# Numerical simulation of severe precipitation in the Northern Adriatic during HyMeX IOP16: impact of mesoscale data assimilation of different observational data types

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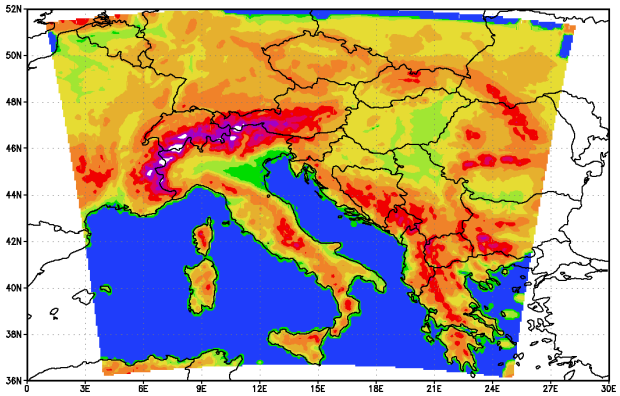
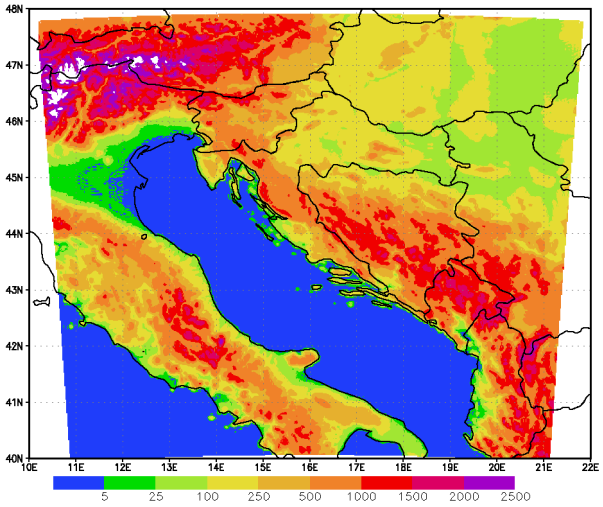
METEOROLOŠKI IZAZOVI 3
**EKSTREMNE VREMENSKE PRILIKE I UTJECAJ NA DRUŠTVO**

