LandSeaLot
Work Package 3

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WP3: Integrated Observation and Modelling Frameworks

Lead Team: Yoana Voynova, Andrew Tyler, Vagelis Spyrakos & Holger Brix

Objectives:

- **To develop, test and benchmark best practice** for integrating observations and modelling capabilities to support modelling frameworks as a steppingstone to development of digital twins of the land-marine interface.
- **Identify gaps, similarities and complementarities** in the current efforts between existing observation networks and services.
- **Provide recommendations** and integration, assimilation and fusion frameworks for improved observations and further harmonisation between the established RIs, networks and services (piloted WP5)
- **Supporting the consolidation** of a framework for the LandSeaLot Common Obeservation Strategy (WP2).

Tasks:

Task 3.1: Overcoming observational heterogeneity between domains and communities (M1-M30) Lead: **HEREON,** Participants: USTIR, PML, CNR, IFR, DLT, COV, +ATL, NOR**.**

Task 3.2: Consistency in Earth observation (EO) of the LSI (M1-M30) Lead: **BC,** Participants: USTIR**,** PML, COV, SYKE, CNRS, IFR, CNR, +ATL.

Task 3.3: Closing the gap between models and observations (M12-M30) Lead: **DLT,** Participants: HEREON, IFR, USTIR, CNR, +ATL, COV, SYKE, NOR, HCMR.

Task 3.4: Roadmap and best practices in integrating observations and models (**M20-M42)** Lead: **USTIR** Participants: IFR, HEREON, ULI, COV, CNR, +ATL, CNRS.

WP 3 | Task 3.1: Overcoming observational heterogeneity between domains and communities

HEREON, USTIR, PML, CNR, IFR, DLT, COV, +ATL, NOR

Overall objectives

- address the overlaps and complementarities of in situ capabilities
- focus on a subset of essential variables addressing specific environmental pressures related to e.g., climate change, anthropogenic discharges and biodiversity loss
- in river mouths, estuaries and coastal systems
- benchmark in situ observing practices across these systems
- identify observational challenges specific to the land-sea interface
    - focus on inconsistencies and their origins

Connections

- Leaning on best practices developed in
    - RIs (DANUBIUS-RI, JERICO-RI, ICOS-ERIC)
    - Previous studies
    - Work from the LILs (WP5)
    - Communities of practices (link to WP2)
- Input to other tasks in WP3

WP 3 | Task 3.2: Consistency in Earth observation (EO) of the LSI

BC, IFR, +ATL, CNRS / NantesU, CNR-ISMAR, USTIR, COV, PML

Overall objectives

- Optimise current satellite and in situ EO capabilities
- unlocking multi sensor products
- removing observation discontinuities in the LSI
- harmonising multi-scale observation strategies across observation disciplines such as altimetry and radiometry
- anticipating on future ESA missions such as Copernicus LSTM
- Piloting activities in LILs (WP5)

Parameters / topics to be addressed

Ocean Colour algorithms

- **Blending of algorithms at transitions zones** in LSI (AC as well as inwater)
- **CDOM algorithm** development and implementation
- Validation of algorithm evolutions

Optical Water Type Classification (OWT)

- Optical water type classifications evolution
- Testing and validation of OWT approaches

Multi-sensor approaches

- Multiple sensor approaches (taking off from developments e.g. in MultiRes approach or CERTO) for Ocean Colour
- Merging S2, L8/9 HR data for estuaries with S3 for open areas
- Validation of merged products

SST

- Thermal evaluation in estuarine areas
- Link SST and water levels

EO and external auxiliary data (riverine input, riparian zone, etc.)

