

Icon-LEPS updates

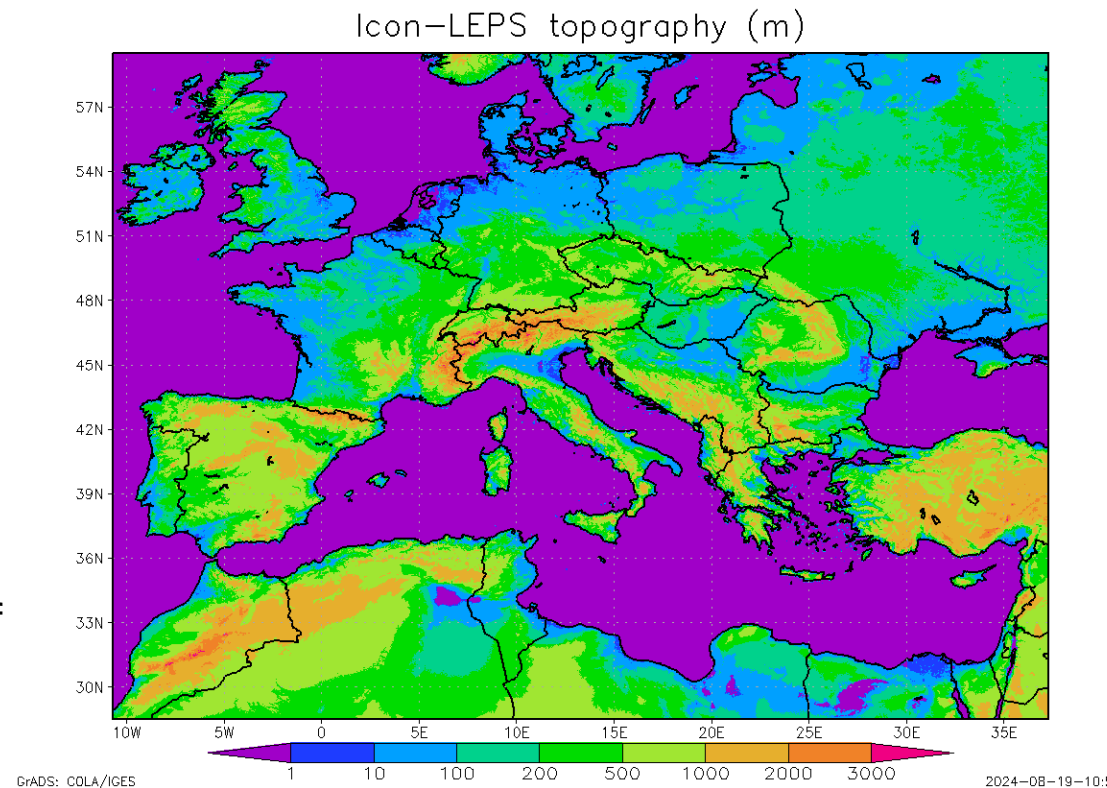
Enrico Minguzzi and the Numerical Modelling group

ARPAE-SIMC Emilia Romagna

COSMO General Meeting, September 14th-19th 2026, Rome

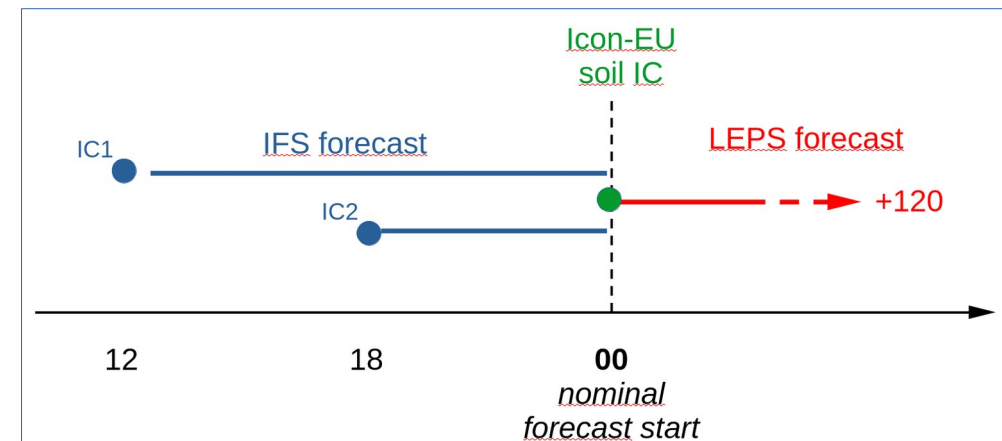
Main features:

