



Polar POD

An innovative zero emission « ship » to explore Austral ocean





- **Polar POD – A project of Dr Jean-Louis Etienne initiated in 2010**
- Ifremer in charge of the construction of Polar POD
- SHIP-ST (naval design company) made the design
- Construction funded by ANR French Agency
- Ocean Polaire (Jean-Louis Etienne) in charge of the first austral expedition
- Expedition funded by Ocean Polaire
- CNRS in charge of the scientific program
- After the expedition, integration of Polar POD in the french oceanographic fleet





POLAR POD



- **Concept : « vertical ship » based on US FLIP (Floating Instrument Platform)**
- **Expédition : 3 years – 2 earth turns around Austral Ocean**
- **> 100 researchers involved - 40 institutions and 10 countries**

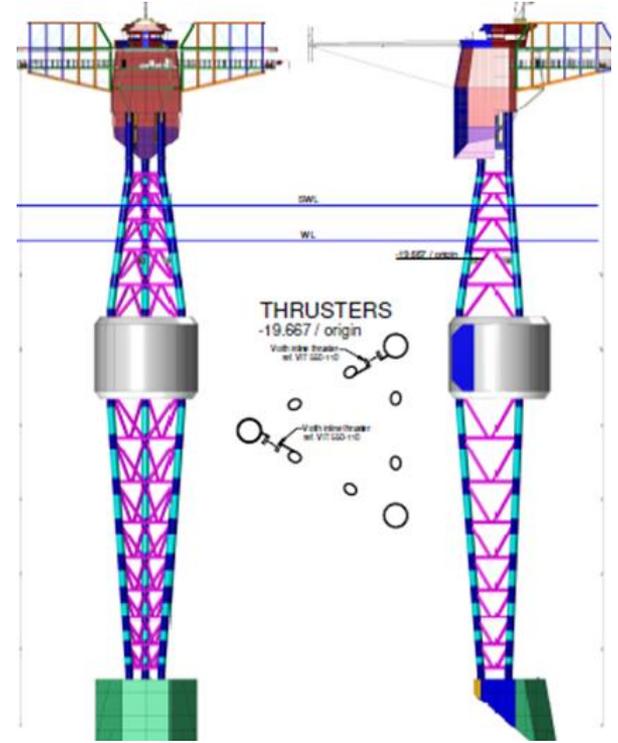




Ifremer

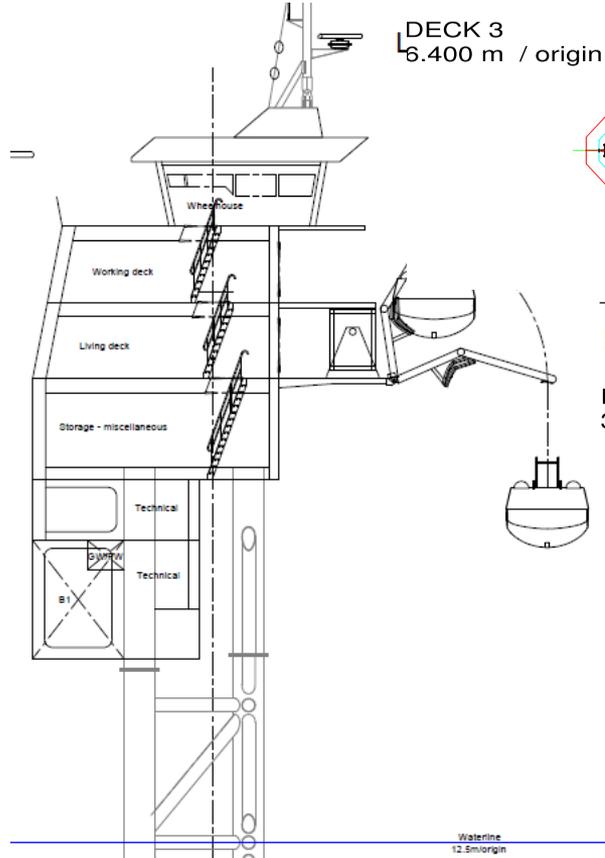
Characteristics

- 12.5m – 42.5 length
- 60-74m draft
- 60m de air draft
- 1080 t
- 8 persons on board
- 6 wind farms (2,5 kW each)
- Safety propellor (150 kW)

