# 3rd SPB Workshop

6–7 Dec 2023 @Nikhef science park, Amsterdam, Netherlands

# Physical Variables & characterization division status

L. Naticchioni – INFN

ET-0492A-23

# WD1: division organization

## SPB WD1

## Physical Variables & Characterization

**ET-Wiki page:**
**https://wiki.et-gw.eu/SPB/PhysicalVariables**

**WP 1.1 – Seismic noise**
Chairs: C. Giunchi & S. Shani-Kadmiel

**WP 1.2 – Gravimetry, Geodesy & Geodynamics**
Chairs: R. Devoti & R. Hanssen

**WP 1.3 – Magnetic noise**
Chairs: R. De Rosa

**WP 1.4 – Other environmental noises**
Chairs: T. Bulik & S. Shani-Kadmiel

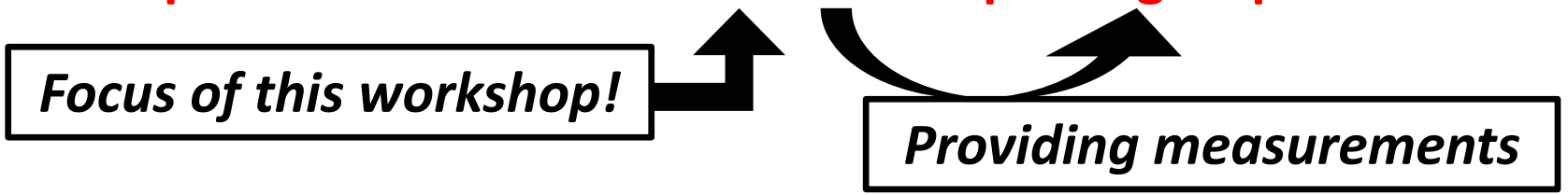
# WD1: Milestones and Deliverables

## Division Milestones:

- **M1.1: physical variables needed for the site characterization and for the evaluation of their impact on the detector performances**
  - ➢ https://apps.et-gw.eu/tds/?content=3&r=18113
- **M1.2: measurements recommendations and standards** (setup, sensors, procedures, best practices…)
  - ➢ https://apps.et-gw.eu/tds/?content=3&r=18114
- **M1.3: data format standards and analysis tools**
  - ➢ https://apps.et-gw.eu/tds/?content=3&r=18398