# Model & domain



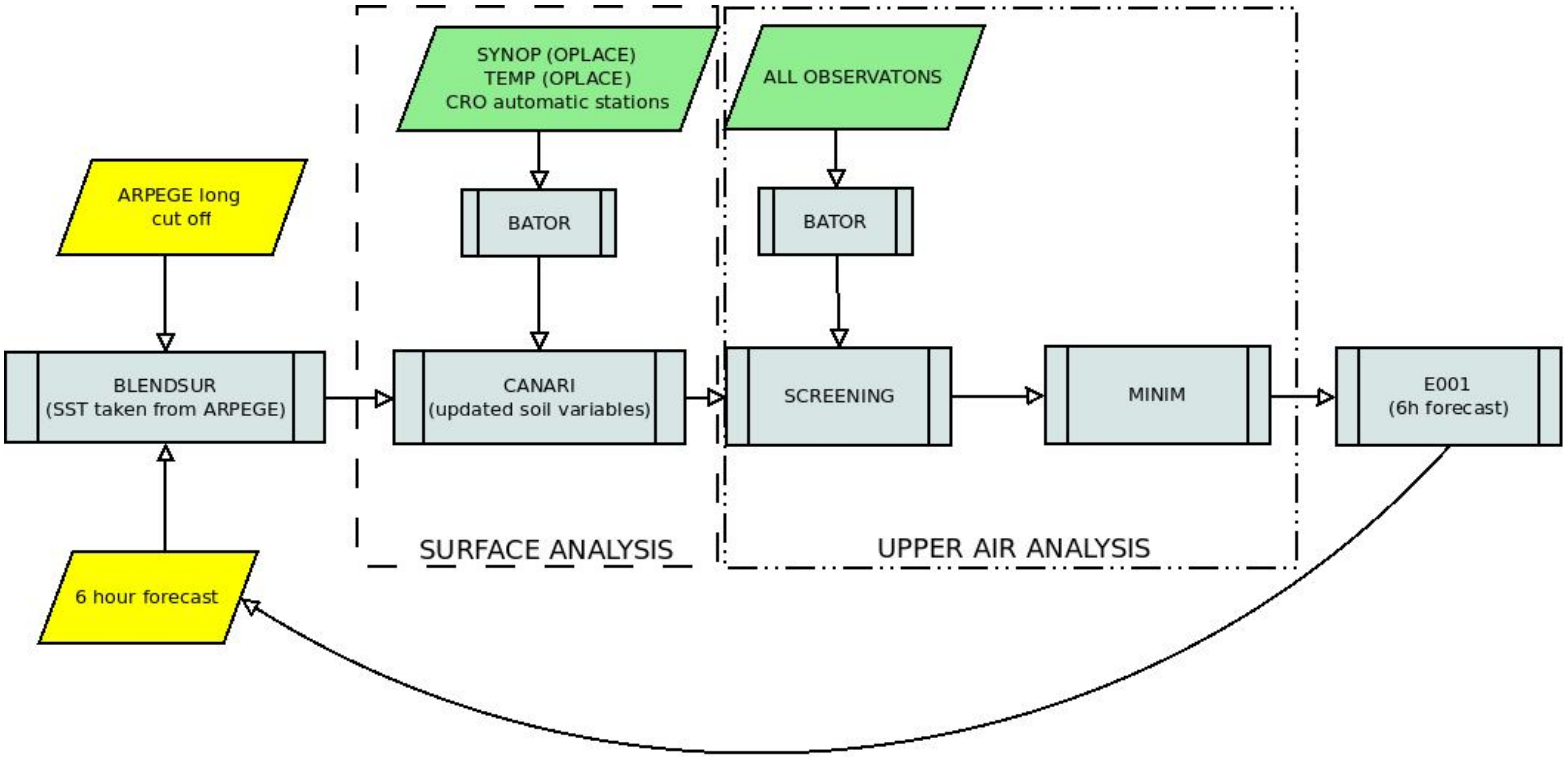

**ALADIN HR domain**

- 8 km horizontal resolution
- 37 levels, 229x205 (240x216) grid points
- 32T3: ALARO0-3MT, old radiation scheme, DFI
- 72 hours forecast, 1-3 hourly output

**ALADIN HR22 domain**

- 2 km horizontal resolution: 439x439 (450x450) grid points
- hourly 2 km dynamical adaptation up to 72 hrs @ 15 levels for 10 m wind forecast, model version AL29T2-mxl
- 24 hrs **2 km full NH** model run @ 37 levels, started from 00UTC 6h forecast, model version AL36T1, ALARO0 set-up (operational since July 2011.)

# Data assimilation system at DHMZ



# Data used in DA

| Observation type | Subtype | Variable | Format |
|---|---|---|---|
| | | | |
| SYNOP | LAND, SHIP | Ps, u, v, T, RH | OBSOUL |
| Aircraft | E-AMDAR | u, v | OBSOUL |
| AMV | GEOWIND(MSG-2) | u, v | BUFR |
| TEMP | LAND, SHIP | P, u, v, T, q, RH | OBSOUL |
| Wind Profiler | EUROPROFILE | u, v | OBSOUL |
| Satellite | ATOVS AMSU-A, B, HIRS (NOAA) | radiance | BUFR |
| Satellite | SEVIRI (MSG-2) | radiance | GRIB |

# Goal

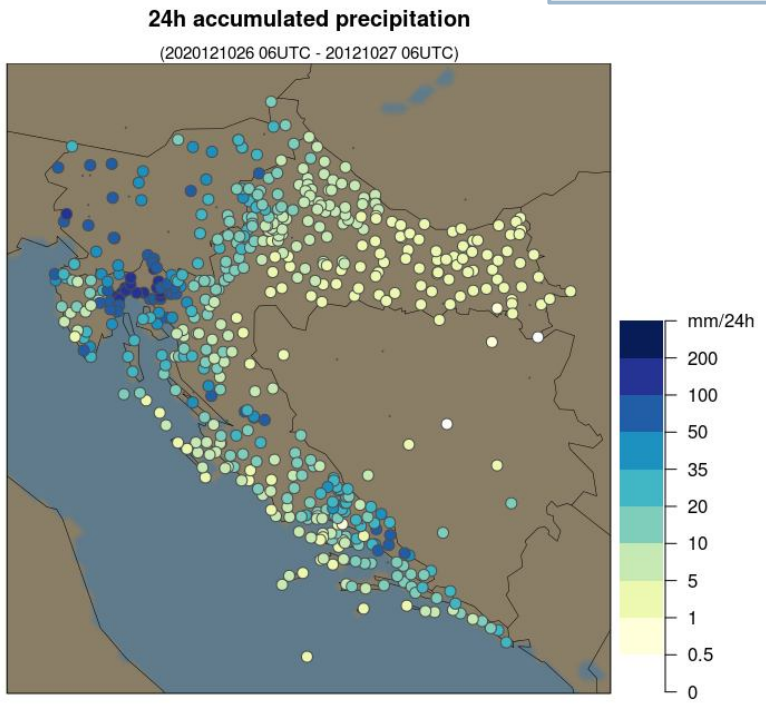
- **Goal:** test impact of assimilation of different data types on forecast of severe precipitation at NE Adriatic during IOP16 (extended to IOP2)