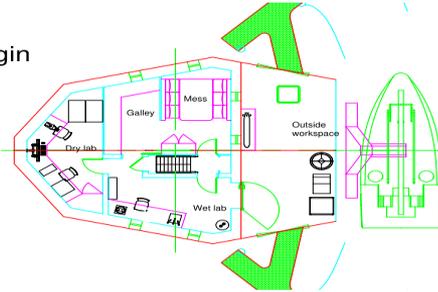




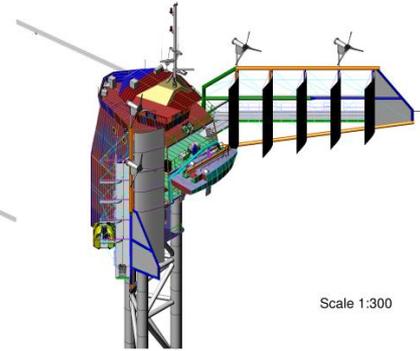
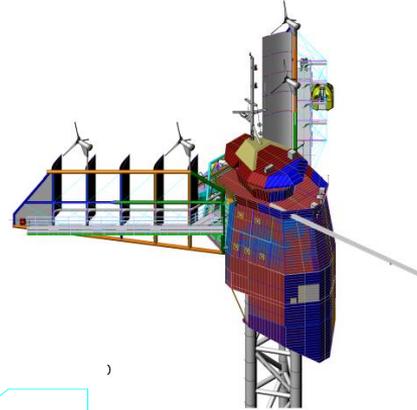
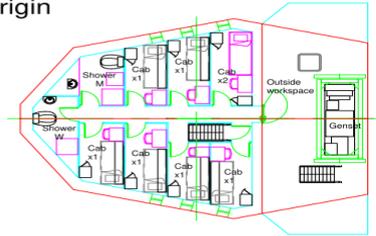
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DECK 3
6.400 m / origin



DECK 2
3.650 m / origin



Scale 1:300



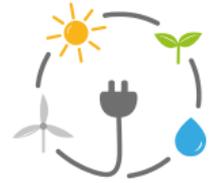
Energy balance

Energy sources

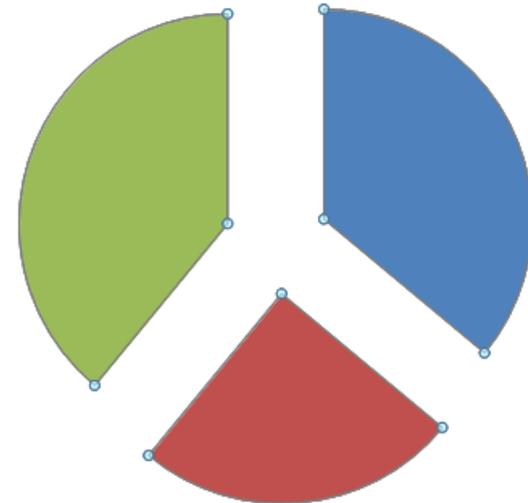
- 6 wind farms – 1 in backup : 1.92 kW each continuously = 230 kWh
- Diesel alternator = 20 kW in backup mode (no wind,..)
- Diesel alternator = 220 kW in safety mode (propulsion, ..)
- Buffer batteries = 100 kWh
- Wind

Daily requirement

- At 5 ° T in nominal mode = 210 kWh



Other 39 %
Fridge, water
heater, cooking,...