## Division Deliverables:

- **D1.1: quantification of noise sources impacting ET performances.**



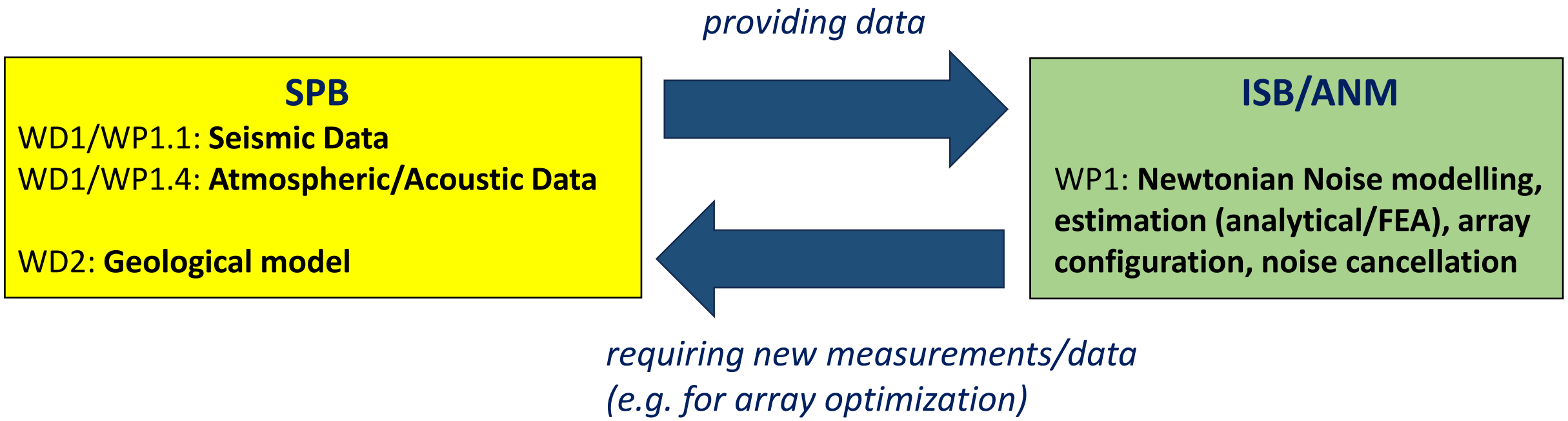

➢ Q3 2024?

# WD1: Status

- **Measurements, standards, recommendations are now defined** in the milestone documents.
- Host teams should follow these indications and provide the required measurements to proceed towards the next step (D1.1).
- Noise characterization is a fundamental part of the site selection procedure, and we must be ready to provide all the required data!

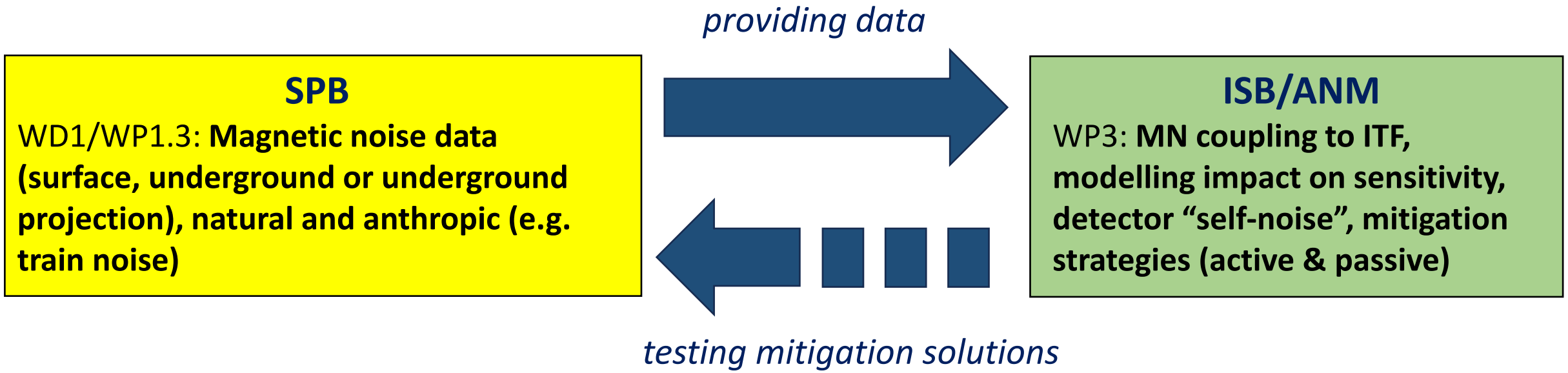
# WD1: Status

- **Noise quantification and mitigation** must be evaluated in collaboration with the ISB-Active Noise Mitigation division, e.g.:
  - **Newtonian Noise** modelling, quantification, cancellation are duties of the NNC WP of ISB/ANM, providing the required data is a duty of SPB/WD1:



# WD1: Status

- **Noise quantification and mitigation** must be evaluated in collaboration with the ISB-Active Noise Mitigation division, e.g.:
  - **Magnetic noise:** MN (natural and anthropic at the site) quantification is a duty of SPB/WD1, instrumental MN, overall impact on the detectors and mitigation strategies are duties of the MN WP of ISB/ANM



# WD1: Status

- **Windfarms noise** can spoil the LF sensitivity of ET, measurement and studies are **urgent** to better define the exclusion zones around the candidate area for the observatory, and possible mitigation strategies for existing / already-authorized wind parks.
  - Studies are ongoing at both sites.
  - See in this workshop G. Diaferia's talk about the WINES experiment in Sardinia.

