The Alaiz Experiment (ALEX17)
Vizualizing the flow in complex terrain with multi scanning lidars

PEDRO SANTOS (DTU)
paas@dtu.dk
NEWA Final Workshop, Bilbao, 2 April 2019

NEW EUROPEAN WIND ATLAS
newa

3 NEWA parterns & Team of Authors

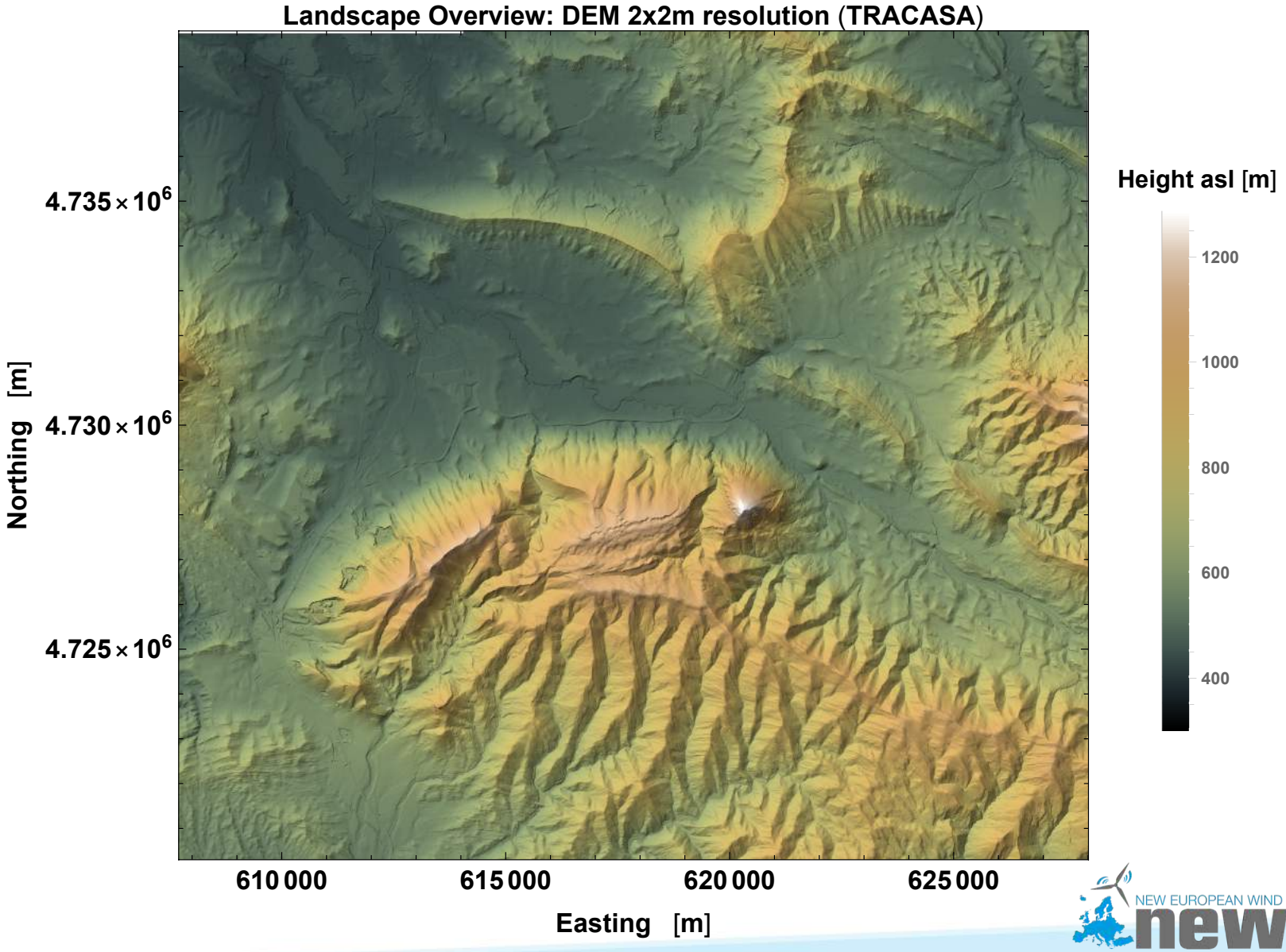
CENER

ADItech

Name	Organization	E-mail
Elena Cantero	National Renewable Energy Centre (CENER)	ecanter@cener.com
Fernando Borbón Guillén	CENER	fborbon@cener.com
Javier Sanz Rodrigo	CENER	jsrodrigo@cener.com
Pedro Santos	DTU Wind Energy (DTU)	paas@dtu.dk
Jakob Mann	DTU	jmsq@dtu.dk
Nikola Vasiljević	DTU	niva@dtu.dk
Michael Courtney	DTU	mike@dtu.dk
Daniel Martínez-Villagrasa	University of the Balearic Islands (UIB)	dani.martinez@uib.cat
Belén Martí	UIB	belen.marti@uib.cat
Joan Cuxart	UIB	joan.cuxart@uib.cat