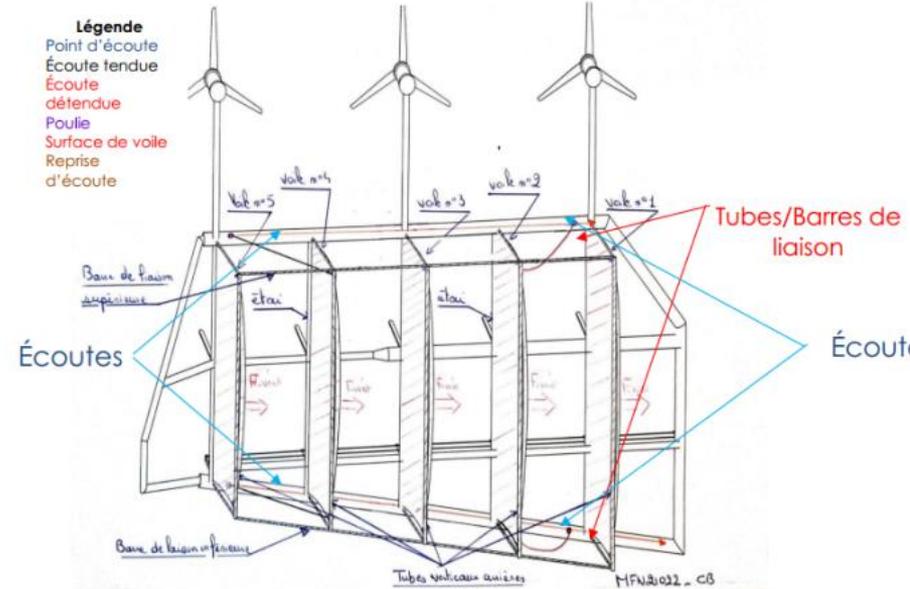
Heating 36 %

Science 25 %



Wind

- To cruise 0.5 knot faster than the current
- To orientate the Polar POD (to secure deployment of systems)
- To cruise broad reach to control trajectory (obstacle avoidance with large anticipation)





Water management

Grey waters

- Disposal by gravity through a specific column under the keel
- Or temporarily stored in the nacelle

Black waters

- No black waters – composting toilet (BIOLET)

Laboratory waters (chemical pollution)

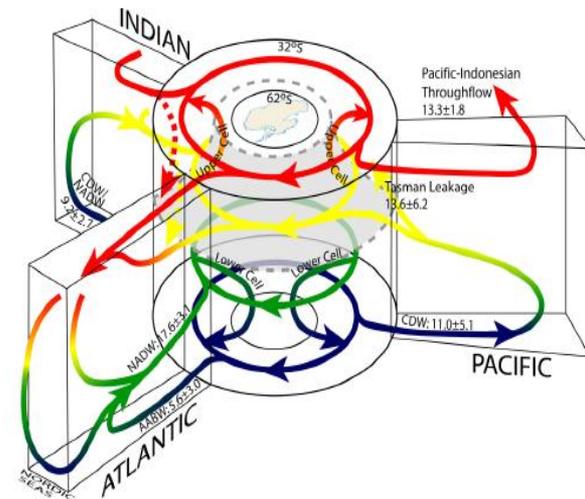
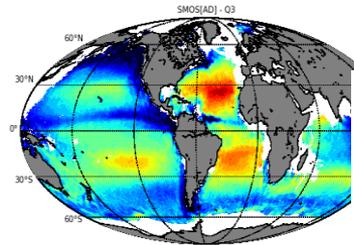
- Stored in tanks and unloaded during transfers





The scientific project is led by Dr David Antoine (CNRS)

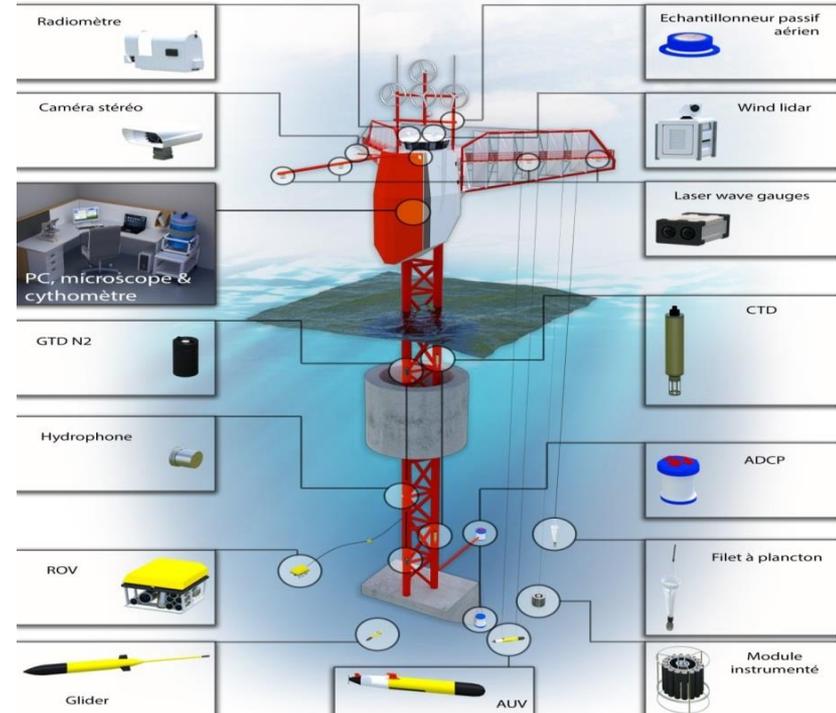
- Air-Sea exchanges in the Southern Ocean
- Long term monitoring of the Southern Ocean from remote sensing
- The biodiversity of the Southern Ocean
- Anthropogenic impacts





