ALARO experience in Slovenia

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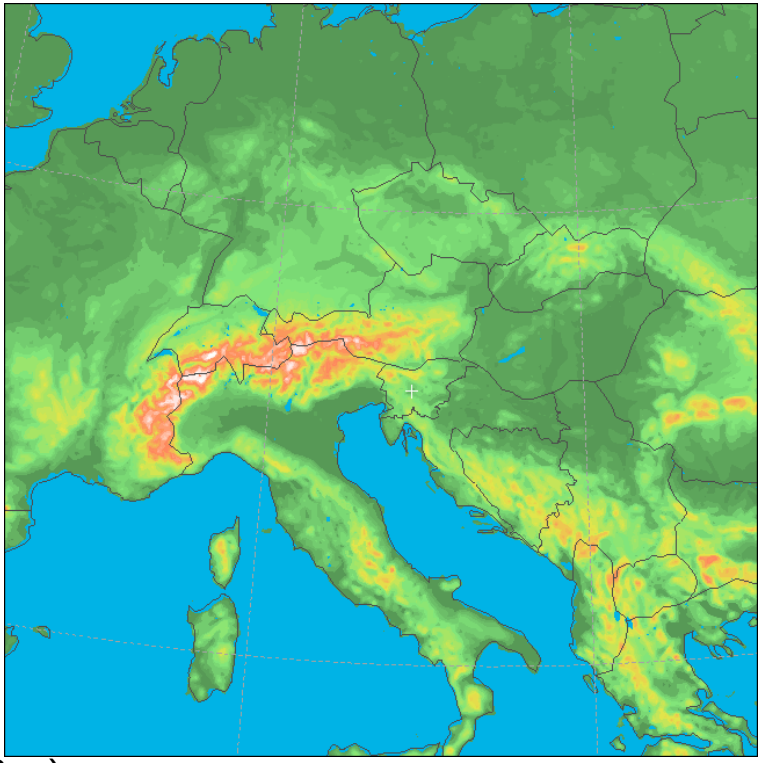
Outline

- Operational application
- ALARO-1vA evaluation
- Two-way Coupling of ALADIN and POM Ocean Model for the Adriatic Sea

Operational suites

- CY38T1, ALARO-0 baseline,
- 4.4 km horizontal grid spacing, 421x421 points, 87 model levels, 180 s time-step



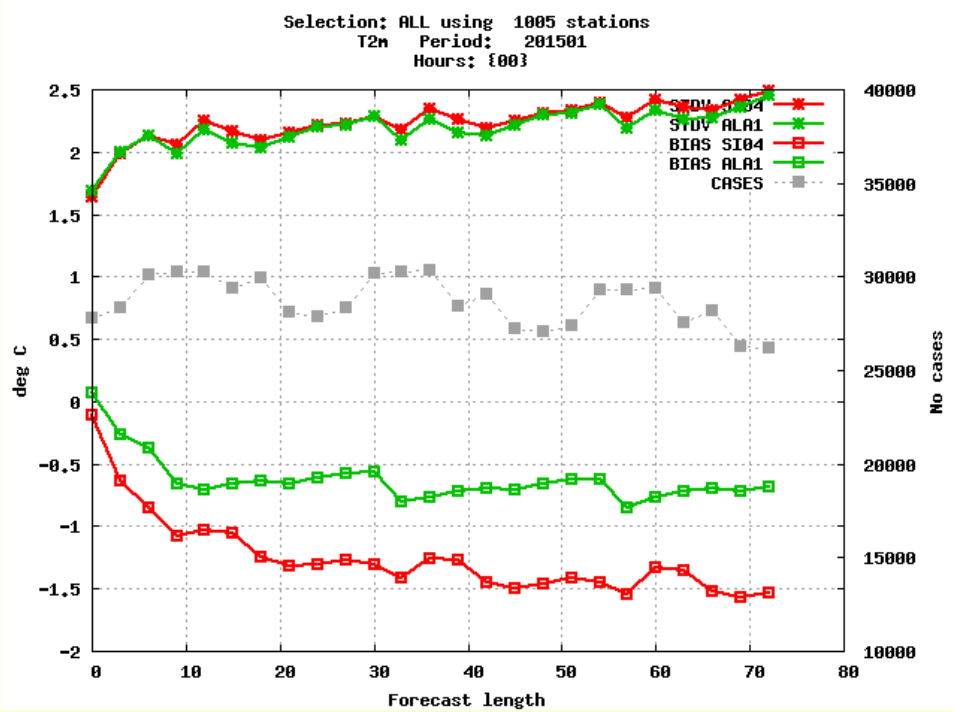
- aosruc04ec
  - 00, 06, 12, 18 +72 h, 03, 09, 15, 21 +36 h,
  - coupling at every 3 hours, LBC from ECMWF time lagged coupling
- aos04ar
  - analysis from aosruc04ec
  - 00, 06, 12 +72 h, 18 +60 h
  - coupling at every 3 hours, LBC from ARPEGE