Terrain and Land Cover

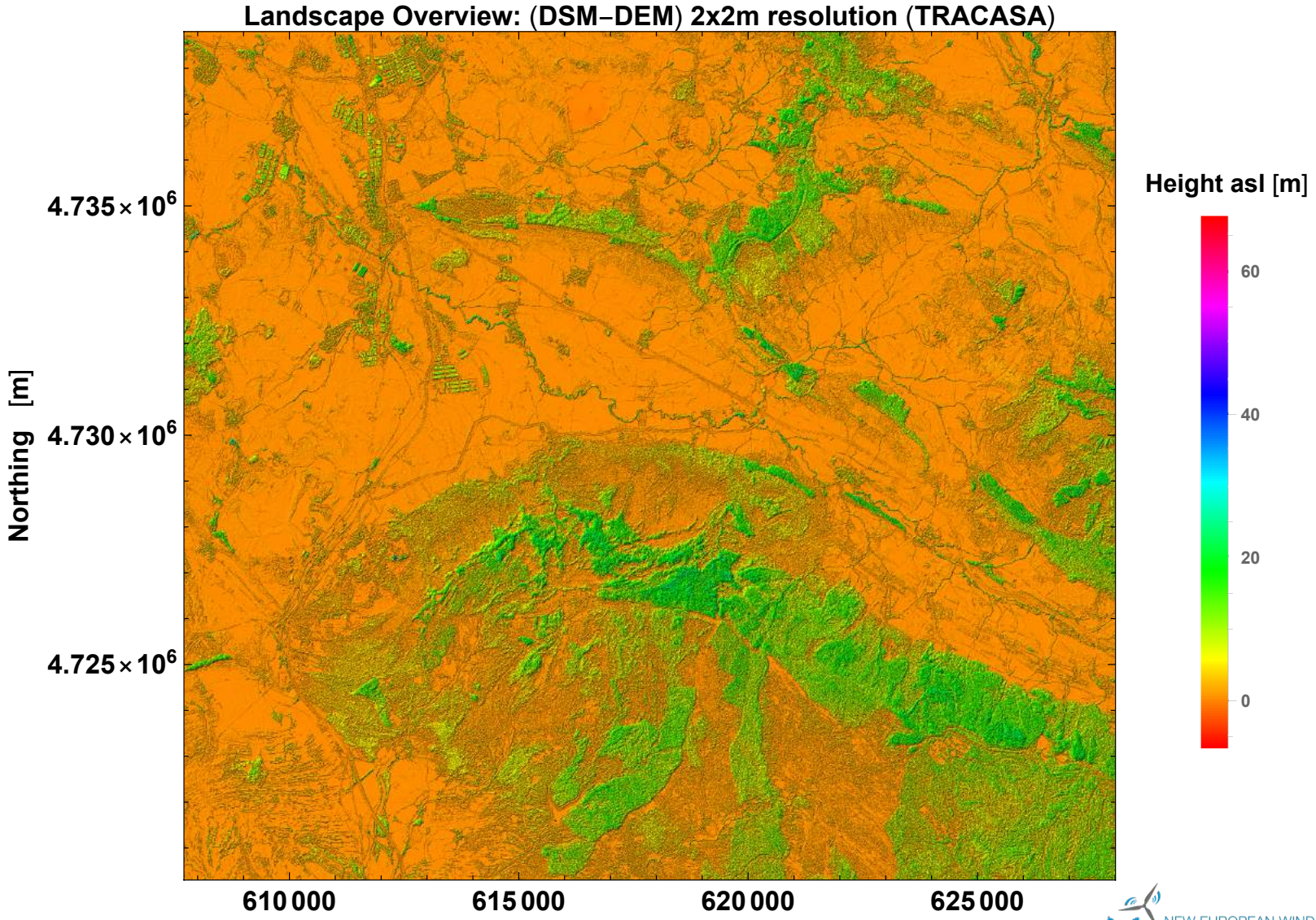
DSM and DTM with 2x2m resolution from TRACASA (Spain)



NEW EUROPEAN WIND ATLAS
newa

Terrain and Land Cover

DSM and DTM with 2x2m resolution from TRACASA (Spain)



