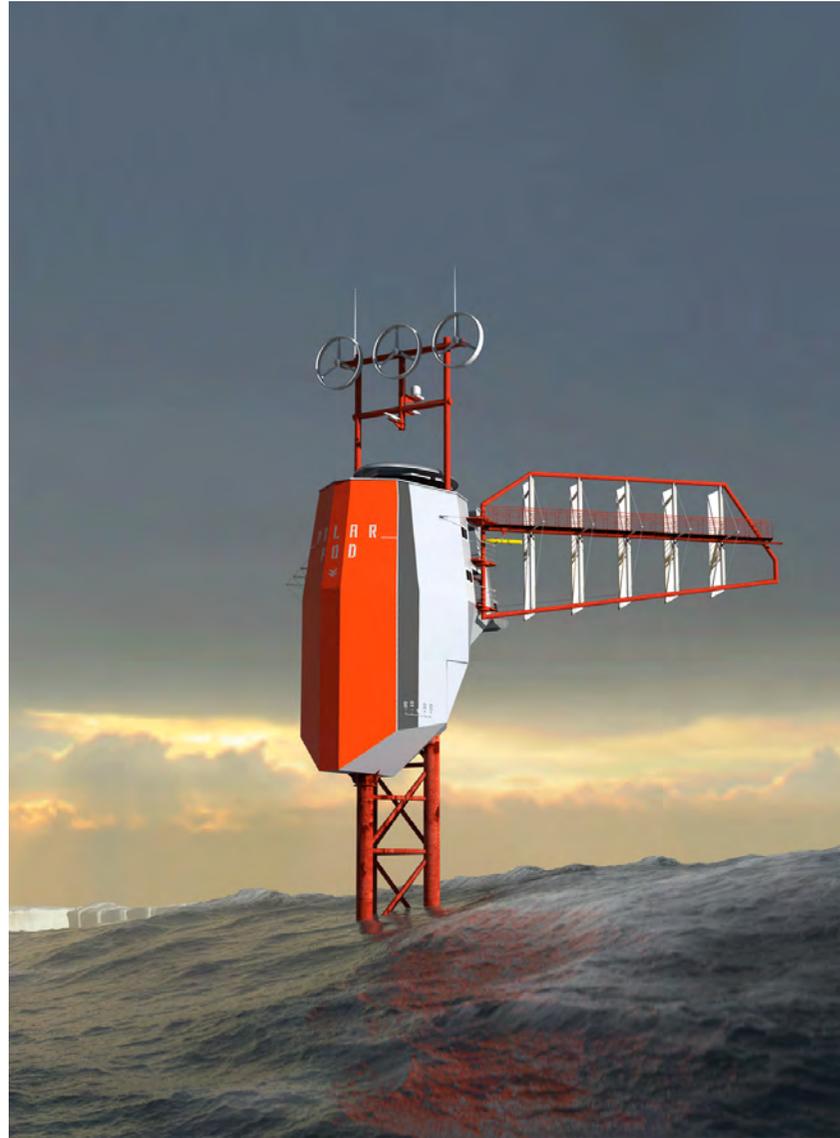


IFREMER contribution to POLAR POD project



Olivier Quédec – ERVO 2017

Images provided by Jean-Louis Etienne

POLAR POD – A project led by Dr Jean-Louis Etienne

Some expeditions carried out until now

- ✓ 1986 : First-ever solo dogsled reach of North Pole - 63 days
- ✓ 1989-90 : First-ever international dogsled crossing (6300 km) of Antarctica
- ✓ 2002 : 4 months drift on-board Polar Observer in Arctica
- ✓ 2010 : First crossing over Arctic ocean on-board Generali Arctic Observer



POLAR POD Project

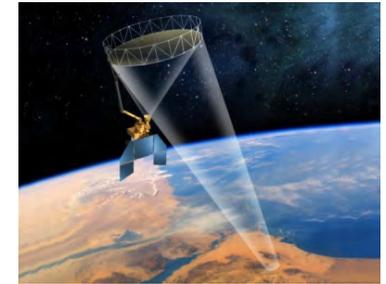
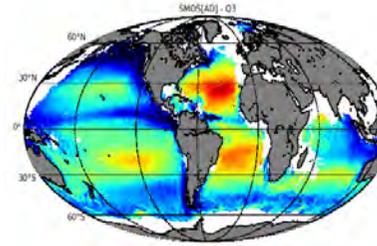
- POLAR POD : Platform based on the US FLIP (SCRIPPS) – Floating Instrument Platform
- Concept : « Vertical ship » between a buoy and a ship