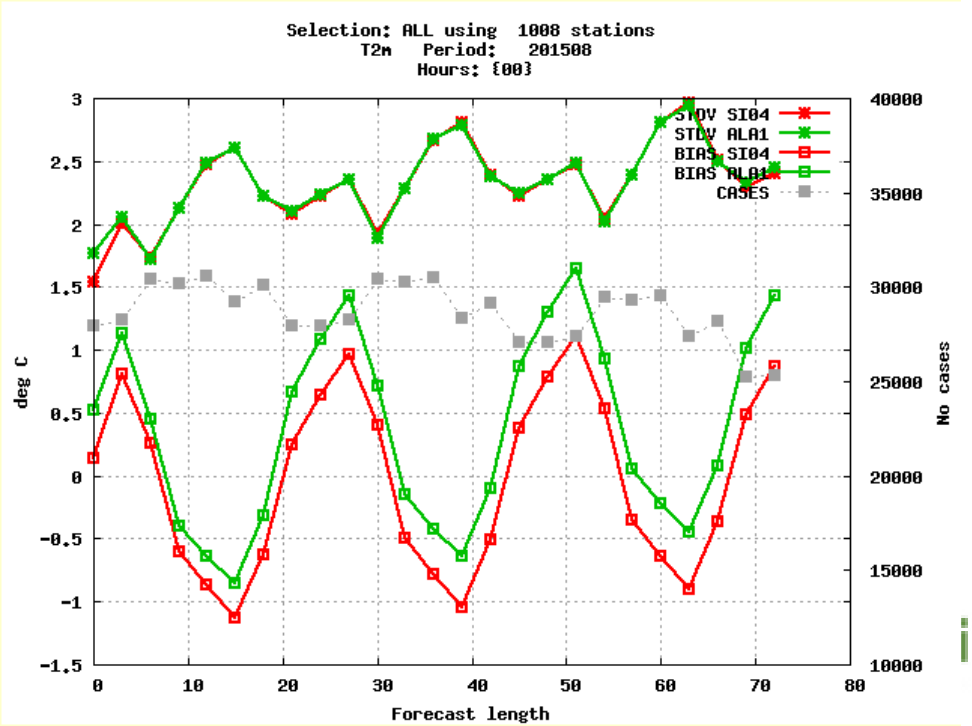
- Assimilation cycle:
  - 3-hourly 3D-Var assimilation cycle (RUC),
  - B-matrix sampled from downscaled ECMWF ensemble members,
  - CANARI surface analysis using surface observations (T and RH at 2 m),
  - coupling frequency 1 hour,
  - space consistent coupling, no digital filter initialization,
  - observations: OPLACE data and local observations (SYNOP, Mode-S MRAR).

ALARO-1vA evaluation

ALARO-1vA physics:

- 3 h assimilation cycle (2 years, using the same operational background error covariances)
- 3 day forecast for Nov2014, Jan,Mar,Jul, Aug2015
  - winter BIAS of T2m is reduced,
  - summer T2m max to low, T2m_min to high





ALARO-1 evaluation

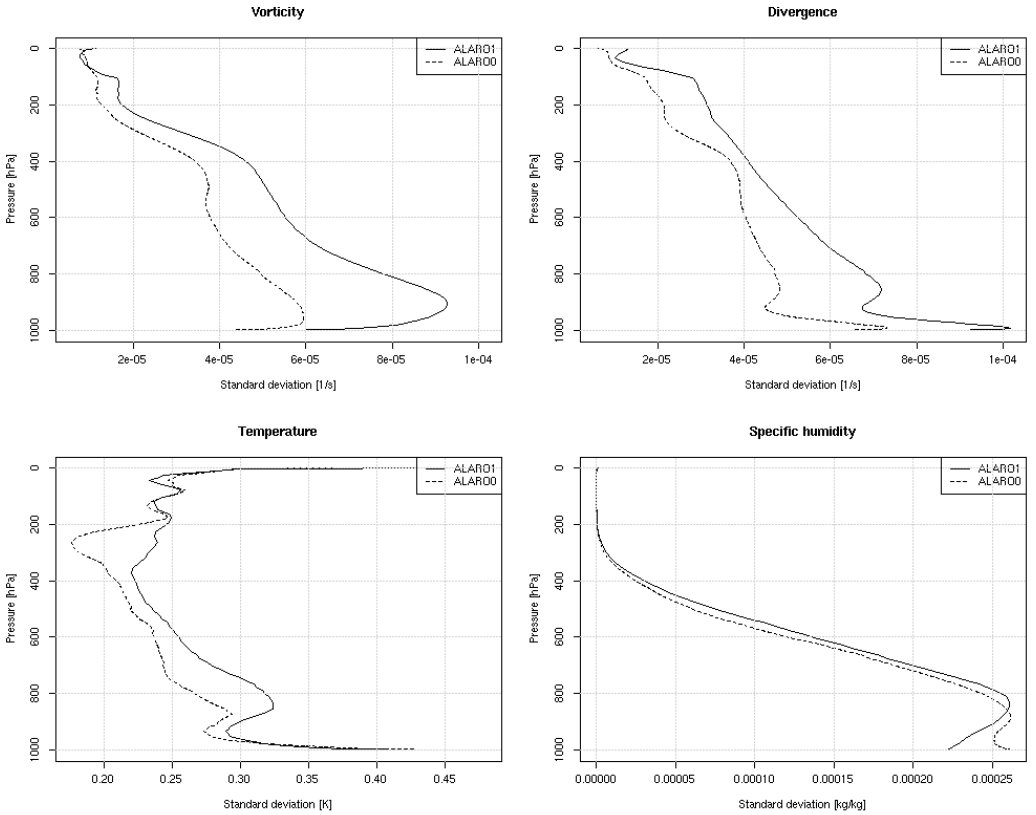
- ALARO-1vA physics:
  3 h assimilation cycle (2 years, using the same operational background error covariances)
  3 day forecast for Nov2014, Jan,Mar,Jul, Aug2015
  - winter bias of 2 m temperature is reduced,
  - summer maximum 2 m temperature forecasts are still underestimated,
  - impact is hardly visible in standard deviation of forecast error,
  - 2 m humidity bias improved in 0 UTC (night) runs and degraded in 12 UTC (day time) runs,
  - 10 m wind speed BIAS during day slightly improved, during night slightly worse during summer
  - neutral impact on upper-air fields

