



# **COSMO-LEPS: status**

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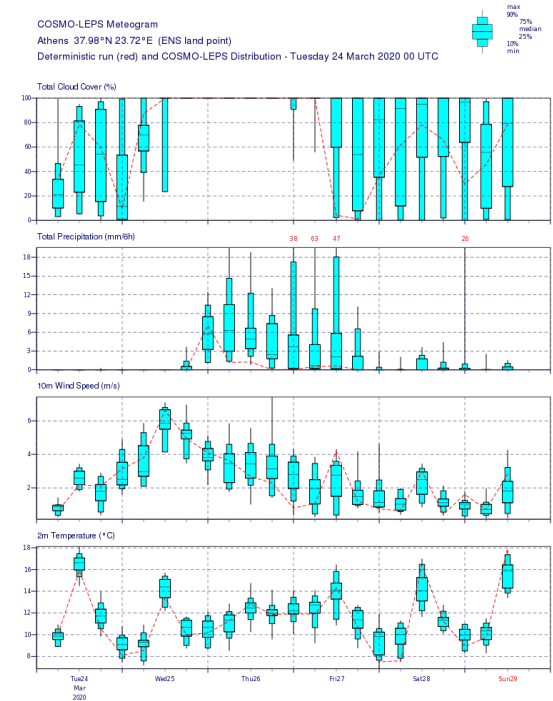


CGM 09/2019

# COSMO-LEPS: overview

**COSMO-LEPS is meant to provide probabilistic forecast over the European area for the short-medium range weather forecast at a higher resolution than global models for COSMO Members and other users**

- Reliable operational production and product delivery (one delay case and no failures in the last year)
- User-tailored probabilistic products
- Higher performance compared to ECMWF EPS in any season for precipitation and for all the surface variables verified
- Time range of 5 days is not covered by higher-resolution models EPS
- Ensemble members are used to drive downstream models e.g. hydrological models, phytosanitary models



# Operational suite: status

The operational suite runs at ECMWF HPC as time critical application managed by Arpae-SIMC (Ines and help by Andrea)

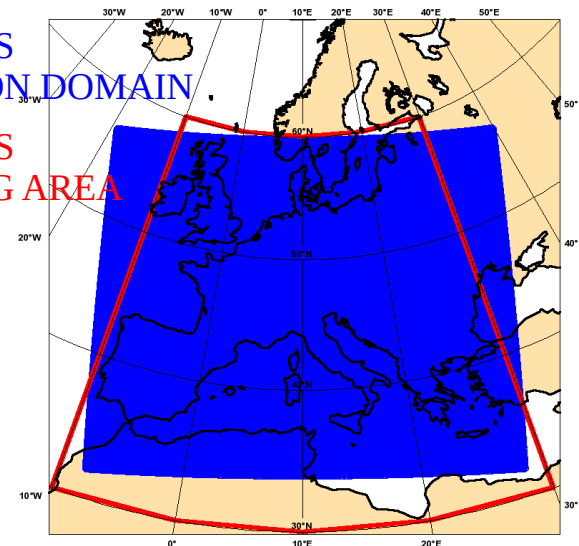
The computer time is provided by the COSMO partners which are ECMWF member states (CH, D, GR, I, Is)

## Configuration:

- ensemble size: 20 members
- IC/BCs from ECMWF ENS members (only 00 and 12UTC ENS runs are considered) using cluster analysis and soil IC from ICON-EU
- horizontal / vertical resolution: 7 km / 40 ML
- forecast range: +132h
- starting times: 00 and 12UTC
- COSMO model version: 5.03 in single-precision
- convection scheme: Tiedtke
- perturbations in turbulence scheme and in physical parameterisations (PP), but no SPPT
- ecfLOW suite

COSMO-LEPS  
INTEGRATION DOMAIN

COSMO-LEPS  
CLUSTERING AREA



# Updates in 2019

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## Technical Upgrades

- Transition to new MARS dissemination (January 2019)
- INT2LM version updated to 2.05 (February 2019)
- Transition to new version ENS ECMWF (June 2019)
- Complete migration from grib\_api to eccodes, including the version upgrade of several modules (Magics, Metview, libsim, fieldextra) and the migration from python to python3 (January 2020)