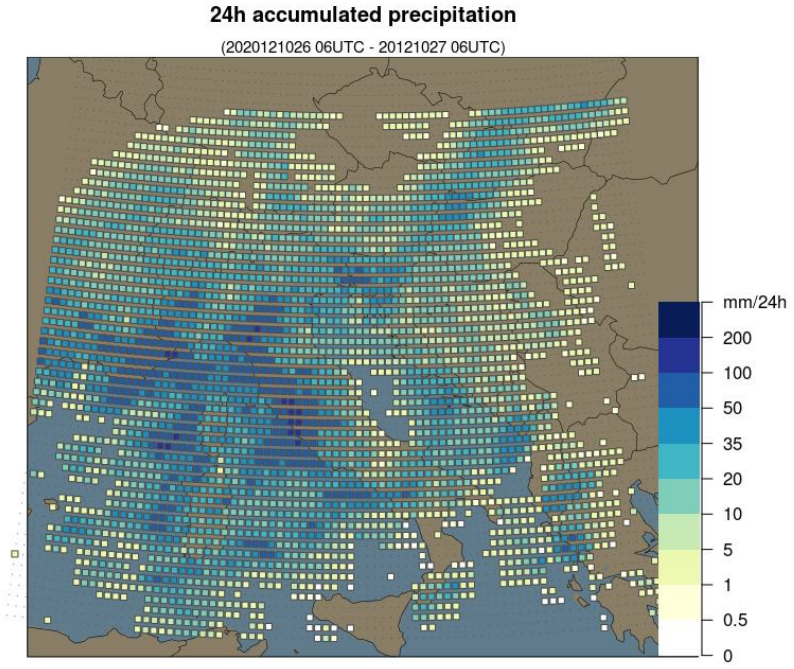
# IOP 16

- Heavy precipitation event (HPE) happened on Friday and Saturday (26 – 27Oct) and mostly affected the municipality of Rijeka in Croatia and regions near Italian-Slovenian border
- Daily maximum measured at Rijeka Kozala station reached 158.7 mm from 26 – 27 Oct 06 UTC

# IOP 16

26 – 27 06 UTC

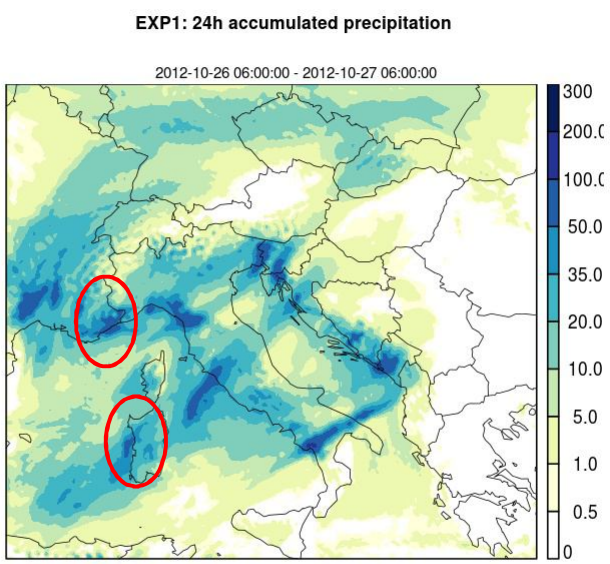


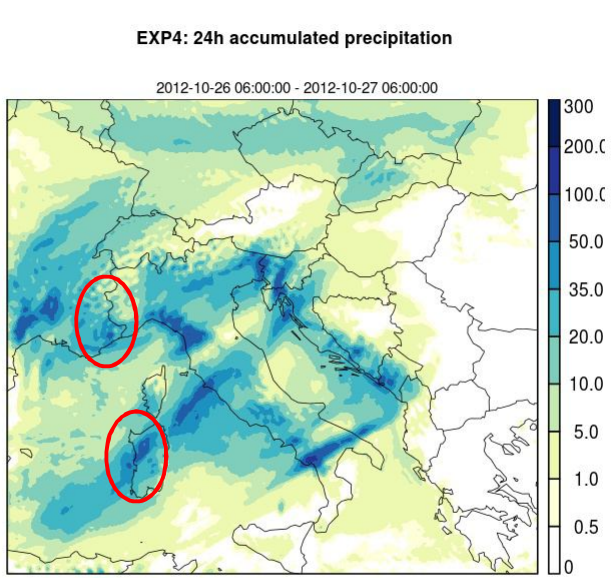

24h accumulated precipitation from rain gauges (left) and from TRMM 3B42RT (right).