- Expedition : 2 years circum-navigation around Southern Ocean

Scientific project

- ✓ Air-Sea exchanges in the Southern Ocean



- ✓ Long term monitoring of the Southern Ocean from remote sensing

- ✓ The biodiversity of the Southern Ocean



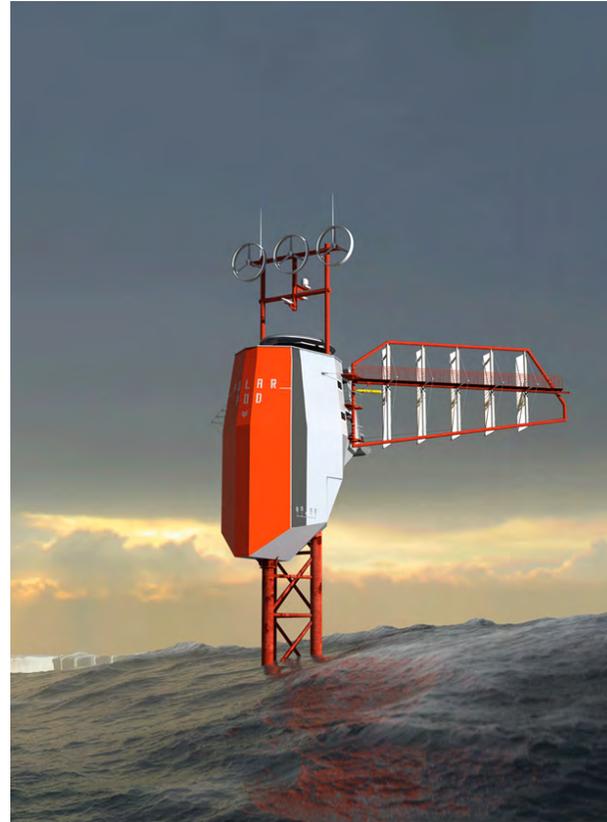
- ✓ Anthropogenic impacts



- ✓ > 100 researchers involved from 40 institutions and 10 countries

POLAR POD characteristics

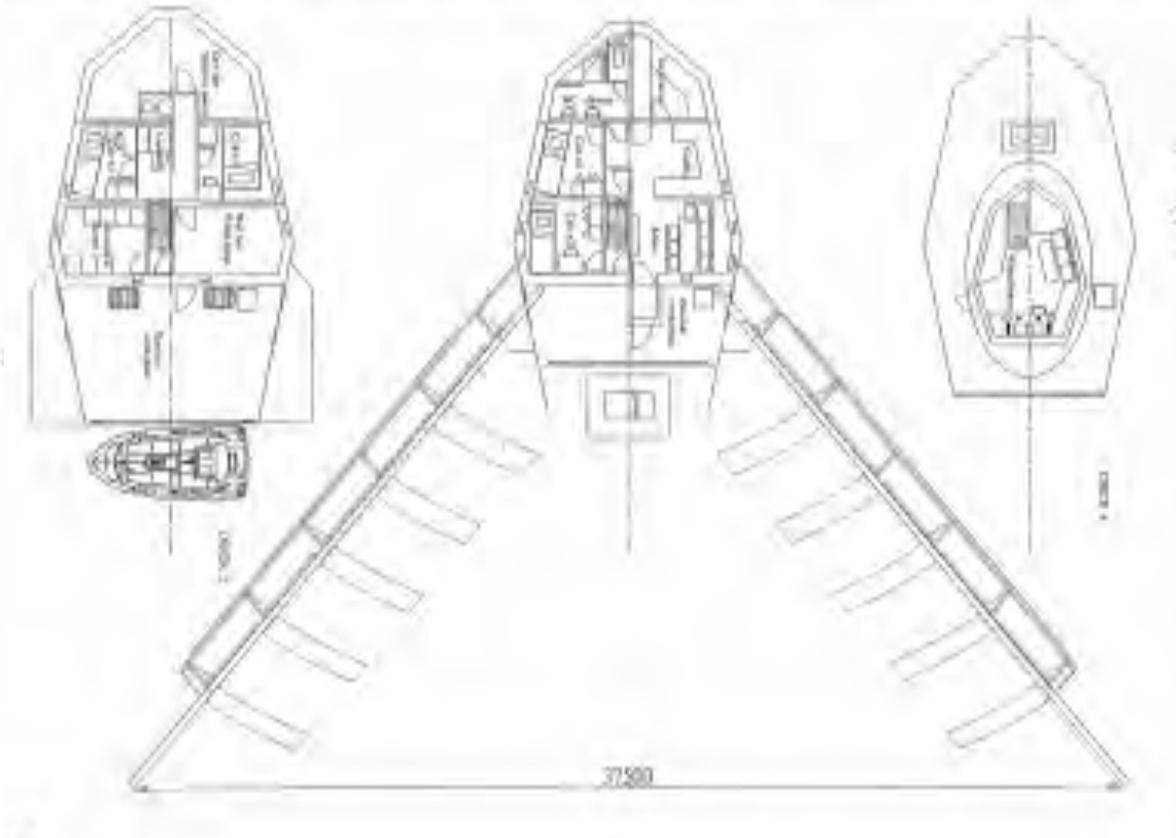
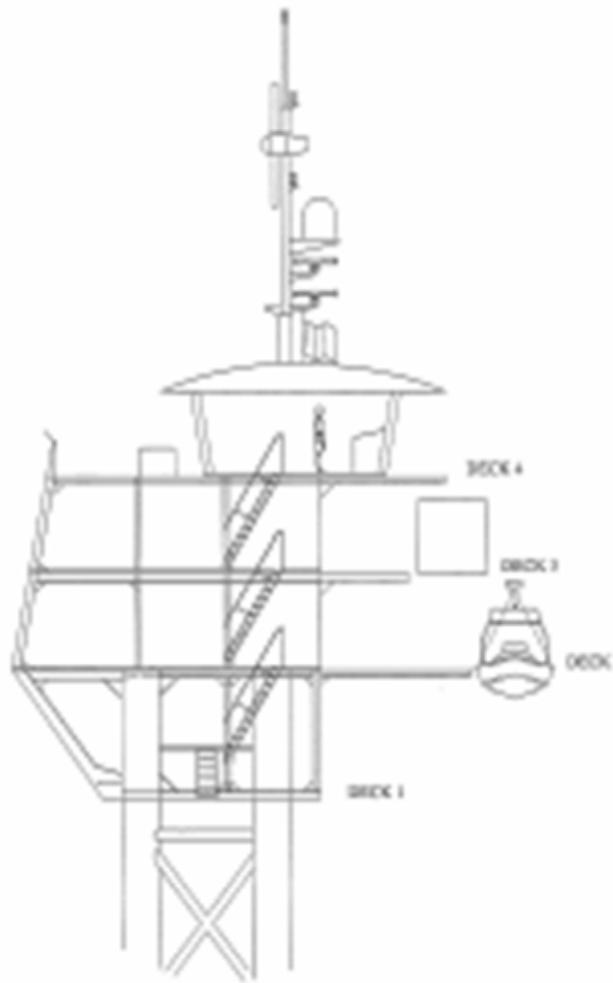
- ✓ 22m length
- ✓ 80m draft
- ✓ 60m air draft
- ✓ 800 t
- ✓ 7 persons
- ✓ <1,5 knts drift speed
- ✓ 3 or 4 windfarms (2,5 kW)
- ✓ Emergency DA
- ✓ Emergency propeller