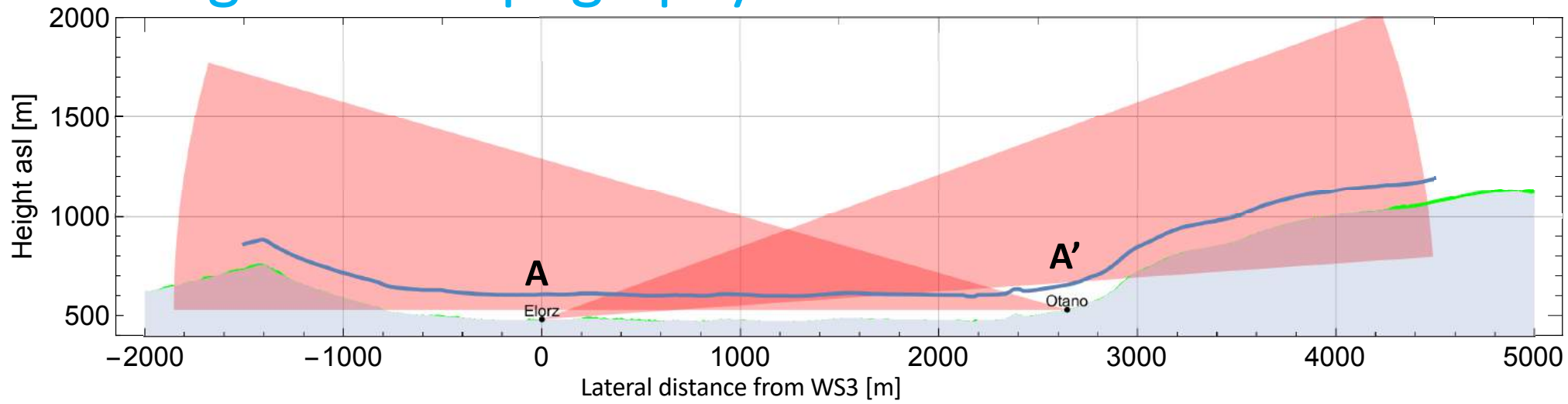
NEW EUROPEAN WIND ATLAS
newa

ALEX17: Scientific Objectives

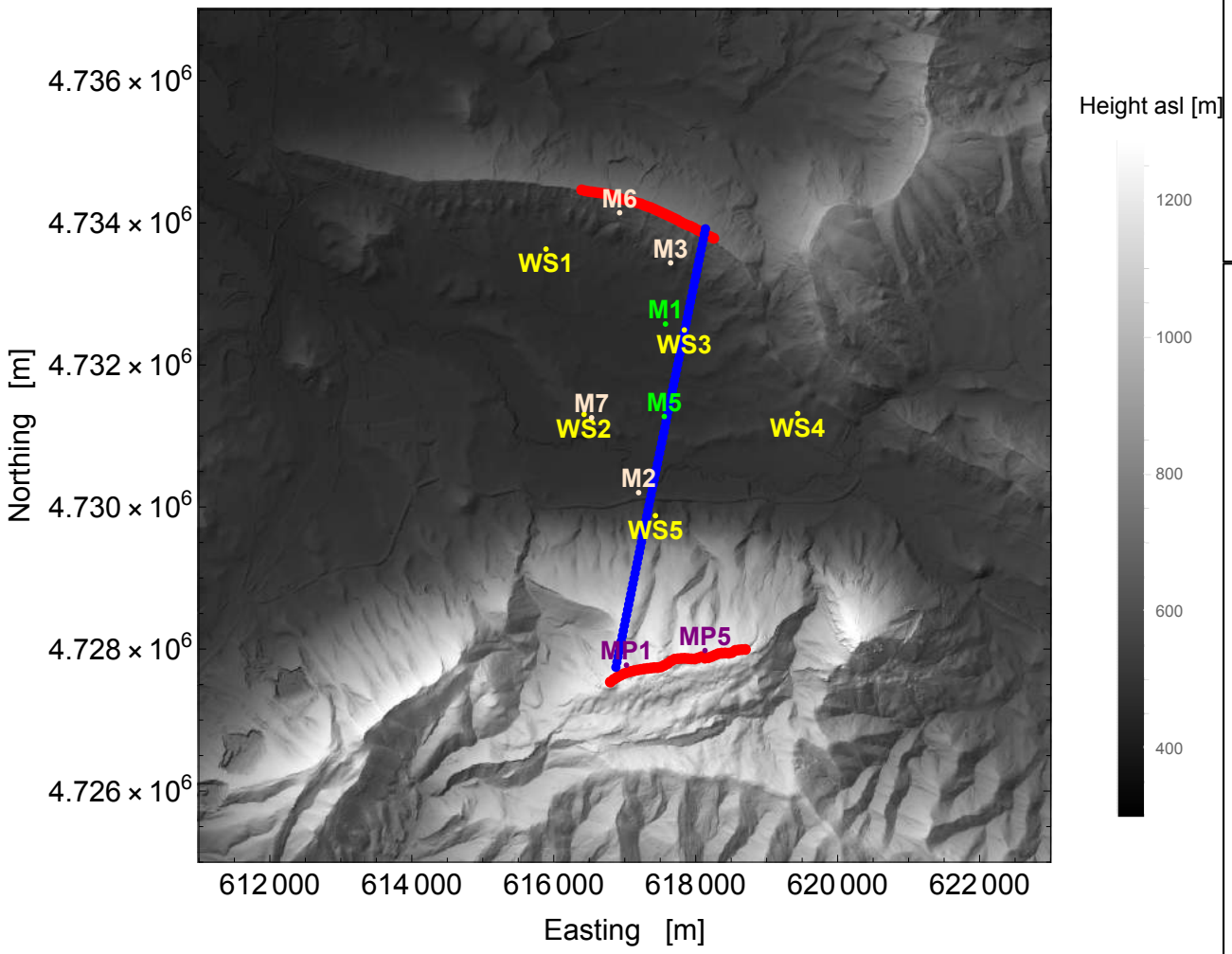
- Obtain a high-quality dataset over an **unprecedented (20x20km) area**
- Reconstruct the 2D/3D wind field along a **10km continuous transect**
- Identify and **quantify variability** of important sitting parameters
- **Validate meso-to-microscale** numerical modelling

NEW EUROPEAN WIND ATLAS
newa

Large-scale topography



Experimental Layout: Wind Field



Measurement equipment:

- 5x WindScanners (WLS200S)
- 2x 80m Cup Masts
- 4x 80m Sonic Masts
- 2x 118m Masts (CENER's site)