**All these upgrades are user transparent**

# Issues and User requests in 2019

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## **Run time issues**

- Connection to the user server for the upload of results (broken or overloaded)
- Connection with new DWD server for downloading ICON-soil: COSMO-LEPS fed with IFS-soil between 2019/06/04-25
- Other rarer cases (missing BC/IC, workflow errors)

## **User requests**

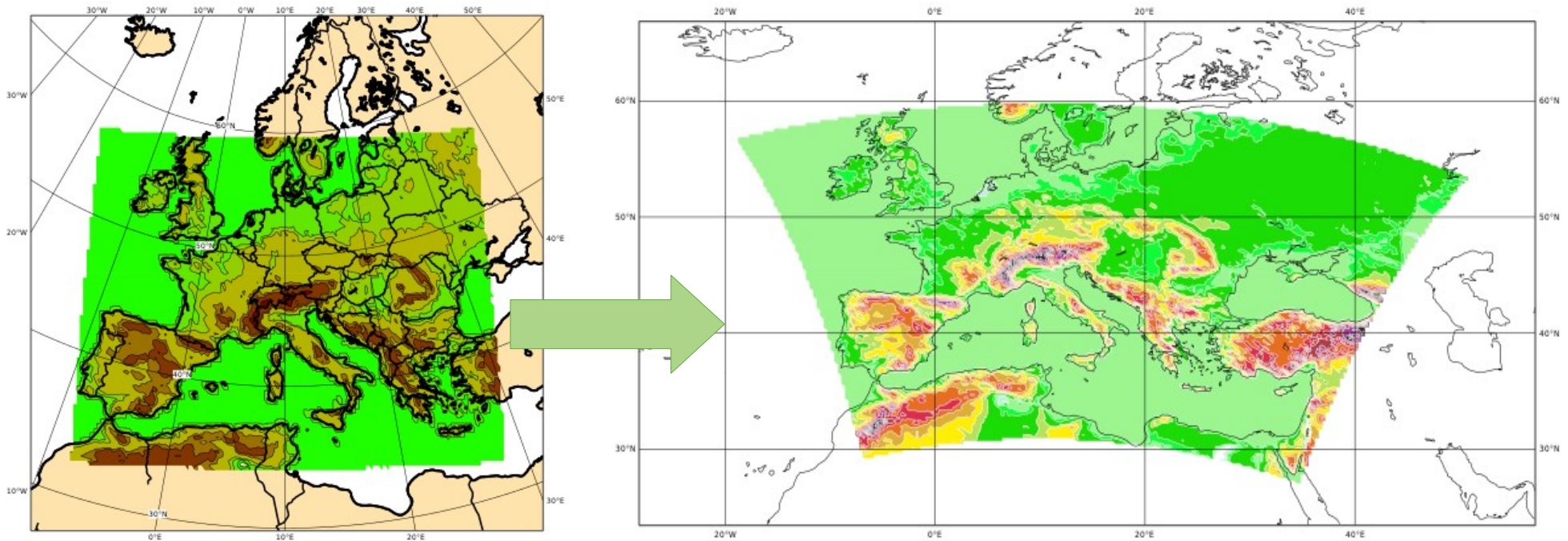
- Migration to product in Grib2 (DWD)
- Request for new products (Project LANDSUPPORT H2020)