ALARO-1 evaluation

- ALARO-1vA physics with new screen level interpolation
  - background error covariances are recomputed
    - period is March 2016 (712 samples)
    - ECMWF EDA downscaled members
  - Reanalysis: 3 h assimilation cycle (years 2011-2012 computed)

ALARO-1 evaluation

- new B-matrix
  - changes/differences in standard deviations



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ALARO-1 evaluation

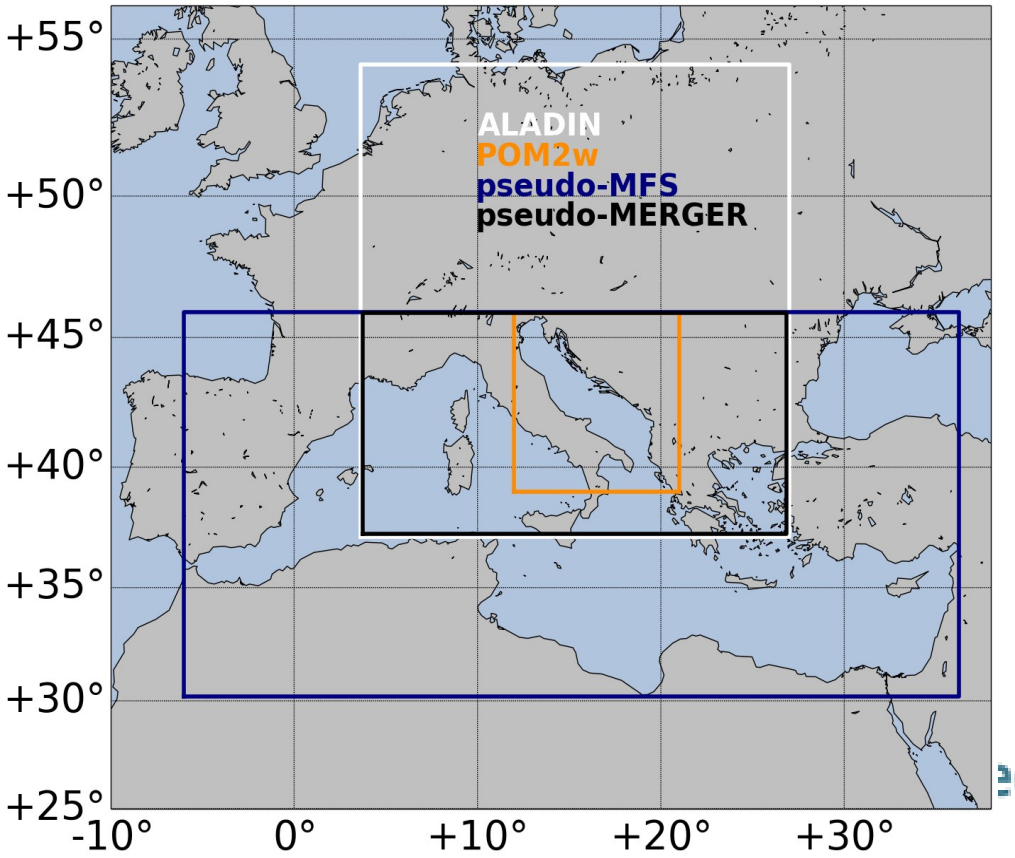
- new B-matrix
  - changes/differences in standard deviations
    - wind forecast error increase
    - temperature and humidity decreases in low-levels and increases elsewhere
  - somewhat sharper vertical correlations
  - less coupling between humidity and temperature in ALARO-1