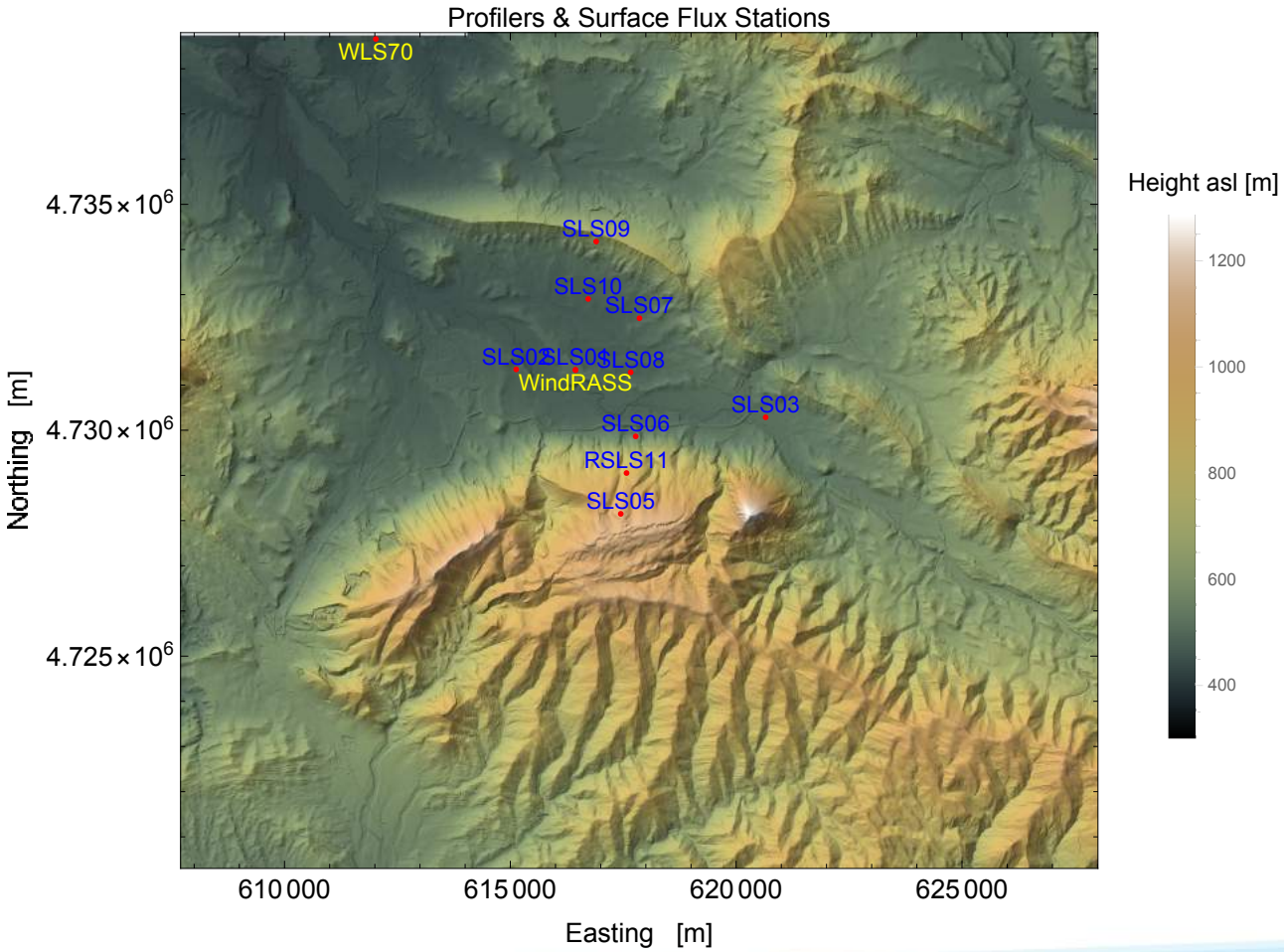
Wind Field Reconstruction (125m a.g.l.)

- 2D wind on North Ridge (2km along Tajonar)
- 2D wind on South Ridge (2km along Alaiz)
- 3D wind along 6km transect
- 2x [50,500]m Virtual Met Masts at the transect

NEW EUROPEAN WIND ATLAS
newa

Experimental Layout:

Fluxes and Profiles



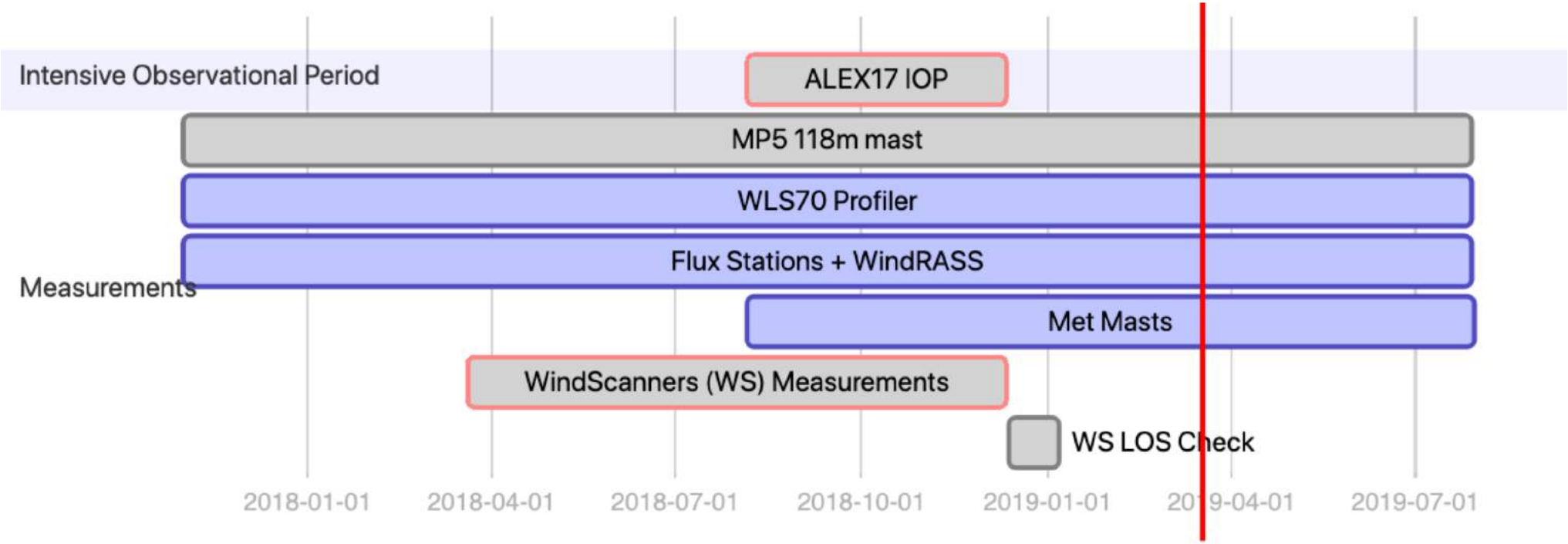
Additional Sensors:

- 9x Surface layer stations (SLS)
- 1x Surface energy balance station (SEB)
- 1x Sodar/RASS
- 1x WLS70 profiler