Expedition

- ✓ Towed to the gyre horizontally, then flip to vertical position
- ✓ 2-3 month legs (2 years cruise)





Expedition

- ✓ Technical room
- ✓ Wet lab
- ✓ Dry lab
- ✓ Handling area

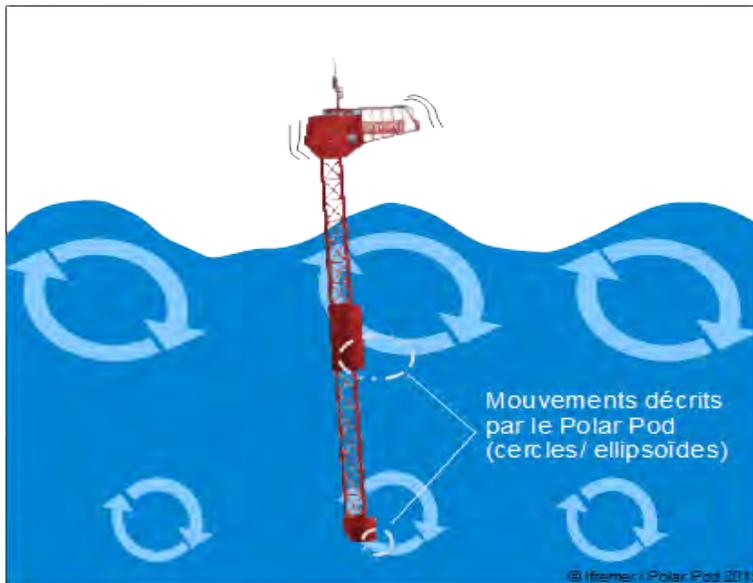
POLAR POD concept

Requirements

- ✓ Reduced motions in heavy seas
- ✓ Silent (engineless)
- ✓ Weak perturbations of the environment

Solution

- ✓ Anchoring the ship in calm waters (80m)



Design

- ✓ 20.6m H1/3, 76 knts wind speed
- ✓ Absorption of 90% heave motions
- ✓ Less than 5° pitch
- ✓ Surge acc. < 0,03g/wave height
- ✓ Vertical acc. < 0,007g/wave height



IFREMER contribution to the project

Technical contribution

- ✓ Call for tender for the construction
- ✓ Construction (to confirm)
- ✓ Assistance to the integration of scientific equipment
- ✓ IT equipment
- ✓ Data management