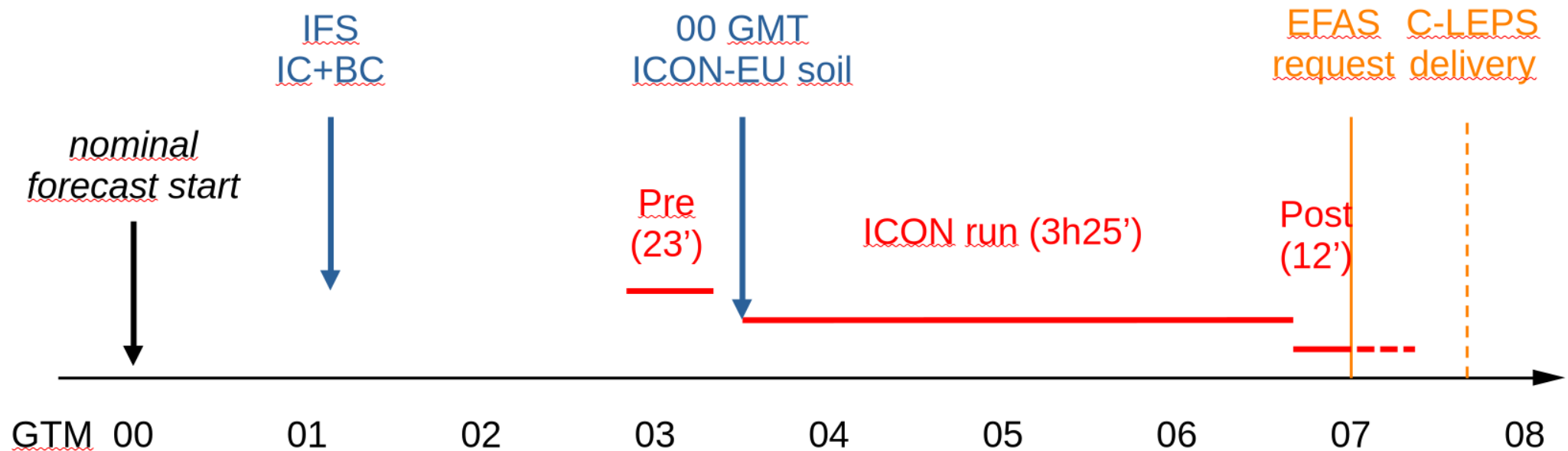
- Domain: Europe + Mediterranean
- Resolution 2.5 km (R8B8)
- 20 members + “control run” (*deterministic*)
- Atmospheric IC/BC from selected IFS-EPS members
- Icon version 2026-04; DWD perturbations; namelists as ICON-D2, but “greyzone tuning” off



Pre-operational setup:

- One run per day, starting at 00 GMT, up to +120 hours
- Lagged ensemble, using IFS runs at -6 and -12 hours
- Soil IC from Icon-EU at forecast start (*same for all members*)





- The system is running once a day (00 GMT) since August 2nd
- Products are expected to be delivered around 07 GMT (*maybe slightly earlier with timecritical resources*): this is compliant with EFAS requests, and $\approx 30'$ earlier than C-LEPS.
- Earlier dissemination time may possible using more nodes to run Icon (*is it worth?*)