NEW EUROPEAN WIND ATLAS
newa

Timeline: long-term, 1-year and IOP

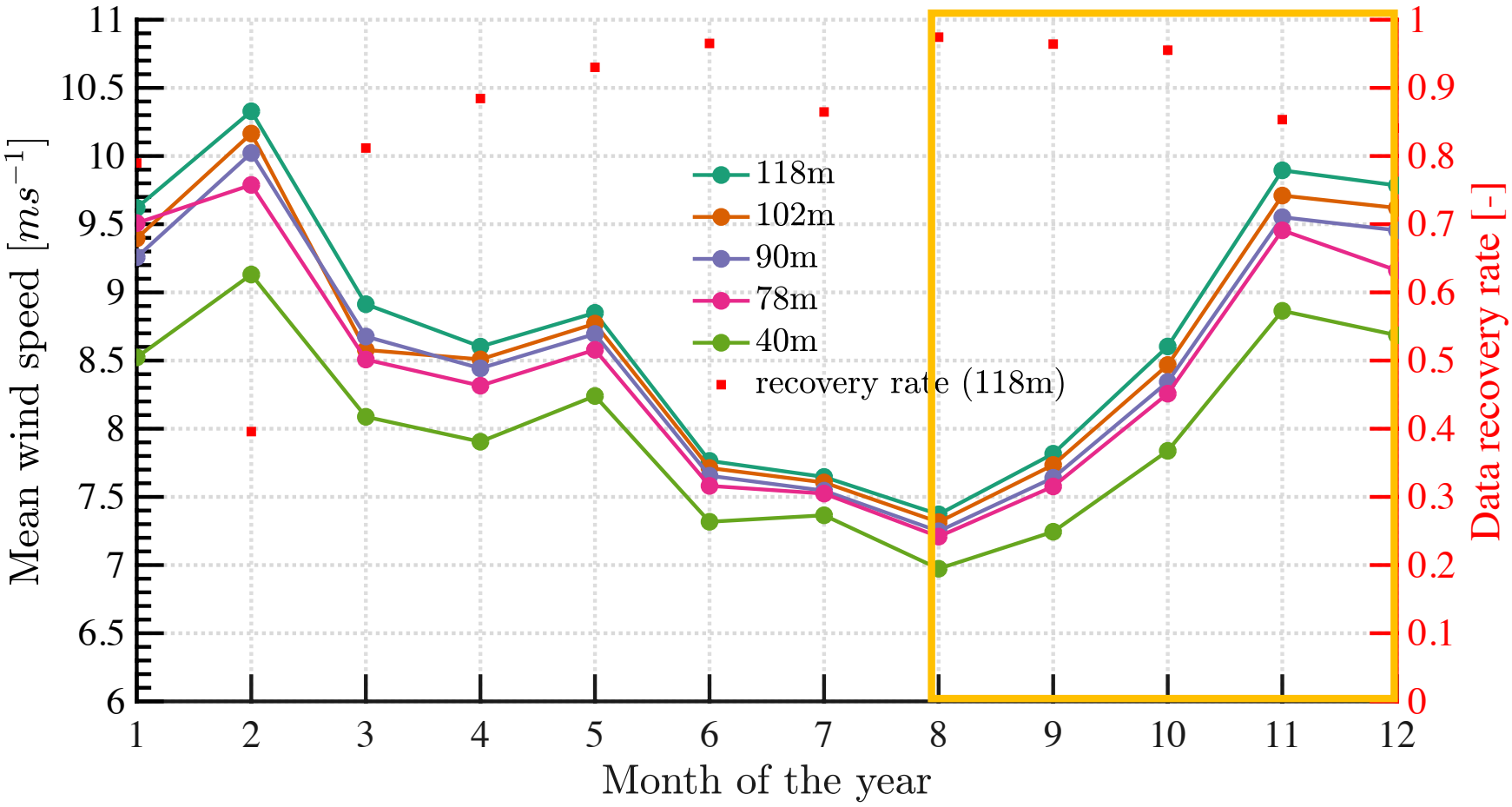
- Intensive Observational Period (IOP): 6 months from Ago/18 to Dec/18;
- WindScanners: 9 months from April/18 to Dec/18
- 80m sonic masts: 1 year from Ago/18 to Jul/19
- Other instruments: 1+ year of measurements, including IOP