ALARO-1vA

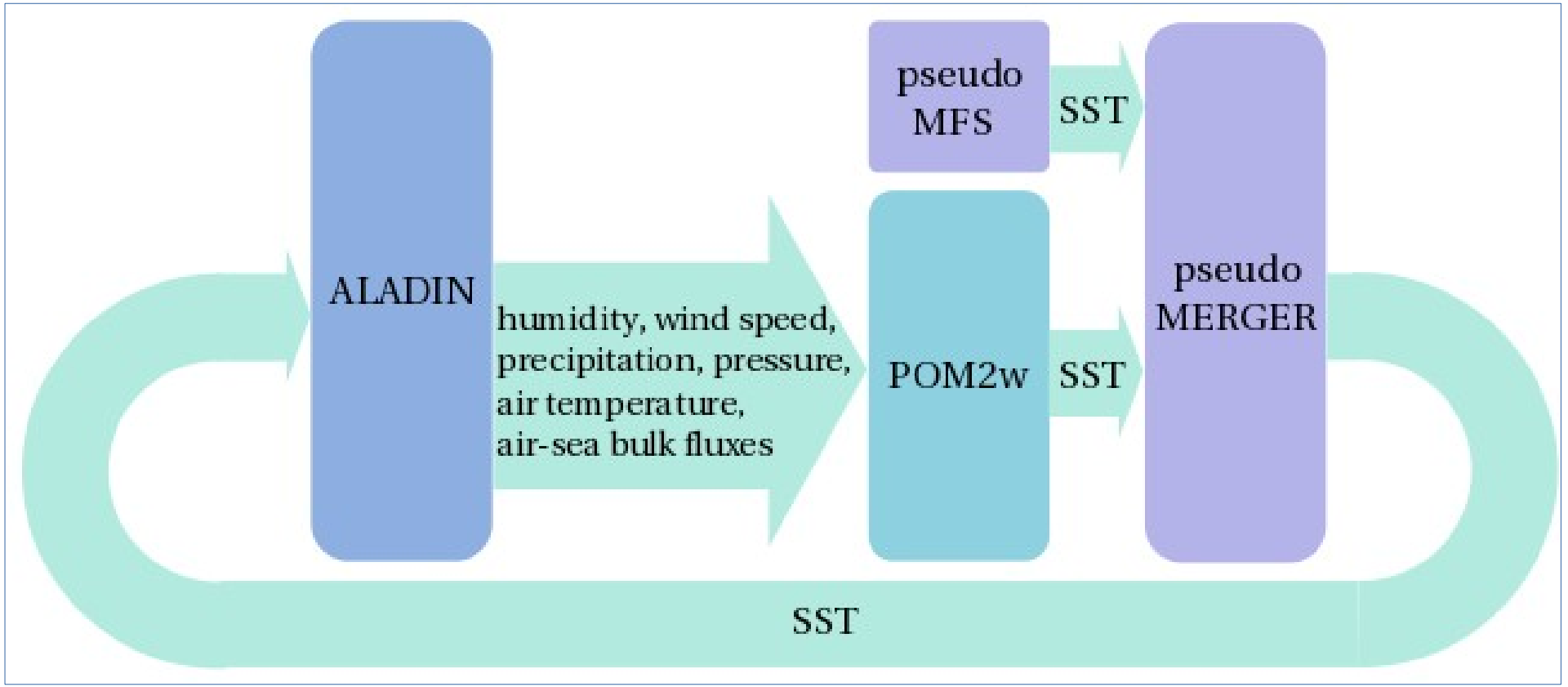
- Plans
  - implementation of the latest improvements
  - ALARO-1vA in the operational suite
  - re-compute forecasts based on reanalyses for the period of few years

2-way atmosphere-ocean coupling

- ALADIN (4.4 km) is bi-directionally coupled with an ocean model POM (Princeton Ocean Model) over Adriatic Sea region at 3.6 km
- using OASIS3-MCT model coupling toolbox