# Strategy for COSMO-LEPS

## Main points on the table:

### 1. Extension of COSMO-LEPS domain to include the Mediterranean Sea:

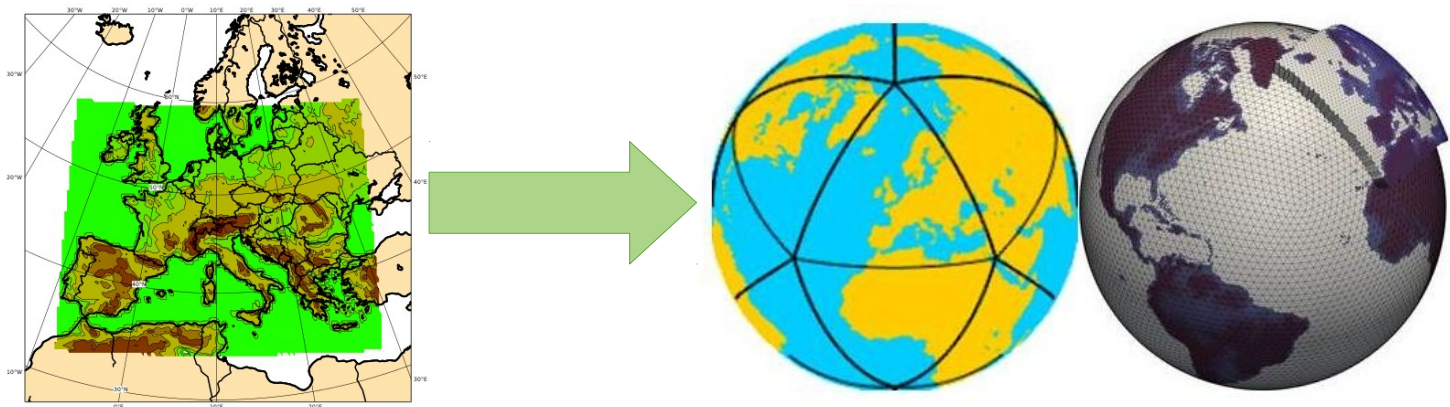
- **PRO:** full coverage of Greece and Israel, might be useful for ocean applications,
- **CONTRO:** small but non-transparent changes in the output fields e.g. rotation pole
- **COST:** computational cost  $\sim +40\%$ , the suite would require several modifications  $\sim 0.1\text{FTE}$



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2. **Migration to ICON-LEPS:**
  - **PRO:** useful to facilitate adaptation to the new model, domain extension and horizontal resolution increment can be easily included, review of the parameter perturbations, it might be part of PP APSU
  - **CONTRO:** non-transparent changes in the output fields e.g. migration to grib2
  - **COST:** computational cost  $\sim =$ , the suite would require several modifications  $\sim 0.1\text{FTE}$ , parallel production, verification and dissemination should be done for  $\sim 6\text{months}$   $\rightarrow$  ready at best in second semester 2021



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- 3. Increment of the horizontal resolution:**
  - **PRO:** demonstrated performance improvements at 5km, ENS is planned to go at 10km by 2022.
  - **CONTRO:** convection-permitting resolutions would be too expensive, grey zone issue, small but non-transparent changes in the output fields e.g. grid increments
  - **COST:** computational cost  $\sim +3$  times, the suite in COSMO is ready to use
- 4. Improvement perturbation of IC/BC and of model perturbation:**
  - **PRO:** improve spread/skill relation, SPPT already tested with good results
  - **COST:** minimal computational cost and suite modifications, user-transparent changes



# Strategy for COSMO-LEPS

## Computational costs compared to COSMO-LEPS

Model	Similar domain and resolution as COSMO-LEPS	Domain extension	Resolution increment (5km/45lev)	Domain extension + Resolution increment (5km/45lev)
<b>COSMO (Single-Precision)</b>	(this is COSMO-LEPS)	+40%	+200%	(> + 200%)
<b>ICON (Mixed-Precision)</b>	~0%	~+30%	Not tested	+160%

At the moment the COSMO-LEPS operational production consumes about 50% of the resources allocated → increments up to 100% can be affordable

# Strategy for COSMO-LEPS

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## Development proposals for 2020-2022

### 1. STAY WITH COSMO:

- a) **Extension of COSMO-LEPS domain to include the Mediterranean Sea**
- b) **Improvement perturbation of IC/BC and of model perturbation (enhance lagged ensemble and introduce SPPT)**

**COST:** computational cost  $\sim +40\%$ , the suite would require several modifications  $\sim 0.1\text{FTE}$ , ready by end 2020 or first semester 2021

### 2. MIGRATE TO ICON-LEPS:

- a) **Extension of COSMO-LEPS domain to include the Mediterranean Sea**
- b) **Improvement perturbation of IC/BC and of model perturbation (enhance lagged ensemble, revise parameter perturbation, introduce SPPT)**

c) **Increment of the horizontal resolution might be considered in future**

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**ARPAE-Emilia Romagna supports this proposal**

- Similar computational cost
- Part of the Consortium migration to ICON model
- ARPAE will provide FTE

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Thank you for your attention!