NEW EUROPEAN WIND ATLAS
newa

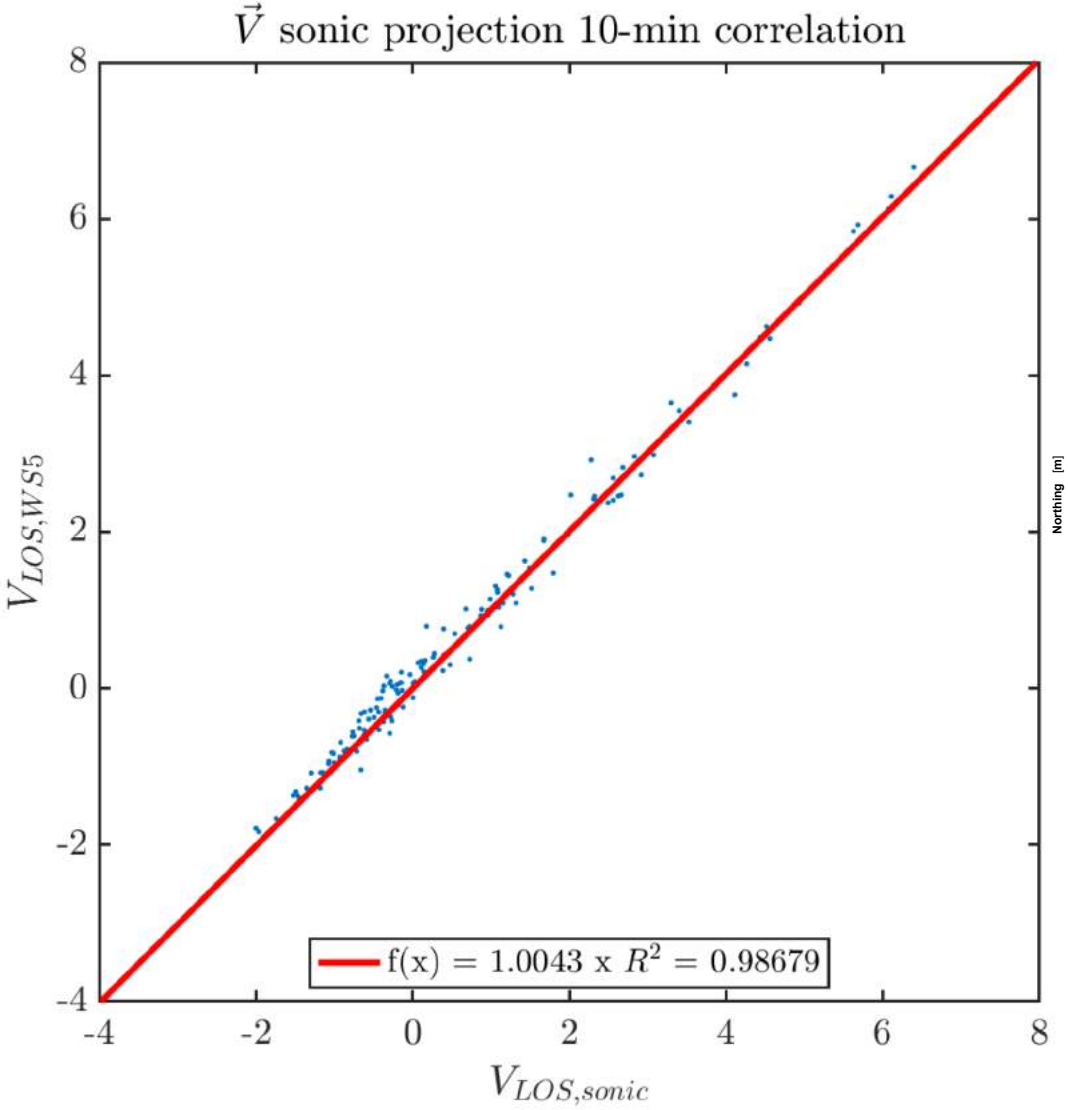
Timeline: IOP Wind regime

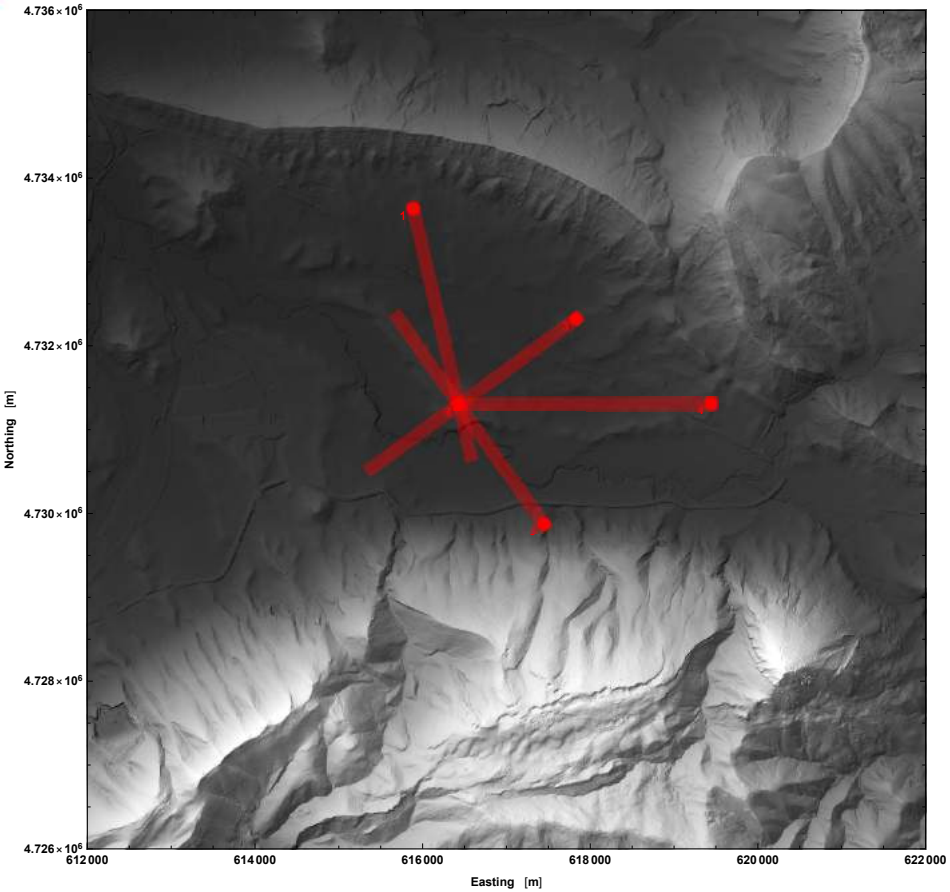
- IOP covers half-year with increasing wind regime;
- Dataset can be tested in new WRA methodologies;



Line-of-Sight (LOS) measurements

- WindScanner measurements “sanity check” against 3D sonic anemometer;