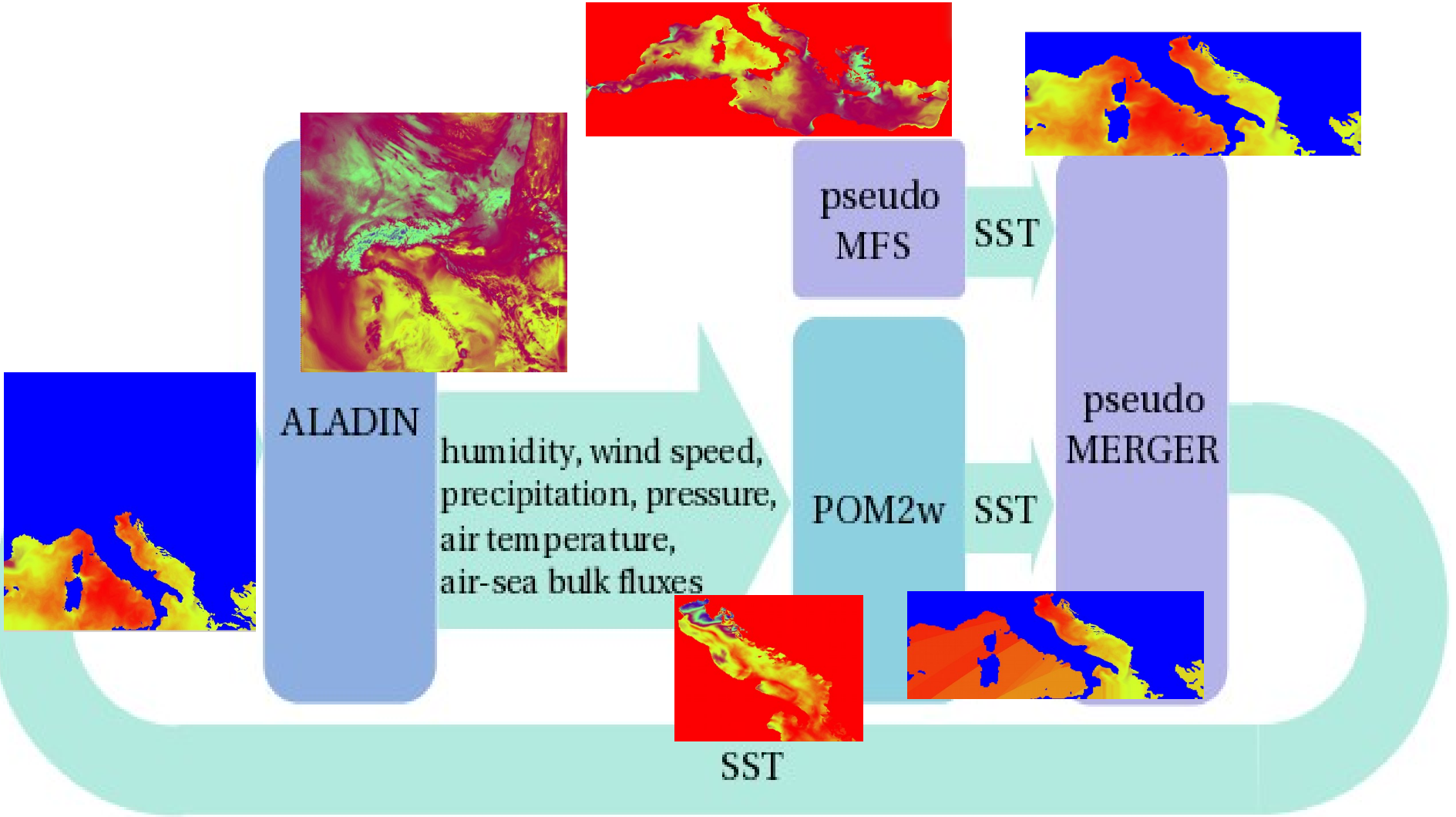
2-way atmosphere-ocean coupling



Atmosphere ocean field exchange during one time step

All temporal synchronisation and spatial interpolations are done by OASIS.

2-way atmosphere-ocean coupling



daily initial and boundary conditions for ADRIPOM are obtained from MyOcean MFS model