- **Magnetic noise** represents one of the main limits in the LF band 2-10Hz. Natural + "anthropic" (existing) + detector self-inflicted sources. The first two sources **must** be measured at the sites (then applying proper coupling factors we can evaluate the effect on the ET sensitivity). → I. Fiori's and B. Garaventa's talks in this workshop.
  - **Sardinia site**: measurements and continuous monitoring at surface and underground at one corner (Sos Enattos), surface monitoring at the other 2 corners (borehole areas).
  - **EMR site**: measurements are mandatory (M1.1 & M1.2) but still missing! EMR team please react!

# WD1: Status - measurements

The status of the ongoing measurement campaigns is reported in:

- **EMR**: M.Kiehn's, S.Shani-Kadmiel's, Soumen's and G. Degrande's talks.
- **SARDINIA**: M. Di Giovanni's & G. Diaferia talks.

**WP1.1**: a **shared seismic study** comparing the measurements from the EMR, Sardinia and Lusatia **boreholes** is led by A. Rietbrock (talk in this session!). The data analysis and writing team includes members from the three sites. Shared methodology, crosscheck of the codes, common paper following the M1.1,M1.2,M1.3 documents produced by the SPB/WD1.

**WP1.4**: acoustic measurements at Sos Enattos, sensor installations planned at P2,P3 (Sardinia), need to speed up installations and measurements at EMR.

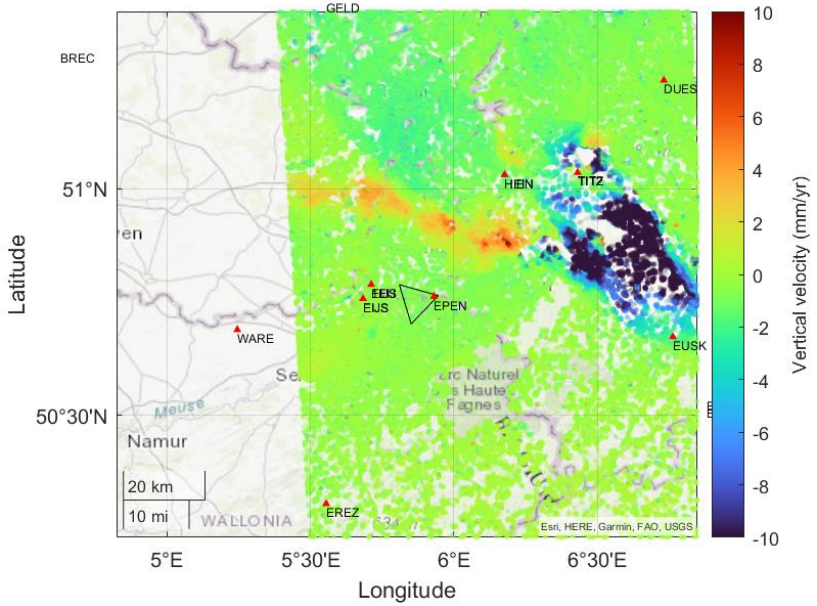
# WD1: Status - measurements

**WP1.2**: geodynamical and gravimetric measurements requires (multi)annual measurement (NB: site selection in 2026?)

**Sardinia**: new GNSS station installed at Sos Enattos, preliminary measurements at P2 and P3 for other two permanent stations.