Scientific contribution

- ✓ Ocean-atmosphere fluxes
- ✓ Chemical contaminants



Assistance to the integration of scientific equipment

Innovative vessel needing a high level of operationability

- ✓ On long periods, typically 2 years
- ✓ In heavy sea states and strong winds

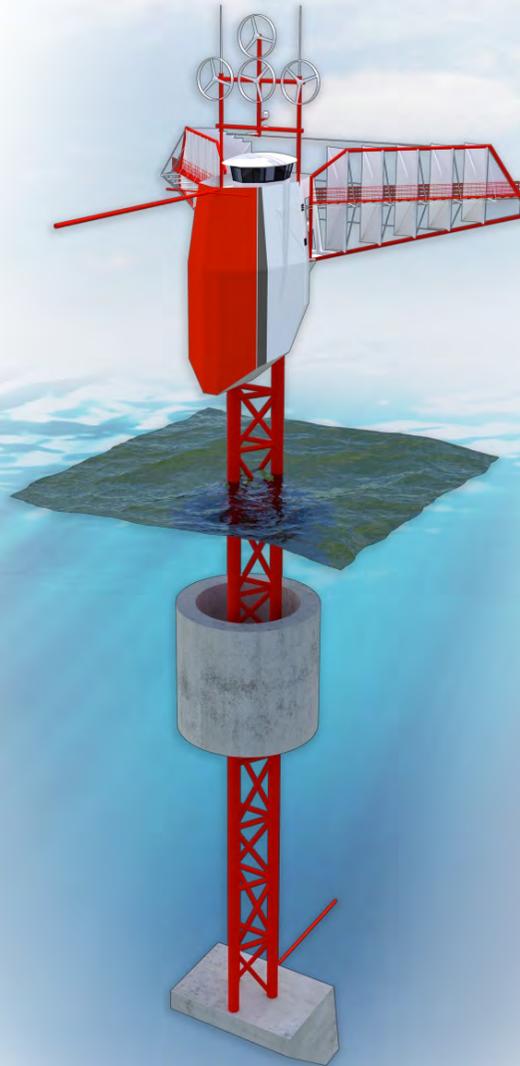
Technical and operational constraints

- ✓ Low energy available (< 3 kW) – Sampling scenarii to define
- ✓ Limited spaces (< 40 m²)
- ✓ Reduced technical crew (4 persons)