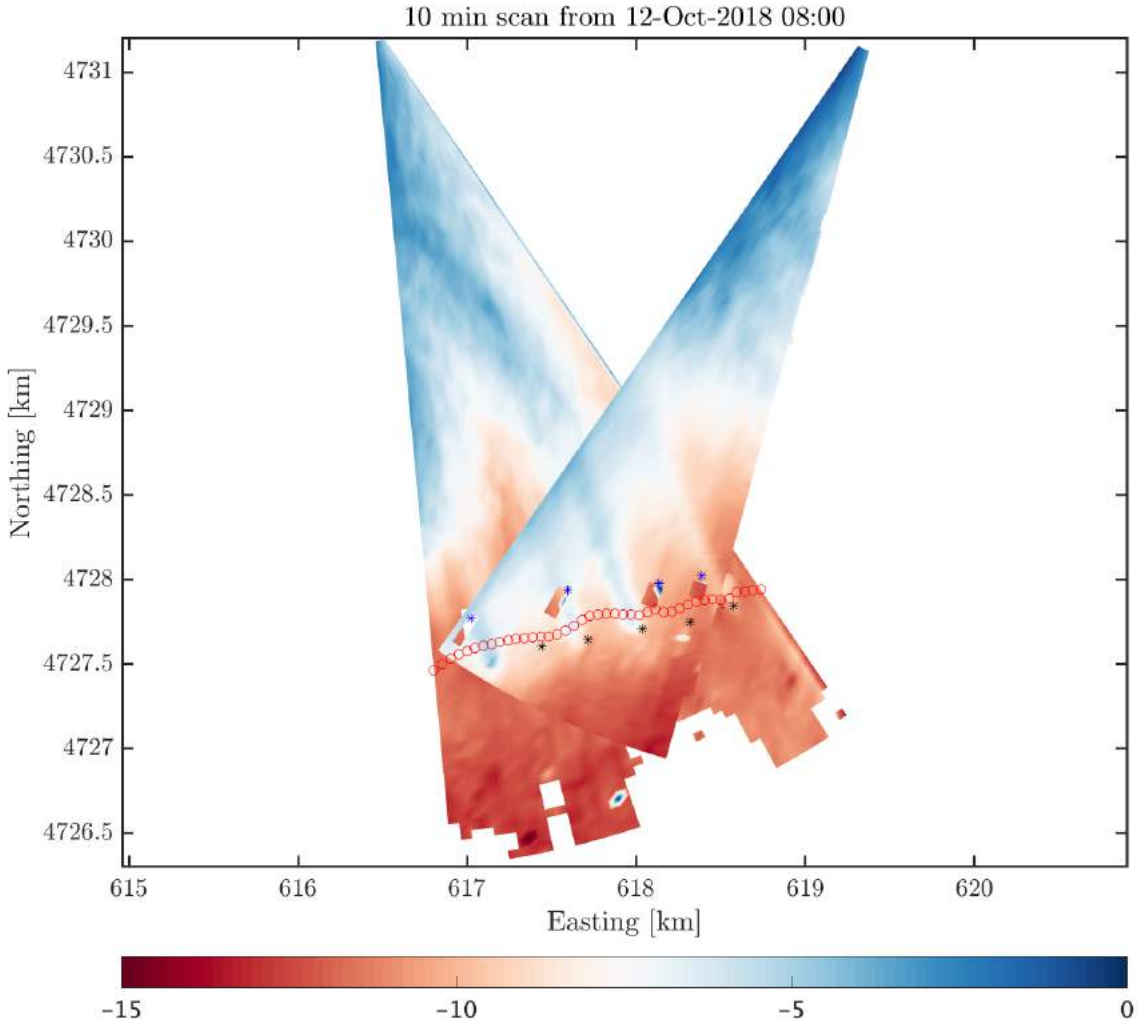


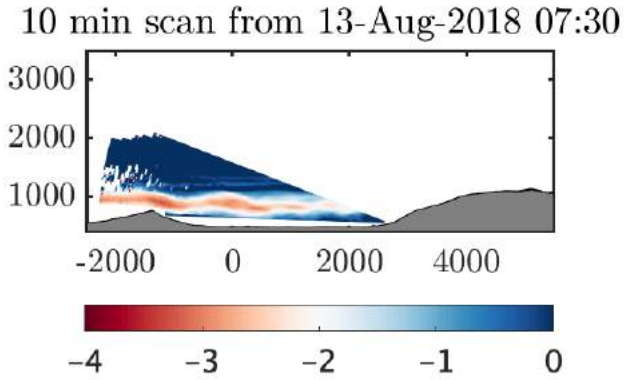


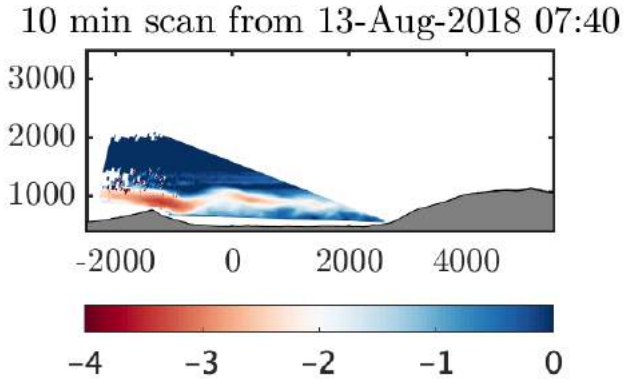
NEW EUROPEAN WIND ATLAS
newa

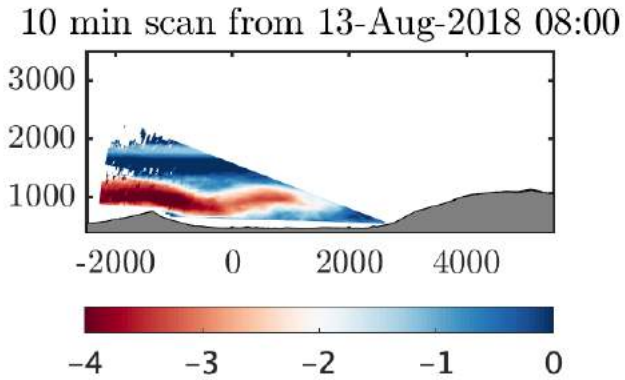
Flow features: wakes and waves

- Wake deflection by topography and valley winds;
- Gravity waves from northerly winds on weakly stable regime.