# IOP 16

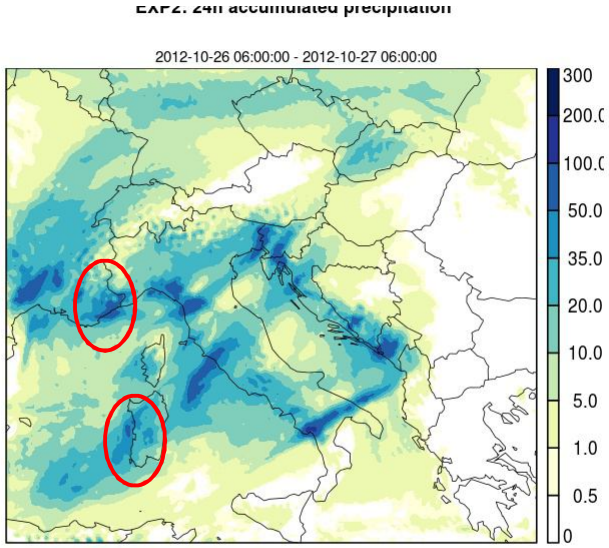
- Number of experiments performed – impact of DA of different obs types low
  - Exp1 – ALADIN 8km, ALL
  - Exp 2 – ALADIN 8km, ALL - satellite data
  - Exp 4 –ALADIN 8km NO DA
  - Exp1_hr22 – ALADIN 2km, LBC from Exp1
  - Exp4_hr22 – ALADIN 2km, LBC from Exp4
- For DA cycle of ~2 weeks for "warm up"
- Inital time of model forecast: 26 Oct 00 UTC