A large panoply of scientific equipment

- SBES (EK80)
- Hydrophones (Passive Acoustic Monitoring)
- ADCP (300 and 45 kHz)
- CTD, CO2, N2, O2,...
- Lidars
- Samplers for contaminants
- Radiometers
- ROV
- ...



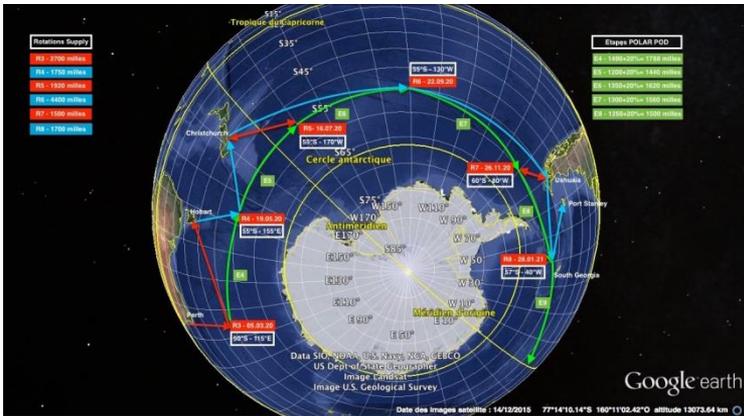
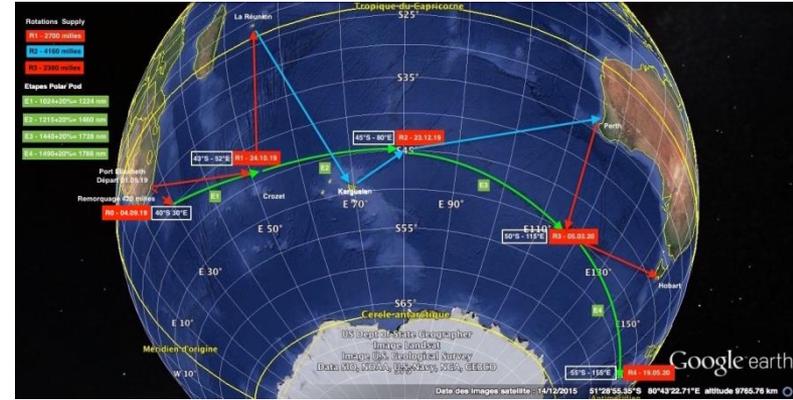


Transfer and supply

- Each 2-3 month
- HS = 4-5m max
- Wind = 5-6 max

Statistically

- 2 times/year, sea state > Hs 4m duration is over 17 days
- 9 times/year, sea state > Hs 4m duration is over 8 days.





Ship supply = Perséverance owned by J.L. Etienne

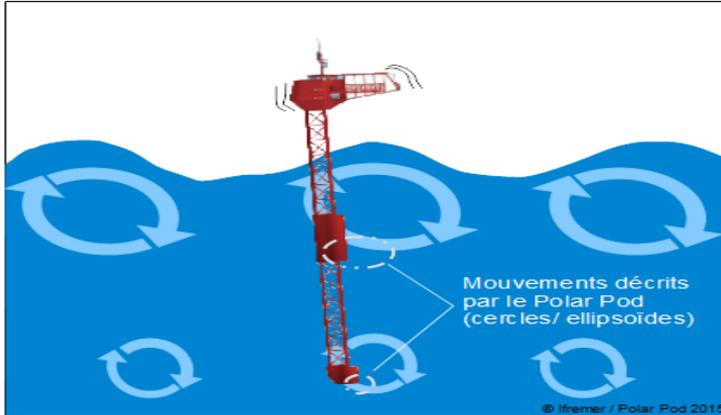
A green ship for a green Polar POD

- Length = 42.6m
- Width = 11m
- Masse = 310t
- Crew = 8 persons
- Passengers = 12 persons