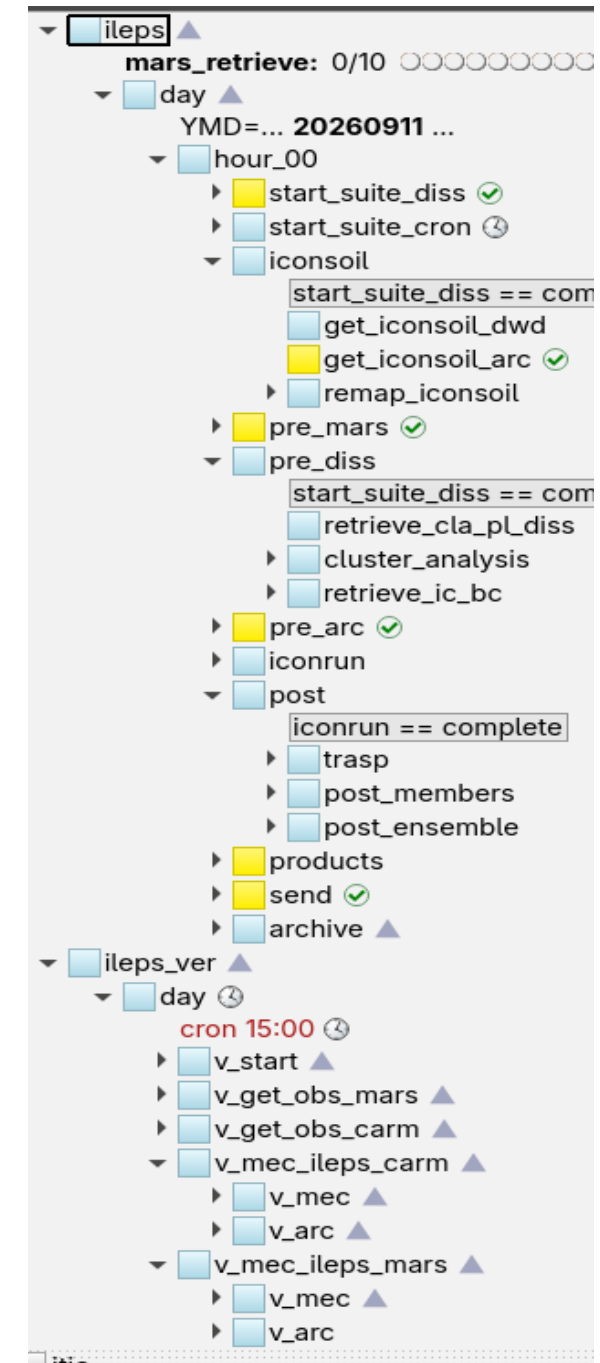
- LEPS suite has been completely re-written (*number of points increased x10: need to limit the size of intermediate files, memory problems in fieldextra*)
- Modular post-processing and product creation
- Heavy post-processing (*eg. percentiles*) is done only once, and only for parameters requested by users
- Dissemination will be mostly on on lat-lon grid (interpolated); exceptions: mec input, meteograms.
- Harmonisation with NWP-TS: Icon namelists and software modules are now in external files with the same structure
- Reduced software dependencies (*try to limit to: icontools, fieldextra, eccodes*)
- The suite source code is now hosted by DKRZ gitlab server

Presently running:

- Pre-processing:
 - IFS and ICON-EU retrieve
 - remap
- ICON run: each member runs on 12 nodes, ordinary queue (no time-critical, qos=np, ntasks=1536). Max load: 252 nodes x 3h30'
- Common post-processing:
 - re-write outputs to one file per level/parameter (*memb. parallel*)
 - derived parameters: wind speed, Tmax, snow, .. (*memb. parallel*)
 - ensemble mean, percentiles, probabilities (*variables parallel*)

Still to be implemented:

- Products
 - user-specific post-processing
 - DMO available at 06:50 (EFAS)
- Dissemination
- Archive
- Errors management
- Documentation (*needed to ask ECMWF time-critical support!*)



ATOS SBU

- Allocation 2026: 510 M
- Available at 10/09/2026: 402 M
- SBU for each I-LEPS run 1.95 M
- SBU for each C-LEPS run 0.10 M
- 2026 leftover (112 more days) 178 M $\approx$ 90 I-LEPS run

80-90 extra runs in 2026, to be run as “parallel suite” at 12GMT (possibly past events, > Aug 2nd)

Request for 2027: 800 MSBUs for one run per day, 1600 MSBUs for 2 runs

Disk space:

- Working directories (1 day) 8+ TB
- Short term archive of mec input (10 days) 20 TB
- Online archive of input and products (40 days) 9+ TB

Request: **>100 TB on \$TCWORK**, on both ws1 & ws2 (*40 Tb per run + 25% overhead; now 50 TB*)

Time-critical resources: may (slightly) reduce processing times; 24/7 assistance by ECMWF

Still to complete

- Archiving
- Products: contact every user and review their requests. Priority to: meteograms, EFAS, HNMS, DWD, ARPAE, AIM
- Dissemination (ectransfer for all disseminations?)
- Get ready for time-critical standard (suite activation, documentation; STC decisions)
- *Double-check all post-processing, products and archives*

Official switch from Cosmo-LEPS to Icon-LEPS is now expected for the first half of 2027 (?)