Around 70 equipment to integrate



POLAR POD – Base – Scientific Equipment



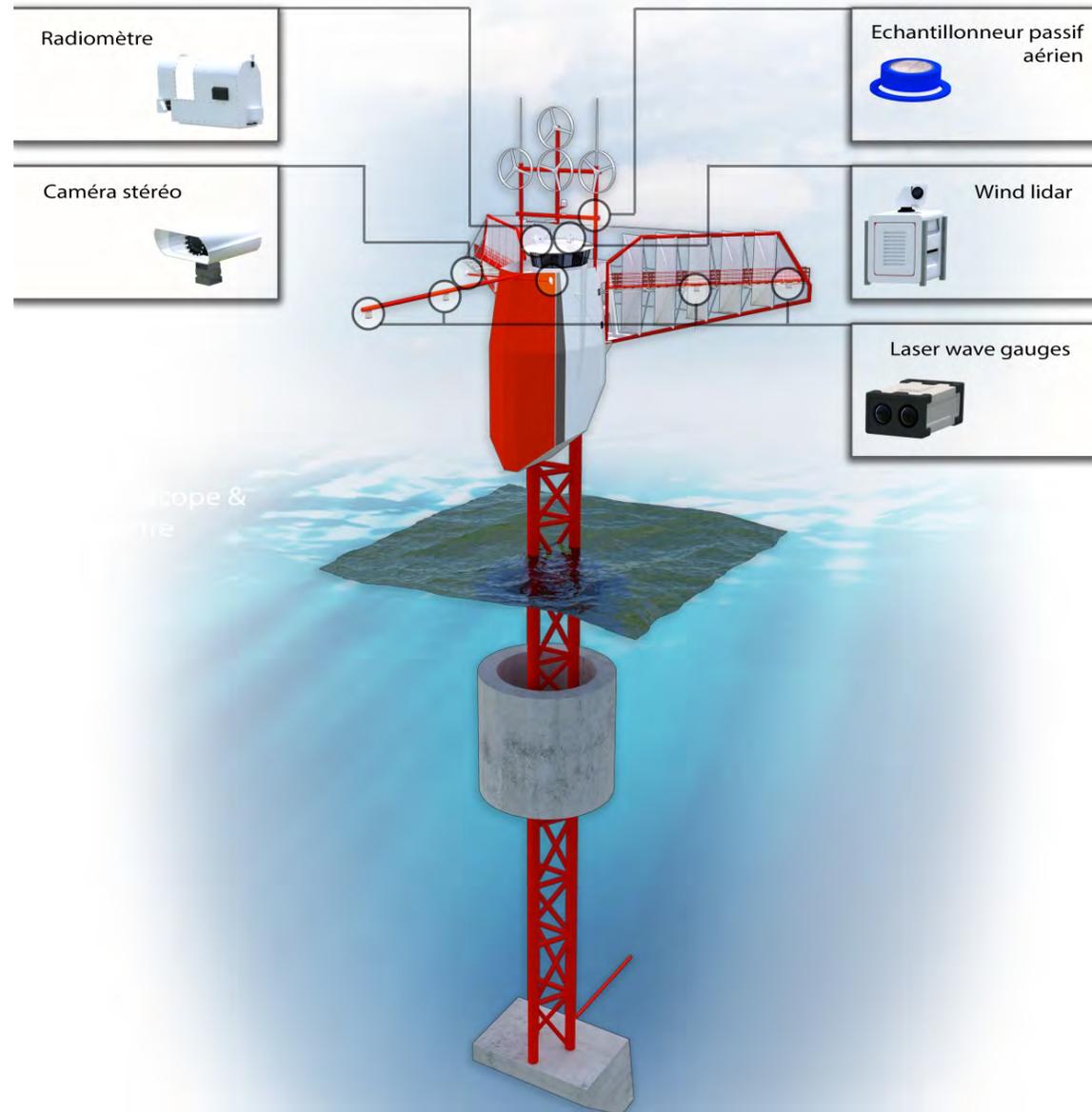
High level of operationability

- ✓ On long periods, typically 2 years
- ✓ In heavy sea states and strong winds

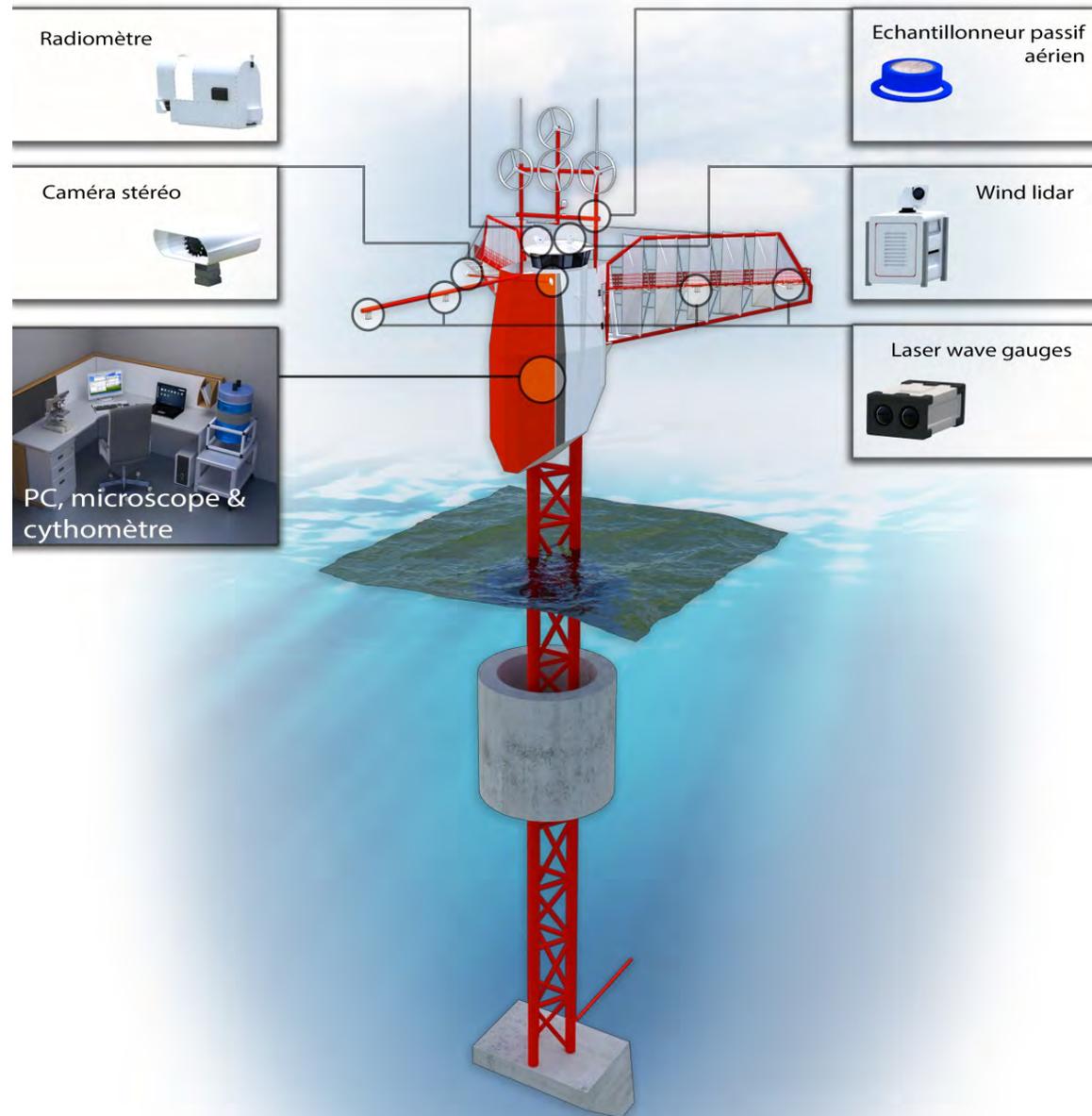
Technical and operational constraints

- ✓ Low energy available (< 3 kW)
- ✓ Limited spaces (< 40 m²)
- ✓ Reduced technical crew (4 persons)