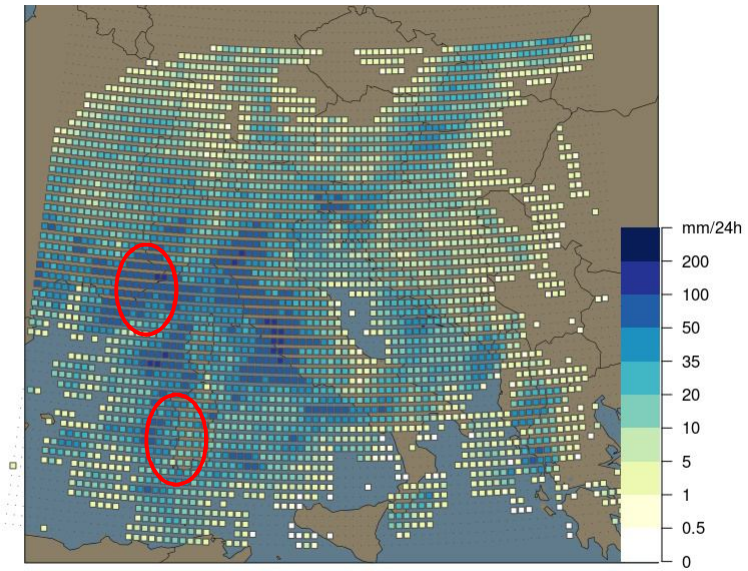

ALL



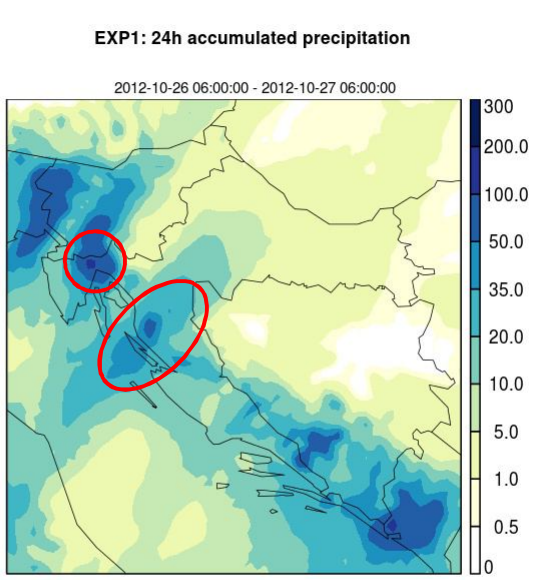

NO DA



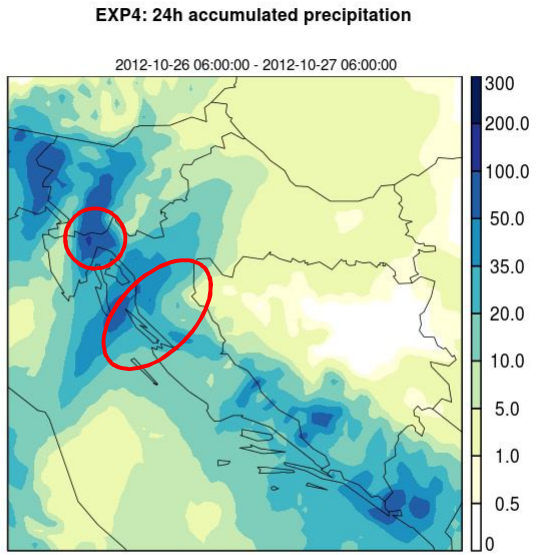

NO satellite



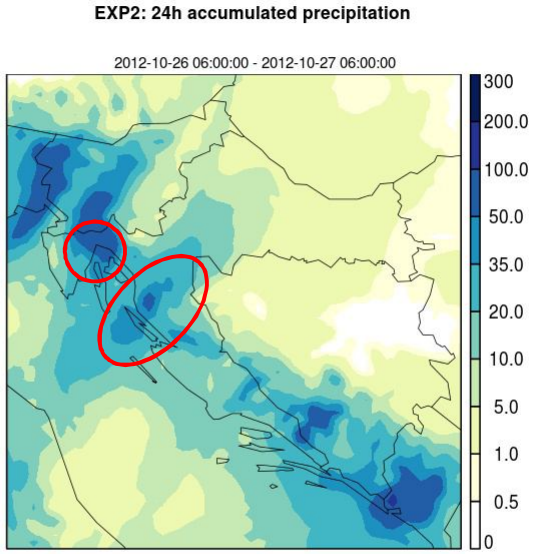

TRMM rain



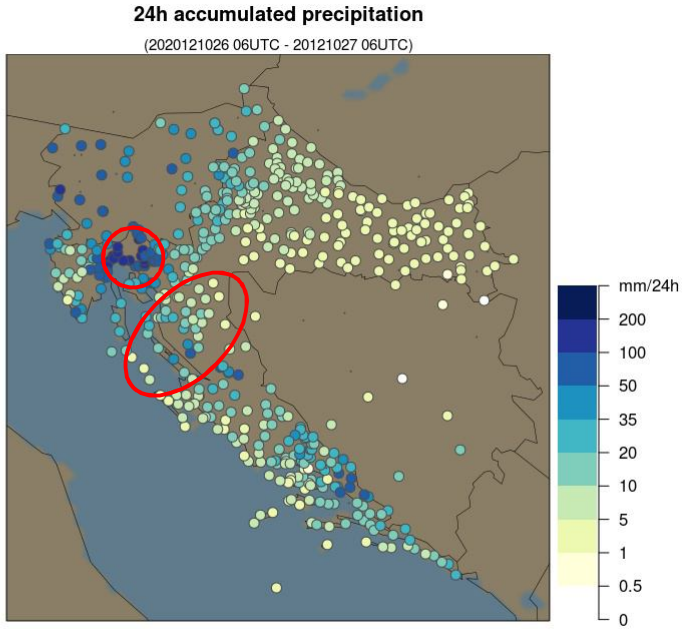

ALL