Scientific developments:

- Specific verification?
- SPP?

The production of feedback files has been implemented as a separate suite, that can run either in NRT or a posteriori. Observations taken from Carma (4 days delay) or directly from MARS

Verification activities proposed:

- 1) Common verification (Dimitra, HNMS): all members, 3 hours frequency, subdomain, up to +48h; delivered every 3 months. *CARMA observations (Amalia); LEPS FF upladed to NMA ftp server*
- 2) Deterministic verification (Flora and Keloniki, HNMS): only “control” run, 3 hours frequency, full domain, up to +120h. *CARMA observations (Amalia); LEPS grib output made available on ATOS*
- 3) Scientific verification on subdomains
 - ARPAE: comparison with IFS-ENS and ARPAE-ENS on Italy. *Spatial verification of precipitation. Overlap with PP KAOS*
 - ARPA Piemonte (Naima): *fuzzy verification of precipitation, for ensemble mean and percentiles*
 - Greece, Poland (PP Kaos, task 3.1)
- 4) Comparison with IFS-ENS
Include ICON-LEPS in the operational ENS verification at DWD? Contact person: Harald Anlauf
- 5) *Alternative software by Michael Hoff, for spatial verification etc.*
- 6) *Production of “light” FF (hourly resolution, only surface) for comparison high res. observations (?)*

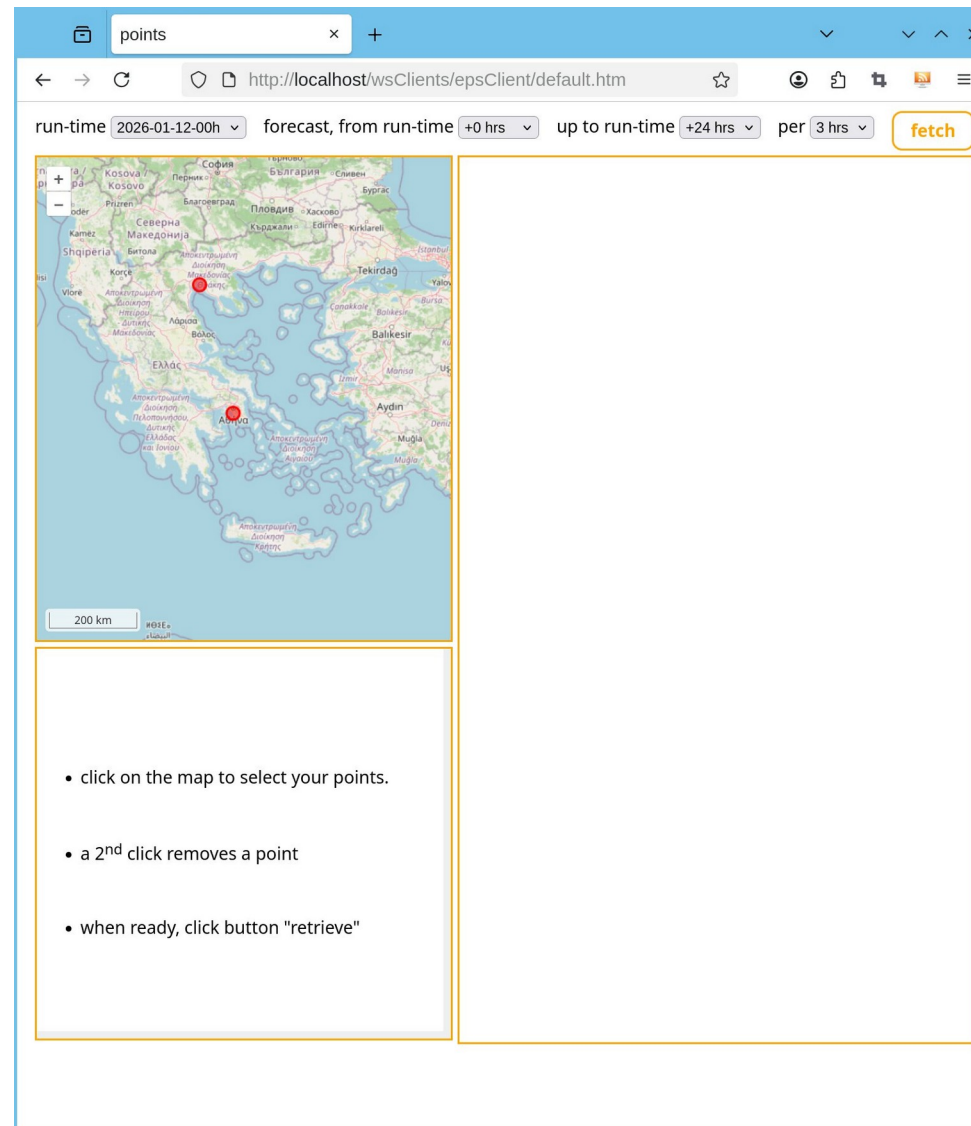
Key points:

- Which “special verification” activities can be undertaken?
- How should we use the extra SBU available for 2026? 12 GMT forecast or SPP test?
- Proposal for new meteograms (by Theodore Andreadis)
- *Open data dissemination? Build some products for public use (eg. simplified meteograms)?*

Technicalities

- Which parameters should be archived?
Files are huge, I would suggest a minimal set (most recent online, then on tapes)
 - Feedback files
 - IFS + ICON-EU inputs
 - Tp, U10m, V10m, T2m: 1h frequency, unstructured grid, single members
 - User-required surface parameters (23): 3h frequency, lat-lon grid, single members + probabilities/percentiles/mean/spread
 - *Pressure levels: Z, T, P, U, V; 5km resolution; 500, 700, 850*
- *Discontinue the production of MARS-based FF?*

Meteograms (1)

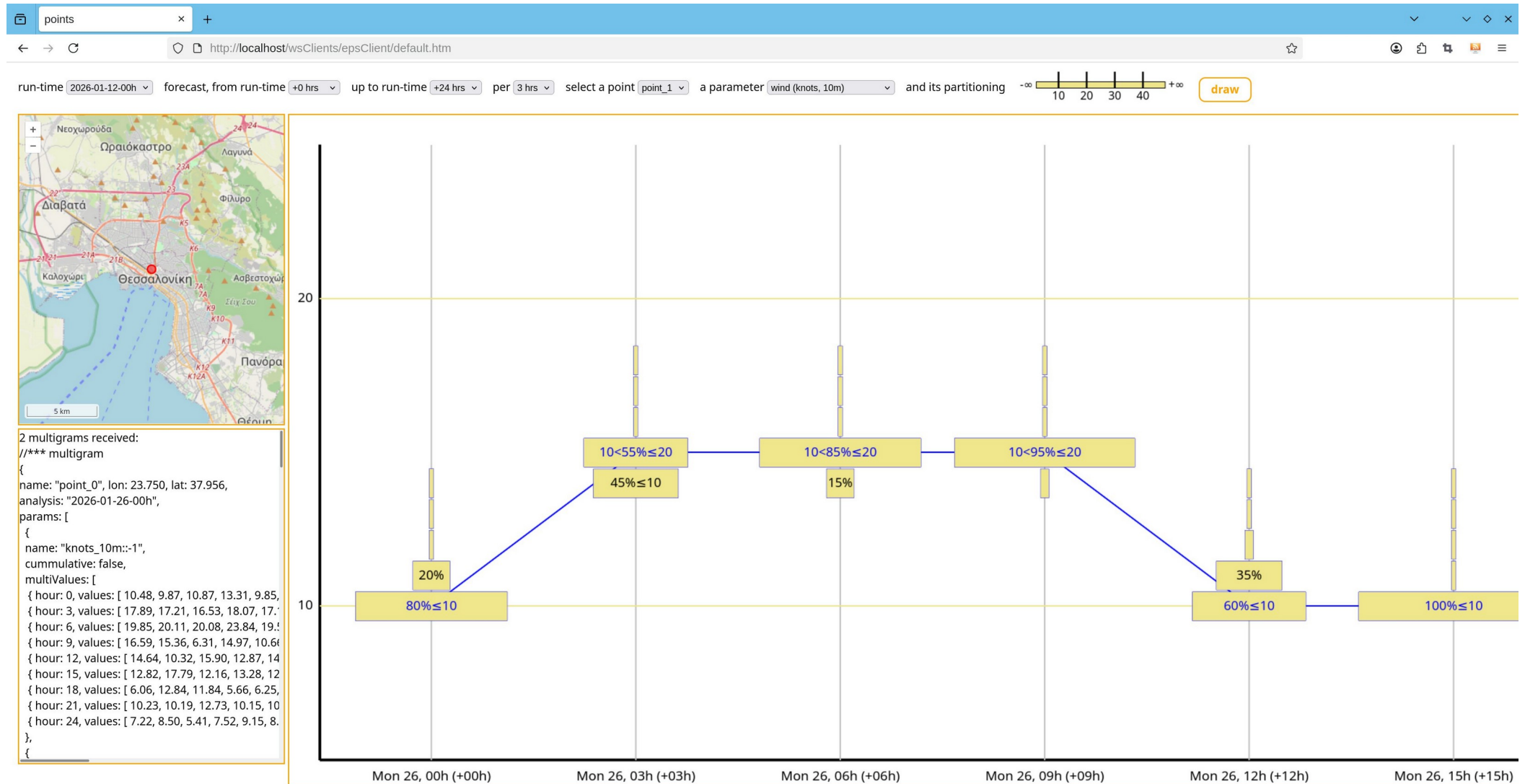