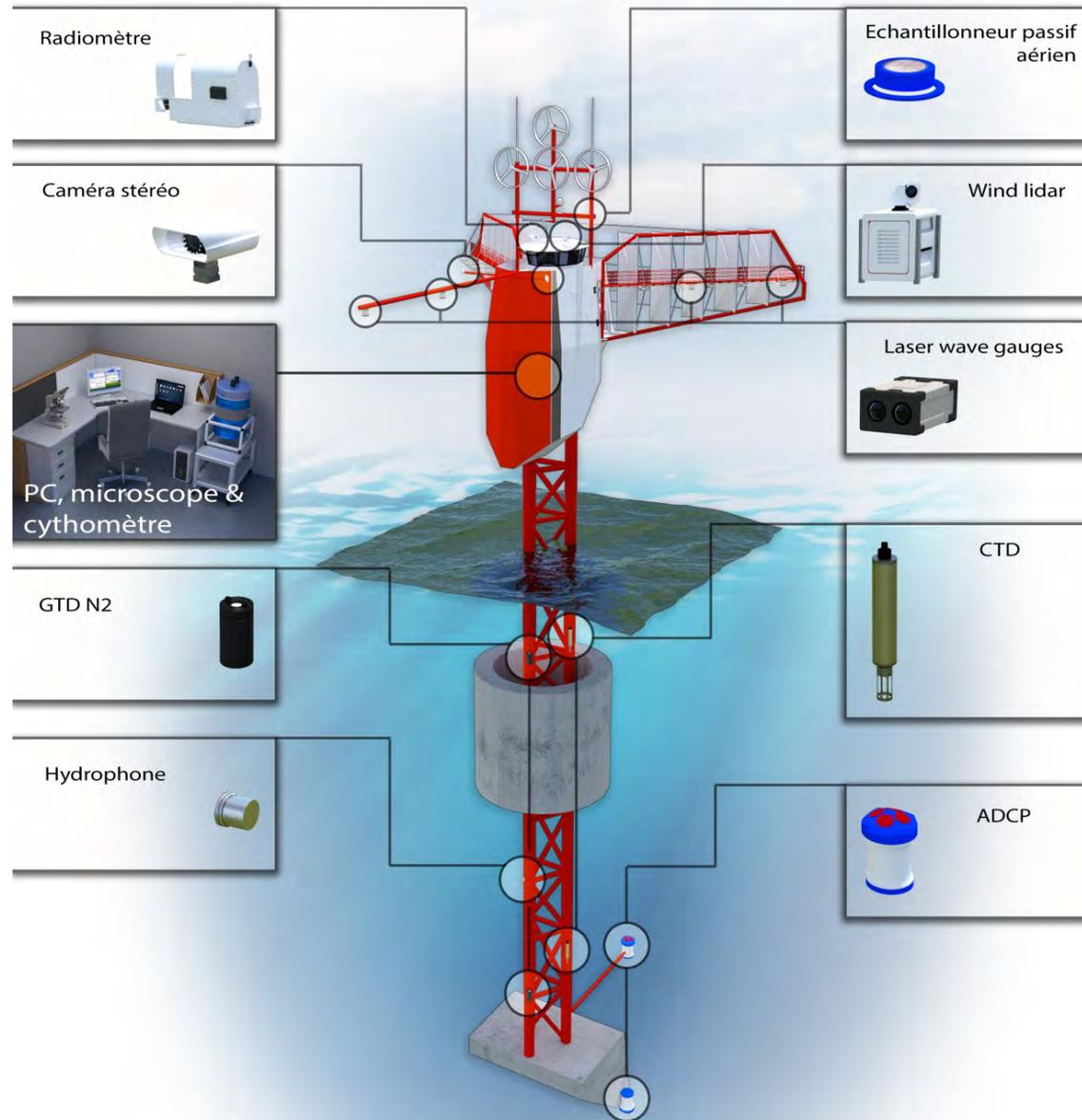
POLAR POD – Aerial equipment



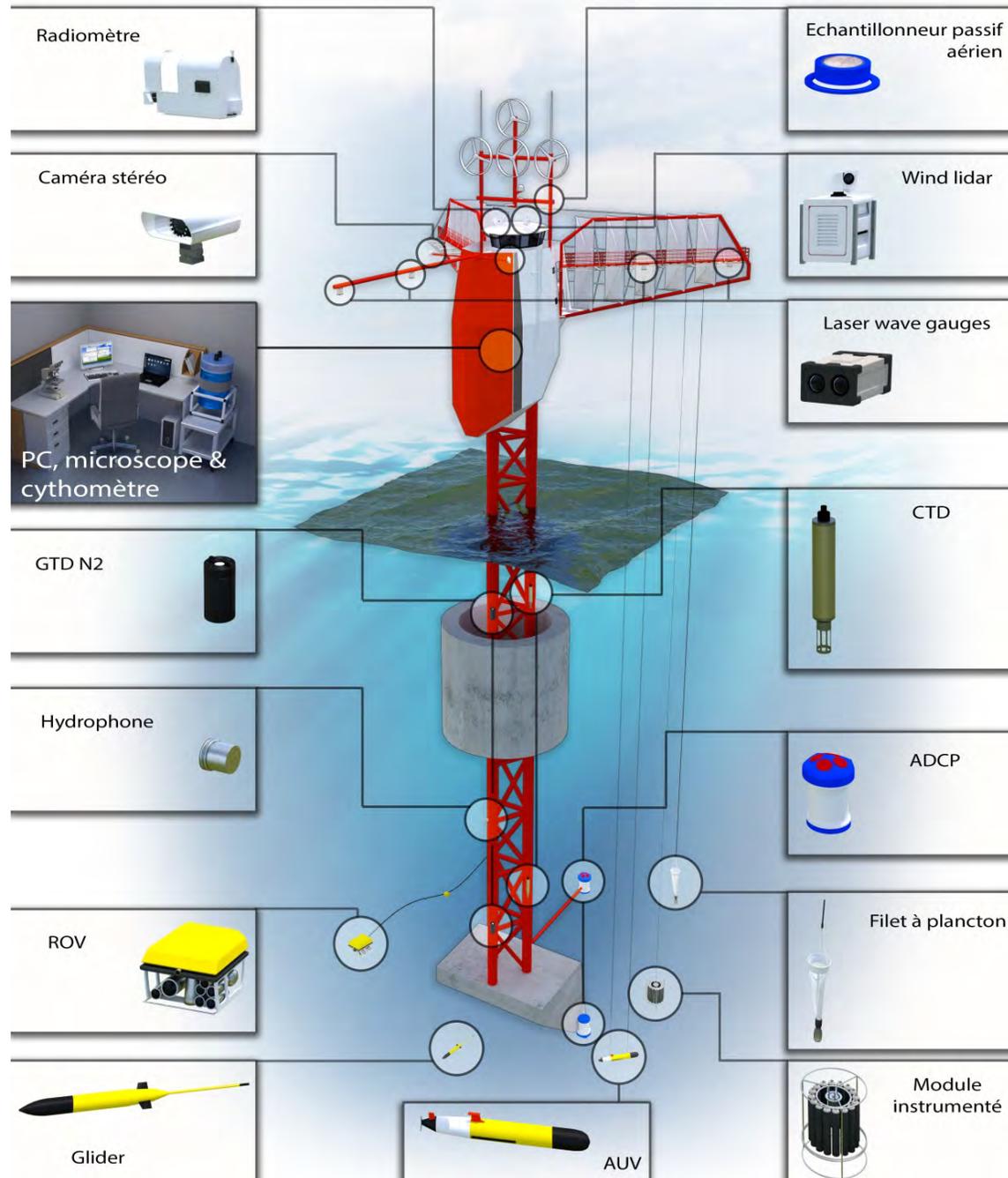
POLAR POD – + equipment in laboratories



POLAR POD – ++ underwater equipment



POLAR POD – +++ mobile equipment



IT Equipement (provisional)

- ✓ 2 * 42 U racks : Sensors Surface Unit, attitude sensor, network,..
- ✓ Network between domestic and enterprise conception
