SINTEF NTNU

The journey:

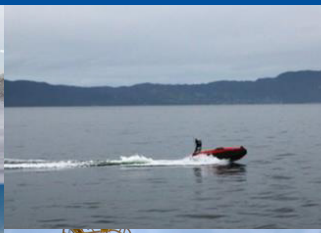
From OceanLab to Fjordlab

Photo: Adressa Brand Studio

A national infrastructure for full-scale ocean space research

- Full-scale testing of subsea robots, autonomous ships and aquaculture.
- Marine observation: Ocean ecosystems and changes in the subsea environment.
- Technology development for protecting subsea installations.

The OceanLab nodes



www.ntnu.no.edu/oceanlab

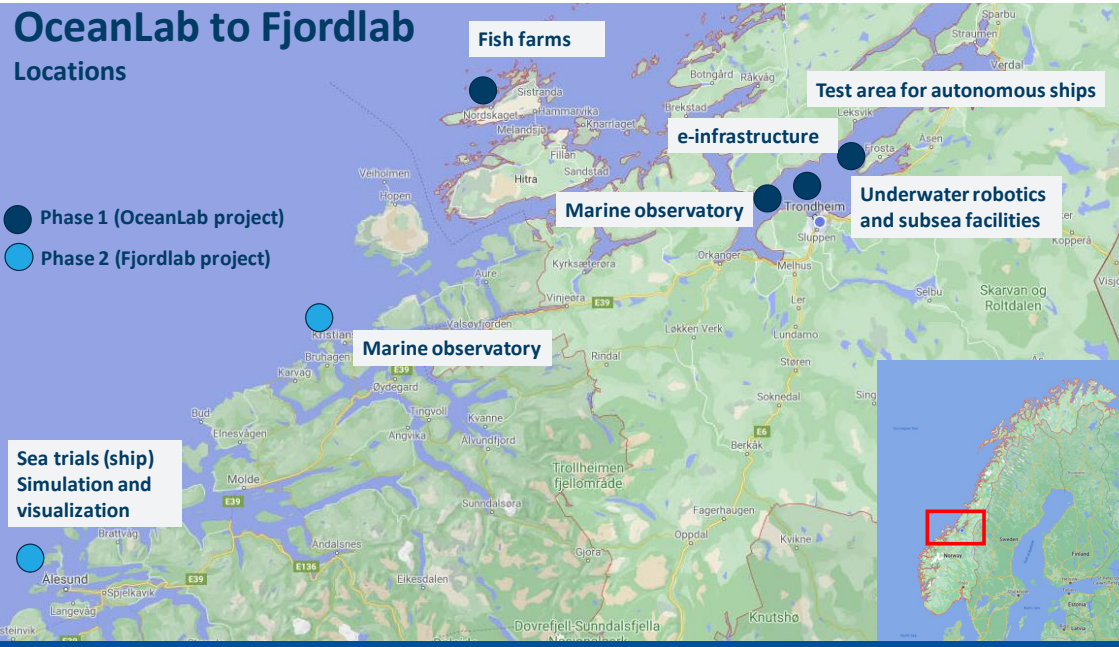
Why OceanLab?

OceanLab is an infrastructure project funded by the Norwegian Research Council, SINTEF Ocean, NTNU and Equinor. Fjordlab will be a continuation and extension of OceanLab and a part of the Norwegian Ocean Technology Centre – Norsk Havteknologisenter:

- **World leading ocean research**
  Enabling technology development, and education for students to the maritime industry. The OceanLab infrastructure can be used both by national and international partners, academia and the industry.

- **The green shift in the blue economy**
  Climate crisis and energy crisis: Transition to zero-emission shipping and autonomous shipping. Nature crisis: Ocean observation is needed.

- **National security and preparedness**
  Ocean surveillance in a new security situation in Europe – war on energy systems and infrastructure: We need an underwater coastguard.



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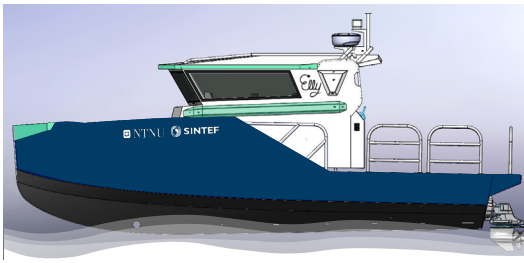
Node 1: Subsea robots and subsea facilities

- Remotely Operated Vehicles (ROVs).
- Autonomous Underwater Vehicles (AUVs).
- Light autonomous Underwater Vehicles (LAUVs).
- Autonomous Surface Vehicles (ASVs).
- Control room.
- Docking stations (90 and 365 m depth).
- Underwater observations and operations.
- Research, education, testing for development, simulations and experiments.
- Subsea interventions, marine science, system approach, machine vision, underwater navigation and communication, autonomy and cyber-physical systems, data collection, mapping and monitoring worldwide.

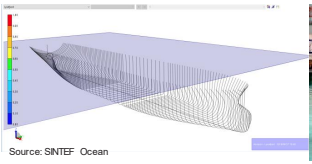
Node 2: Test area for autonomous ships facilities

- Detection (2 x radars, cameras).
- Communication (4G/5G).
- E-Navigation (AIS, 2 x weather stations).
- Electric work boat.
- OceanInfo (data portal).
- Technology for autonomous ships.
- Situational awareness.
- Remote control functions and operations.
- Resilience in autonomous operations.
- Autonomy logistics and transport chains.
- Cost-benefit analysis.



Elly is a newbuilt electrical work boat for operations in the nodes.

From simulation to full-scale testing and verification


Source: SINTEF Ocean

Ship design

Verification of ship design


Source: YARD

Sea trials

Advanced technology and system development

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Node 3: Aquaculture facilities

- Aquaculture sites with biomass.
- Instrumentation for digitalized and autonomous operations.
- Underwater cameras and split beam sonars.
- Automated crane, RPAS and ROVs.
- Load shackles and accelerometer.
- GPS/motion reference unit.
- Sensors for measurement of oxygen, temperature, salinity, turbidity, current, waves and weather conditions.
- Bio marine production, fish farming on four locations, fish well-fare, monitoring, remote operation, safety.

Node 4: Marine observatory facilities

- Several high-spec environmental data buoys: Covering Trondheim–Frøya–Ålesund.
- A suite of mobile oceanographic environmental monitoring.
- Gliders for offshore long-term monitoring.
- Long-range AUV for week-long deployments.
- USVs for environmental monitoring in Ålesund area.

Communication and e-infrastructure facilities

- Communication networks – both surface and subsurface.
- Systems for data storage and analysis.
- Management and data integration/interoperability.
- Restricted access where necessary.
- Communication at sea (radio) and under water (acoustics).
- Connecting and secure storing of the data from all the other nodes.
- Digital twins of the ocean. Machine learning and AI.

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