NO DA

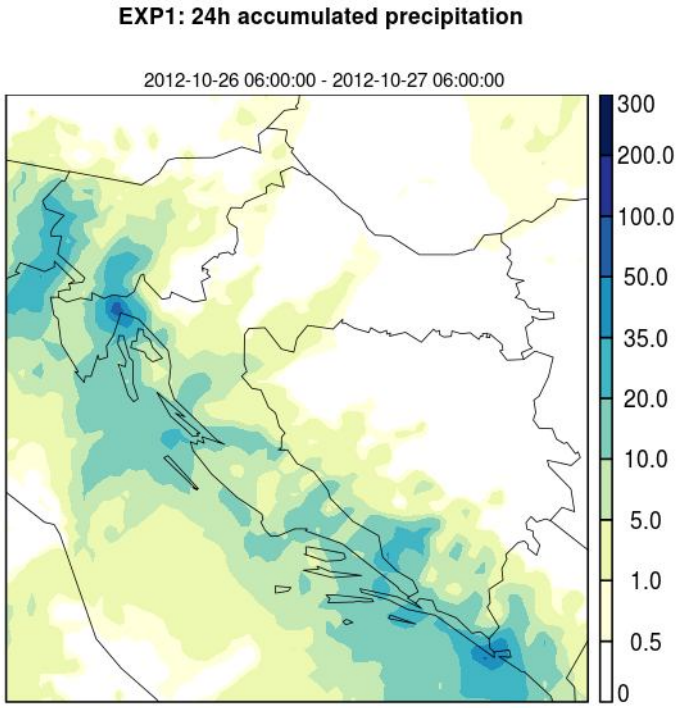



NO satellite

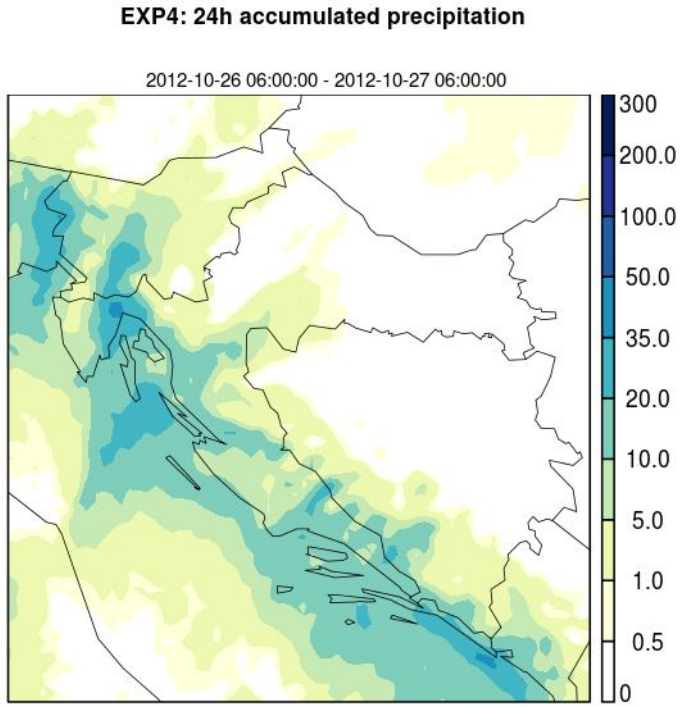



rain gauges

# IOP 16




ALL

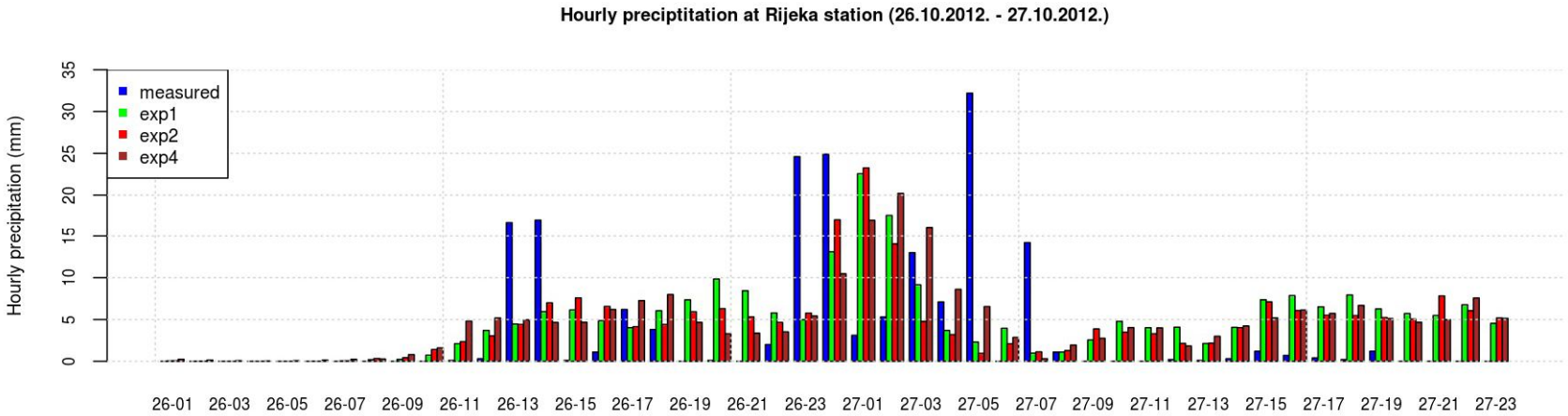



NO DA

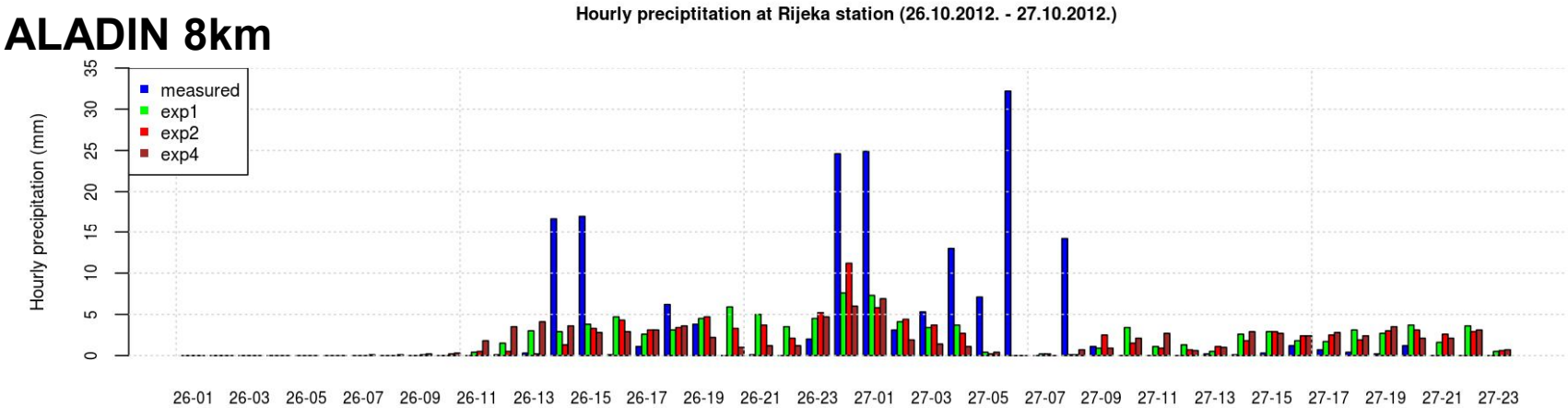