- ✓ Server for virtual machines
- ✓ Data storage
- ✓ Industrial Pc (5)
- ✓ Lap top (5)
- ✓ Monitor wall



Critical points

- ✓ Low power
- ✓ Liability - on land qualification tests
- ✓ Ease of use



Chemical contaminants

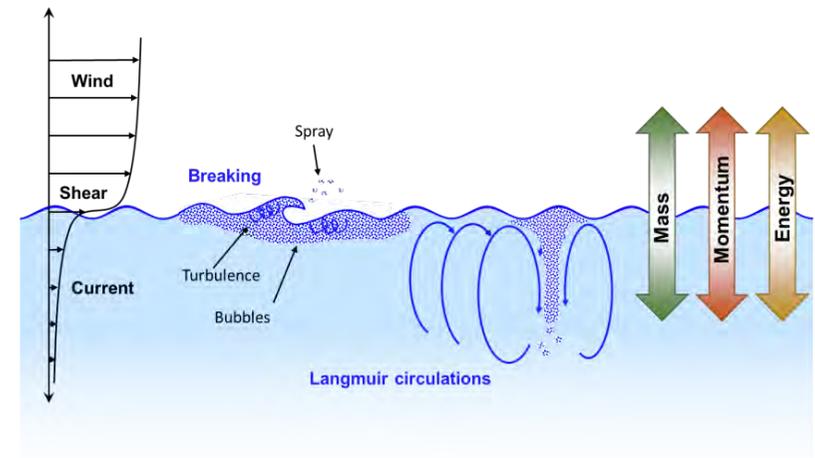
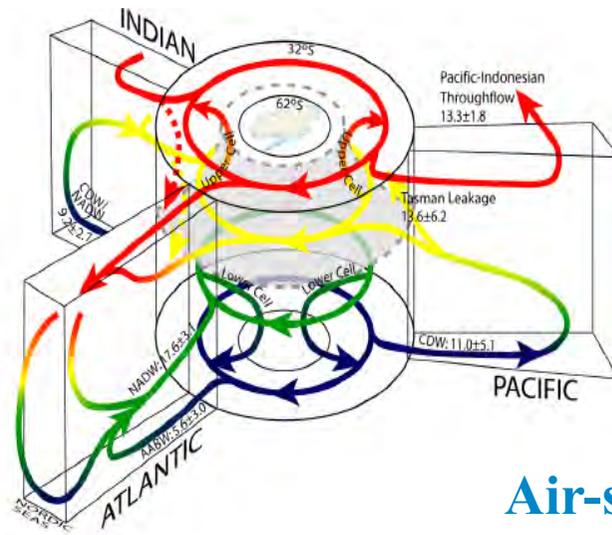
General objectives : Assessment of the organic and metallic contamination