- Merging of water levels in rivers and estuaries with observations

In-situ observations

- Processing / brokering / improving in-situ radiometric observations
- Determining uncertainties **in low-cost in situ radiometry** and providing uncertainties with reference in situ radiometry
- Merging **in-situ HF monitoring system and OC** for turbidity / SPMC quantification
- **Low-coast sensors (SST + Sea Level)** to validate EO related date

WP 3 | Task 3.2: Consistency in Earth observation (EO) of the LSI

- **Link to WP2**
  - Facilitating the process of uptake of WP3 results into LCOS
  - Lessons learned will populate LCOS (WP2)

- **Preparation of LiLs**
  - Baltic (OC, SST, Carbon flux)
  - North Adriatic (CDOM, OWT, multi sensor)
  - Forth (CDOM, multi sensor)
  - Danube (OC, blending, merged products, coastal erosion?)
  - Seine Estuary (OC and dominant phytoplankton during red tides, SST)
  - Po river (OC, DOC, multi sensor)
  - Tagus&Sado Estuaries (SST, SLH)

WP 3 | Task 3.3: Closing the gap between models and observations

DLT, HEREON, IFR, USTIR, CNR, +ATL, COV, SYKE, NOR, HCMR

1. List relevant data available at the European scale
   - In-situ vs. RS vs. citizen science vs. other (e.g. social media feeds)
   - Source to sea: from emissions on land to measurements in the European seas
2. Which of these data are used and how are they used?
   - As model input
   - For model verification
   - Data products / services
   - If not used, why not? Is there potential?
3. Techniques used (for data-model integration)
   - Data analysis / processing (e.g. ML)
   - Data-model integration (e.g. data assimilation)
   - Other available techniques
4. Requirements of LIL's (pilots)
   - Requirements of the LIL's vs. information from item 1-3 → gaps in knowledge/available data/techniques/interoperability/inconsistencies
   - Define steps to be taken to address these gaps
   - Select techniques/methods to fill these gaps
   - **Develop some of these techniques/methods for application in the pilots? Or is this to be done in the pilots themselves?**

WP 3 | Task 3.4: Roadmap and best practices in integrating observations and models

USTIR, IFR, HEREON, ULI, COV, CNR, +ATL, CNRS, DLT

- M20-M42

Task 3.1
Task 3.2
Task 3.3

→ Lessons learnt from WP4 and LILs (WP5) → Roadmap for harmonisation and integration of observations and models at LSI (Input to LCOS – WP2)

First year activities:

- Ensure that links with 3.1, 3.2, 3.3, WP4, WP5 and WP2 are established and understood
- Align with any other relevant activities in WP3 tasks and other WPs

WP 3 | Timeline – Milestones and Deliverables

Month	MS / D	Name	Verification	Responsible
M10 / Nov 2024	MS 7	First recommendation on interoperability of in situ observation systems	Minutes of Meeting with land-sea in situ community	Hereon
M16 / May 2025	MS 10	Joint evaluation and way forward for satellite observation strategies in LILs	Minutes of Meeting	BC
M18 / Jul 2025	D 3.1	Preliminary report on inconsistencies, interoperability methods and alignment of observations and models	R, PU	Hereon
M34 / Nov 2026	MS 15	Draft roadmap for integrating observations and models at the LSI	Minutes of joint WP3, WP5 meeting	DLT + ? (WP5)
M34 / Nov 2026	D 3.2	Final report on inconsistencies, interoperability methods and alignment of observations and models	R, PU	DLT
M42 / Jul 2027	D 3.3	Roadmap for integrating observations and models at the land-sea interface	R, PU	USTIR

WP 3 | Some issues

- How/when discussing about EO plans for each team?
- How to coordinate different approaches for similar questions?
- Which kind of synergies and fruitful exchange can we get? (i.e. Romaric is interested in knowing more about EO SPM works to be conducted in LSL (and who)
- Partners in WP3 (and WP5) are though to be the key actors of the LSC (LandSeaLot Science Community forum).
- The methods (how we are going to operate) needs to be discussed and jointly agreed.
- D3.2, **Final report** on inconsistencies, interoperability methods and alignment of observations and models
- Link with deliverable D3.1, which is the **preliminary report** on inconsistencies, interoperability methods and alignment of observations and models
- In other words, deliverable D3.2 has deliverable D3.1 as precursor. We need to build on that report. **How do we coordinate this?**
- Deliverable D3.2 covers the activities of task 3.2 and 3.3
- Hence collaboration by task 3.2 and 3.3 is very important to generate a well readable deliverable.
- Some participants are only involved in task 3.2 or task 3.3. Example: Deltares leads deliverable D3.2, but has formally no role in task 3.2.
- **How do we coordinate this?**
- D3.2 is due in month 34 of the project, i.e. Nov. 2026

Let’s observe together!

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Be part of the conversation

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