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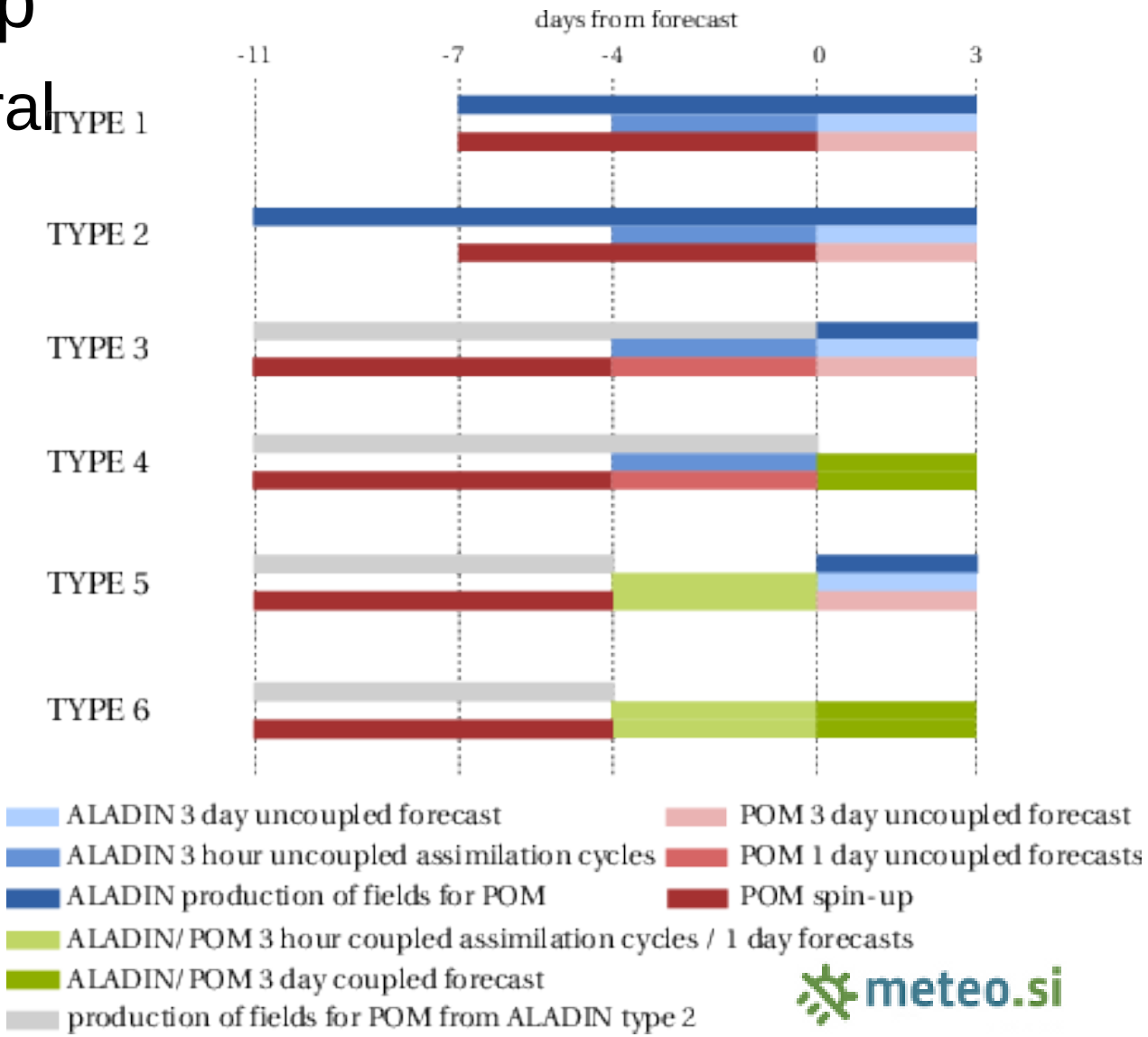
2-way coupling – evaluation on cases

- Experiments set-up
  - 3h assim for several days
  - 3 day forecast
- Questions
  - impact of SST information
  - impact of 2-way coupling



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2-way coupling - results

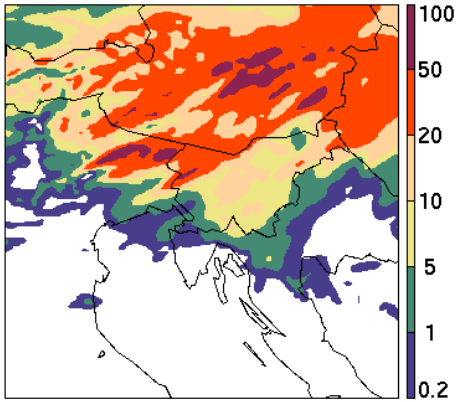
- Case study with focus on precipitation
  - summer day (8.-9. Jul 2015) with front passing and pre-frontal convection, jugo into bora wind
  - the influence of SST on inland convection

1h prec 8.7.2015 00+24

operational

different SST

type 1



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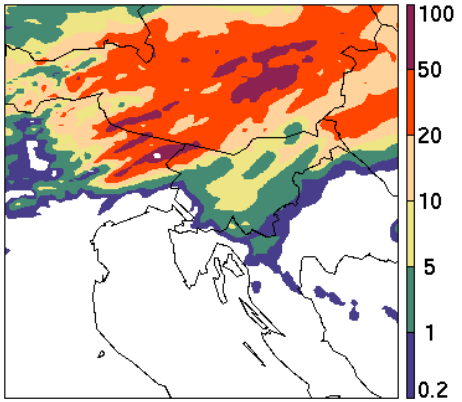

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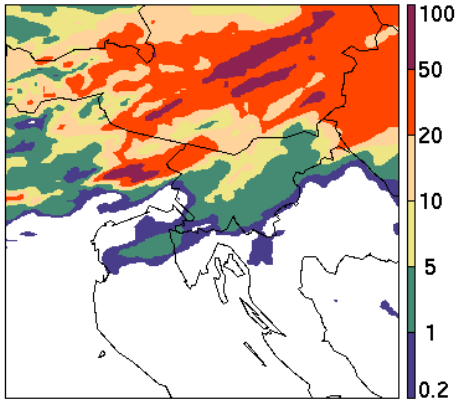
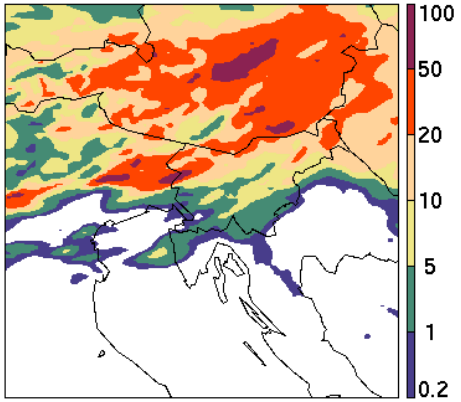