- ✓ Levels, exposure of first trophics levels, seasonal and regional variations, transport on long distance
- ✓ Developments of equipment compatible with Polar Pod constraints
- ✓ Validation and tests of systems before circum-navigation

Problems : not to be contaminated by the Polar Pod itself



Ocean-Atmosphere fluxes



Air-sea exchanges are driven by waves (energy, momentum, mass)

General objectives :

- ✓ Up-grading of climate numerical models
- ✓ Better calibration of models by strong winds access giving new data
- ✓ Comparaison with satellite data

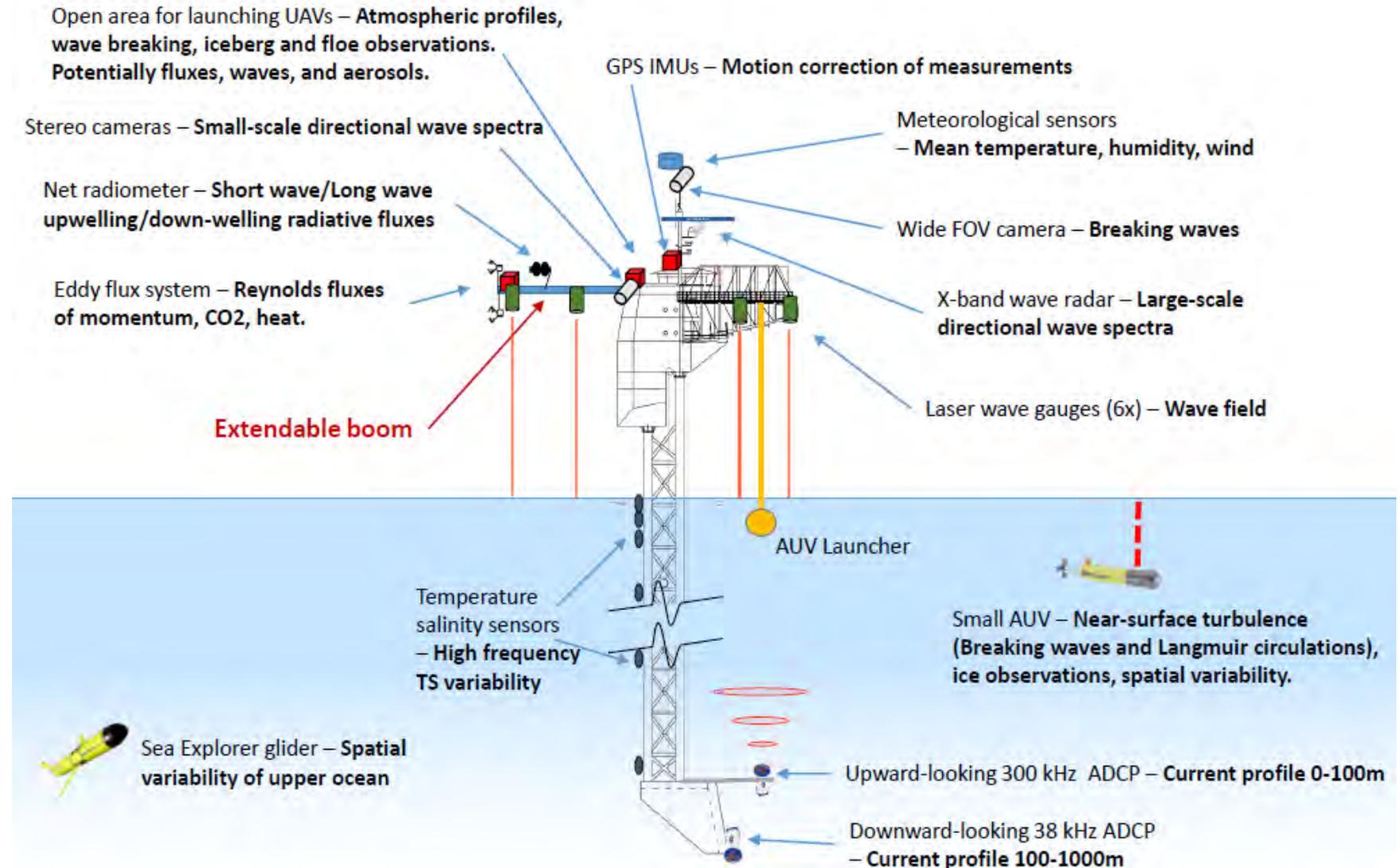


Normal conditions



Extreme conditions

Integration of a complete set of instrumentation



Calendar (tentative)

- ✓ Construction : 2017-2018
- ✓ Extensive sea trials : until mid-2019
- ✓ Towing to the area : summer 2019
- ✓ Cruise departure : Autumn 2019
- ✓ End of the cruise : 2021



End
You are welcome on-board