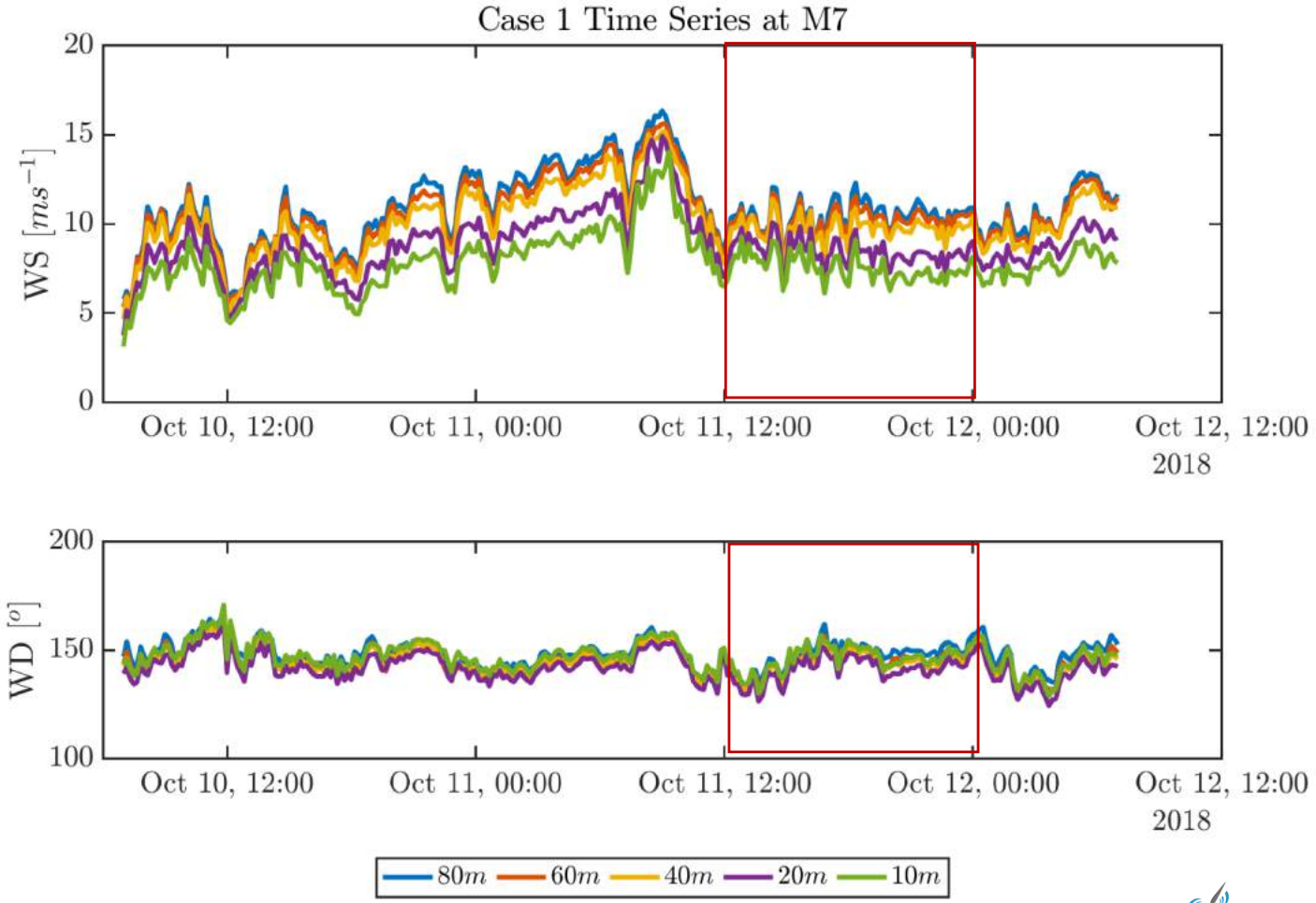






ALEX17 Benchmark

- Verification & validation of numerical models;
- Diurnal cycles will be selected for this purpose.



NEW EUROPEAN WIND ATLAS
newa

Open-source Dataset

ALEX17 Documentation and data will be centralized in a single DOI:

Experiment Report (D2.21)

Journal Paper (D2.24)

Metadata & dataset (M2.10)

- DEM/DSM
- WindScanners
- WLS70
- Sodar/RASS
- Sonic Masts
- Cup Masts
- SEB
- SLS

http://doi.org/10.11583/DTU.7931444

NEW EUROPEAN WIND ATLAS
newa

Acknowledgements

The NEWA project is supported by a European Commission's ERA-Net Plus project, number 618122, joining national projects from 9 funding agencies from 8 member states:

- Public Service of Wallonia, Department of Energy and Sustainable Building (Belgium)
- Department of Economy, Science and Innovation Flemish Government (Belgium)
- Danish Energy Authority (Denmark)
- Federal Ministry for the Economic Affairs and Energy, on the basis of the decision by the German Bundestag (Germany)
- Latvijas Zinatnu Akademija (Latvia)
- Fundação para a Ciência e a Tecnologia (Portugal)
- Ministerio de Economía y Competitividad (Spain)
- The Swedish Energy Agency (Sweden)
- The Scientific and Technological Research Council of Turkey (Turkey)

www.neweuropeanwindatlas.eu

NEW EUROPEAN WIND ATLAS
newa

Questions?

Pedro Santos

PhD Student

paas@dtu.dk

NEW EUROPEAN WIND ATLAS
newa