**EMR**: … please react!

Meuse-Rhine Euregio

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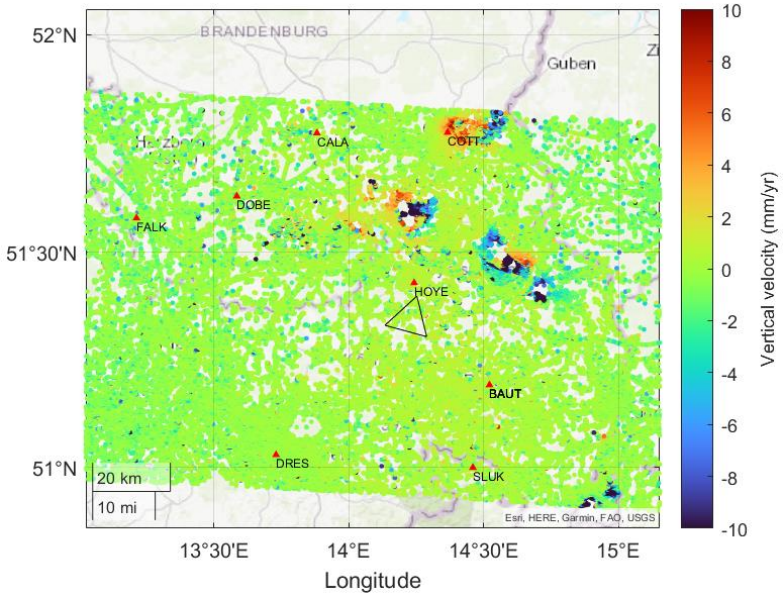
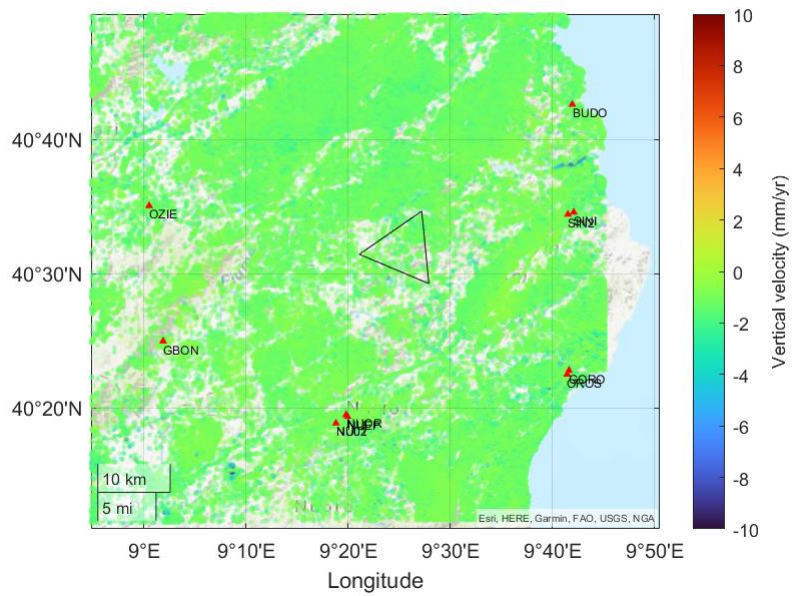



Sos Enattos



# WD1: Conclusions

- Measurement campaigns are going on at the 2 (3) sites;
- A lot of data produced, several publications…
- **Some critical situations**:
  - **WP1.3:** still no MN co-chair from EMR side and **no magnetic noise measurements at EMR!**; **to complete the site characterization as defined by this board, measurements are mandatory!**
  - **WP1.2:** need to speed up installations and measurements considering the 2026 deadline (TBC), in particular at EMR.
- **WP1.1**: a lot of data from the 2 (3) sites, a common analysis and paper from boreholes data is in preparation.
- **WP1.4**: need to complete the measurements in Sardinia and to start those planned at EMR.
- **Newtonian Noise**: discussion must happen inside the NN WP of the Active Noise Mitigation division in the ISB. Dedicated talks and discussions at this workshop.
- **Δ vs 2L**: discussion ongoing at different levels within the collaboration and ET project. Double L is not a remote hypothesis, but a real possibility. We should be ready to extend the characterization to possible L vertex locations at both sites.