# IOP 16 – ALADIN 8km

**Area (30x40km)**
**ALADIN 8km**

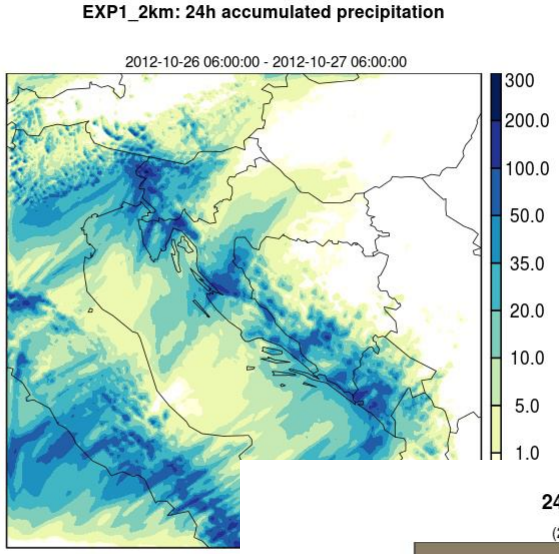
ALL, ALL – satellite, NO DA, measurements

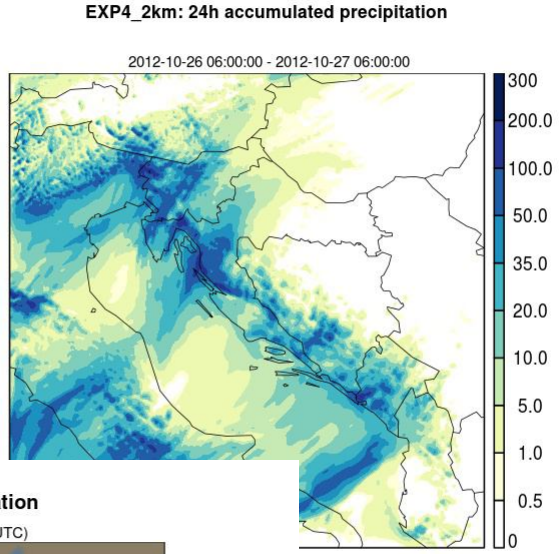



**Point**
**ALADIN 8km**



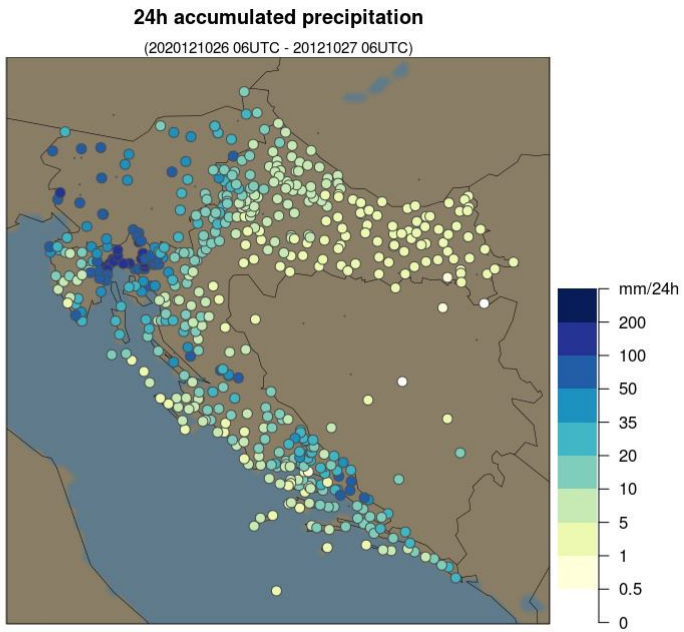
# IOP 16 – ALADIN 2km




LBC – DA (ALL)