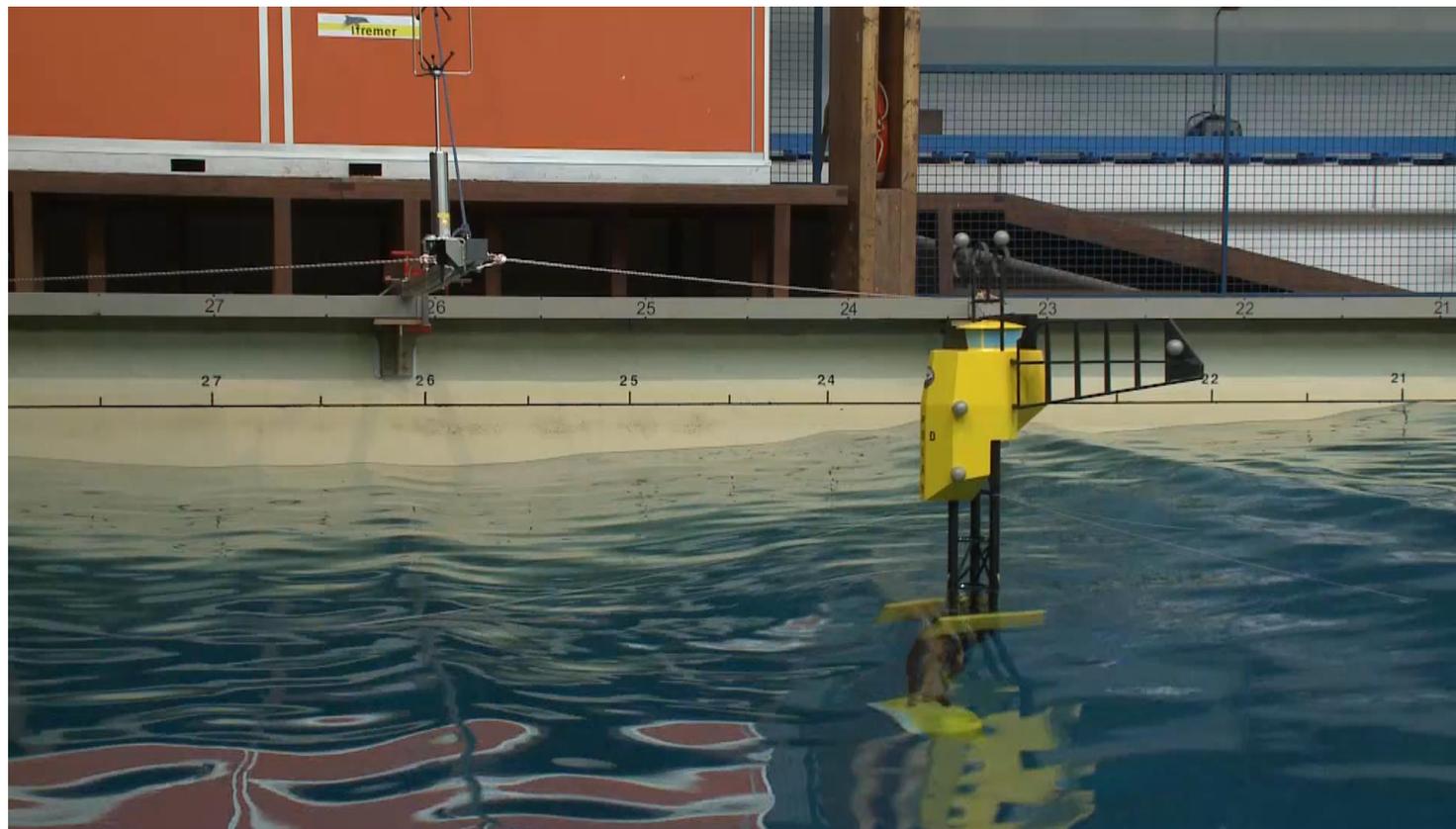
- Heave absorption of 80%
- Surge acceleration $< 0,03g$ /wave height
- Vertical acceleration $< 0,007g$ /wave height

- Wind : 0 - 65 nœuds
- Extreme wind : 136 knots (gales)
- Wave $H_s=15$ m
- Extreme wave $H_s=19$ m





Ifremer





Ifremer

Welcome onboard



The End