The screenshot shows a web browser window with the address `http://localhost/wsClients/epsClient/default.htm`. The interface includes a header with a search bar containing 'points' and a '+'. Below the header, there are several dropdown menus: 'run-time' set to '2026-01-12-00h', 'forecast, from run-time' set to '+0 hrs', 'up to run-time' set to '+24 hrs', and 'per' set to '3 hrs'. A yellow 'fetch' button is located to the right of these dropdowns. The main area is divided into two panels. The left panel contains a map of the Balkans and surrounding regions, with a red dot indicating a selected point. A scale bar at the bottom left of the map shows '200 km'. The right panel is empty. Below the map, there is a list of instructions:

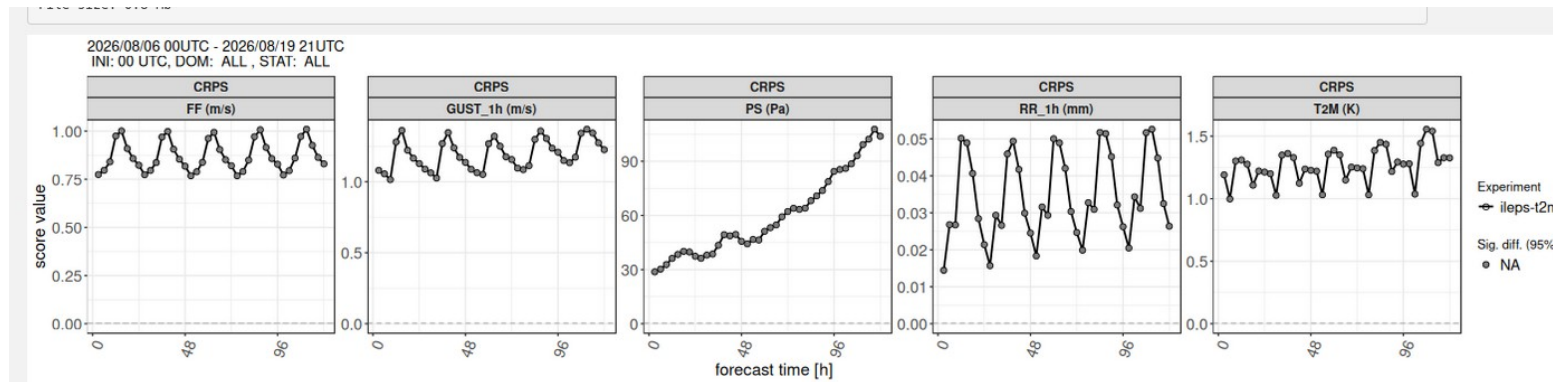
- click on the map to select your points.
- a 2nd click removes a point
- when ready, click button "retrieve"

New web interface for meteograms
Developed by Theodore Andreadis (HNMS)

Meteograms (2)



New web interface for meteograms
Developed by Theodore Andreadis (HNMS)



First test with Icon-LEPS FF