without coupling

type 4



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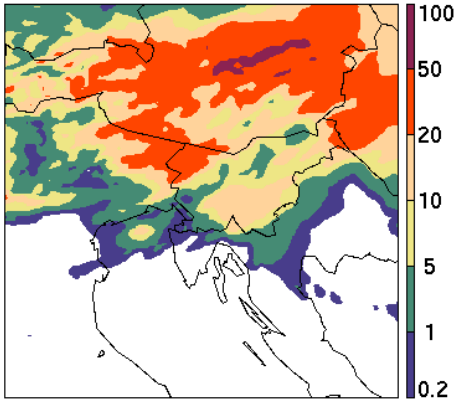

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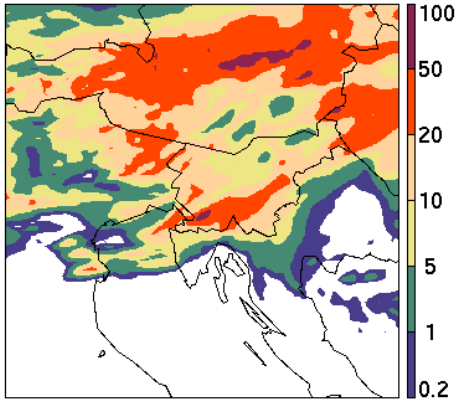


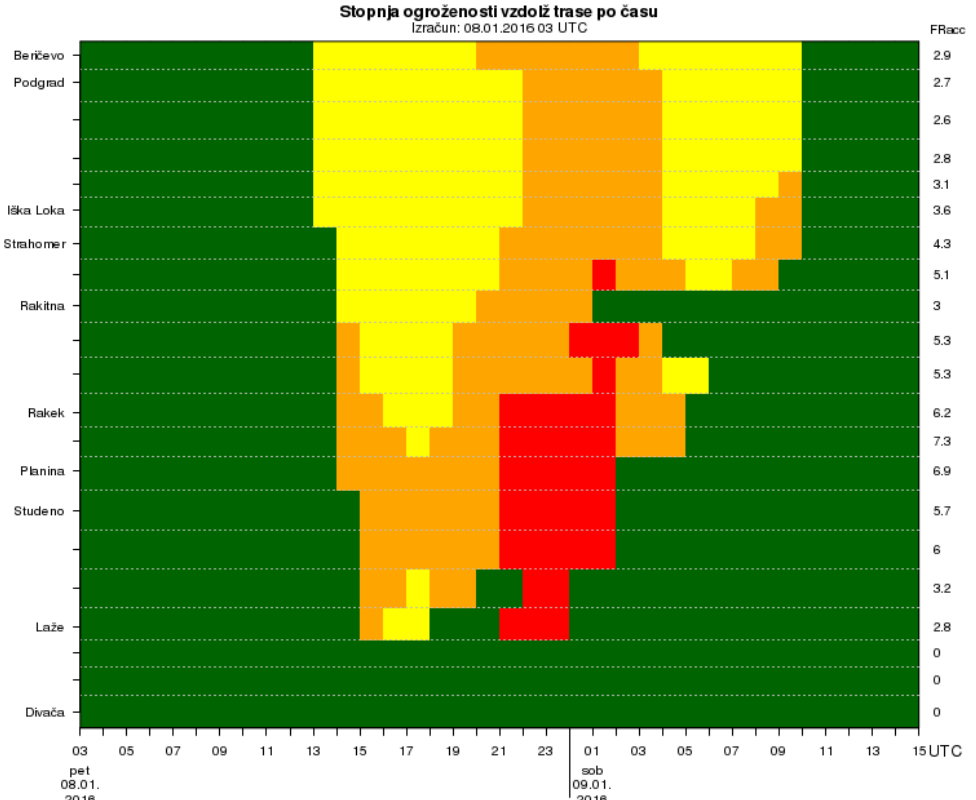
assim - without coupling
prod - with coupling

assim - with coupling
prod - without coupling

assim - with coupling
prod - with coupling

Diagnostic fields

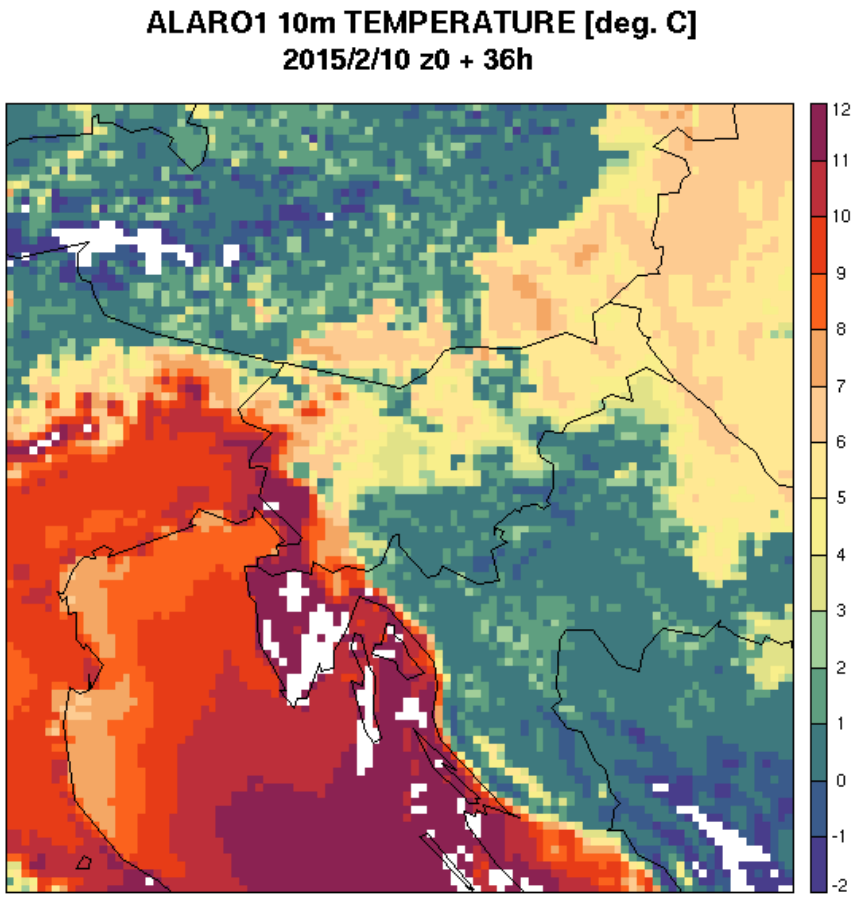
- forecast range vs. power line segment cross section of **freezing rain probability** derived from ALADIN model (air temperature, precipitation phase and amount, surface and ground temperature)
- plan: freezing rain obtained in the model

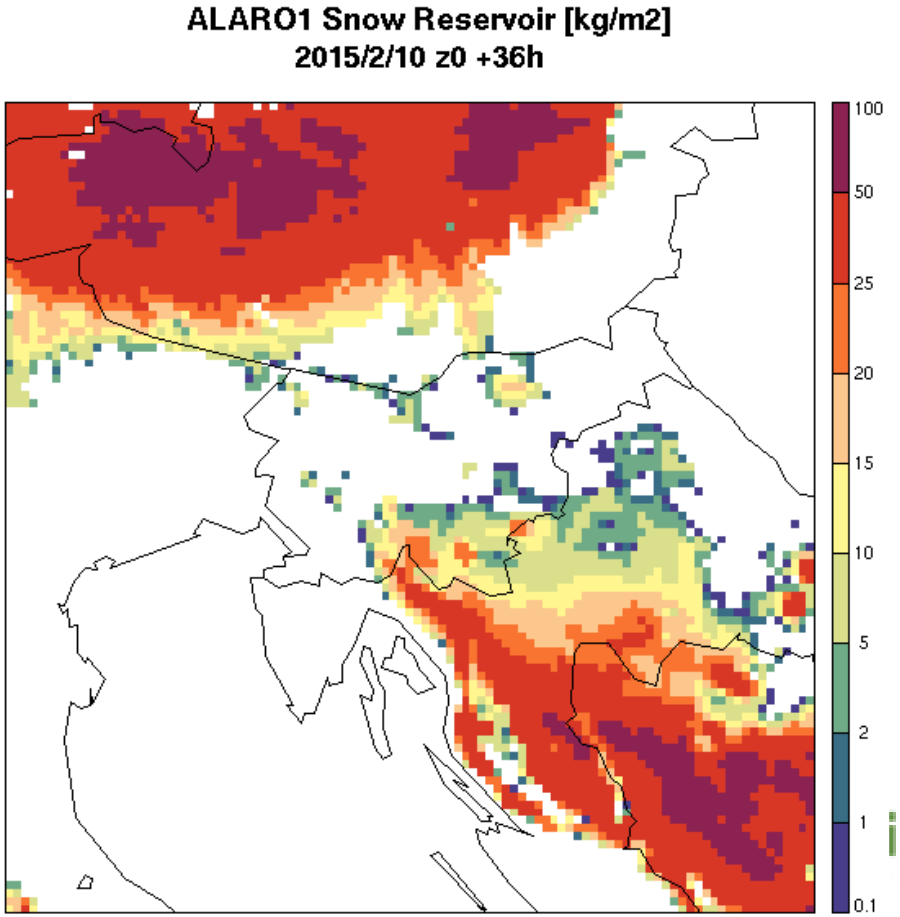


2 m temperature

Advection of warm air above the surface covered with snow

- 2 m temperature above snow near 0 deg.C, measured around 5 deg.C (at station Cerklje)





2 m temperature

T2m BIAS in areas without snow is in ALARO-1vA smaller