LBC - NO DA

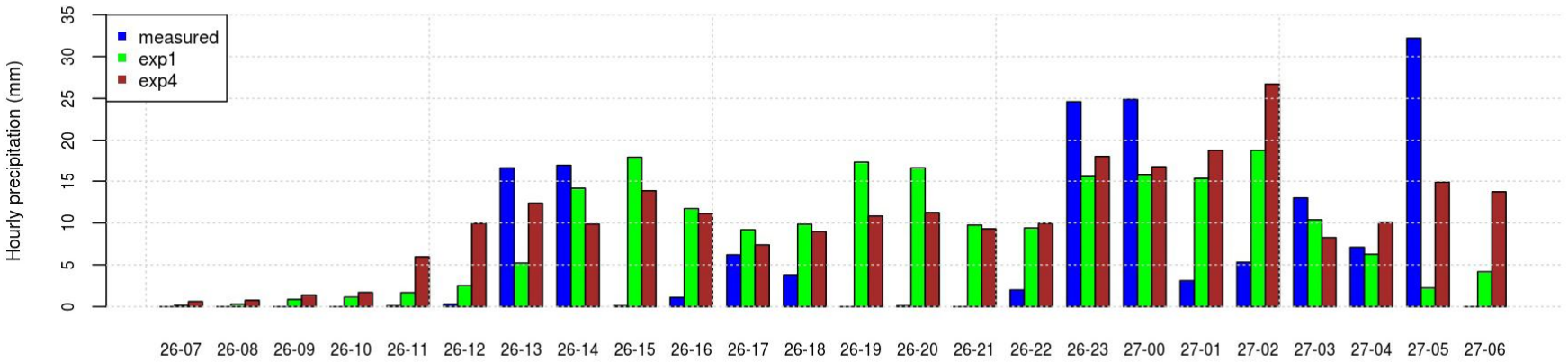


# IOP 16 – ALADIN 2km

LBC – DA (ALL)

LBC - NO DA

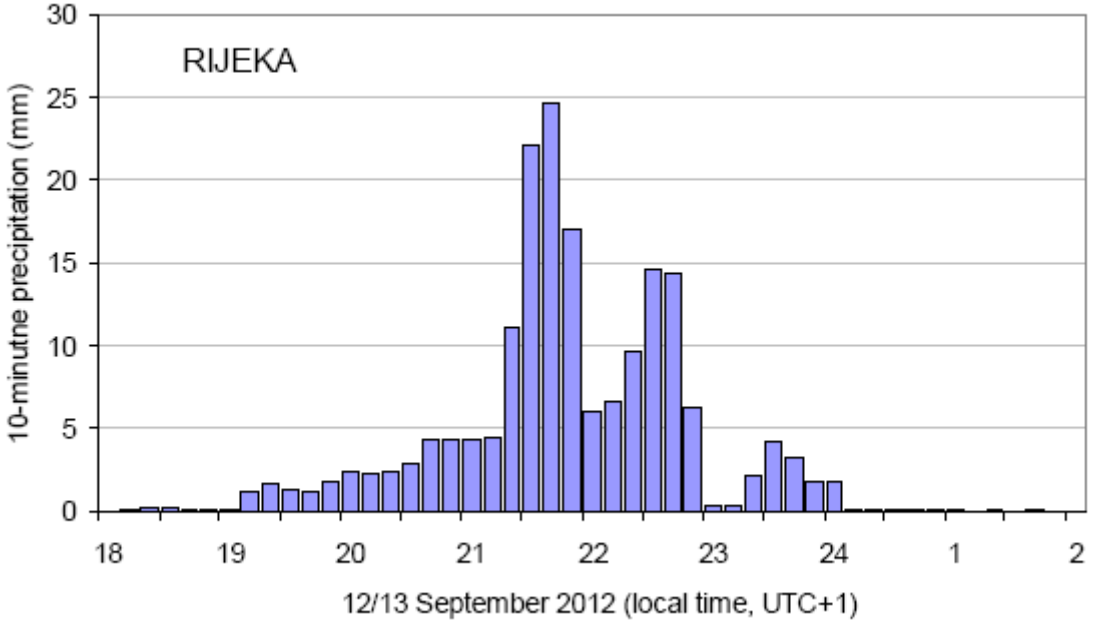
**Area (20x20km)**
**ALADIN 2km**




- good forecast of location of HPE
- better amount of 24h accumulated precipitation compared with ALADIN 8km
- generally amount of precipitation was overestimated
- better timing of main HPE, and the second one at 05 UTC 27 Oct was forecasted

# IOP 2

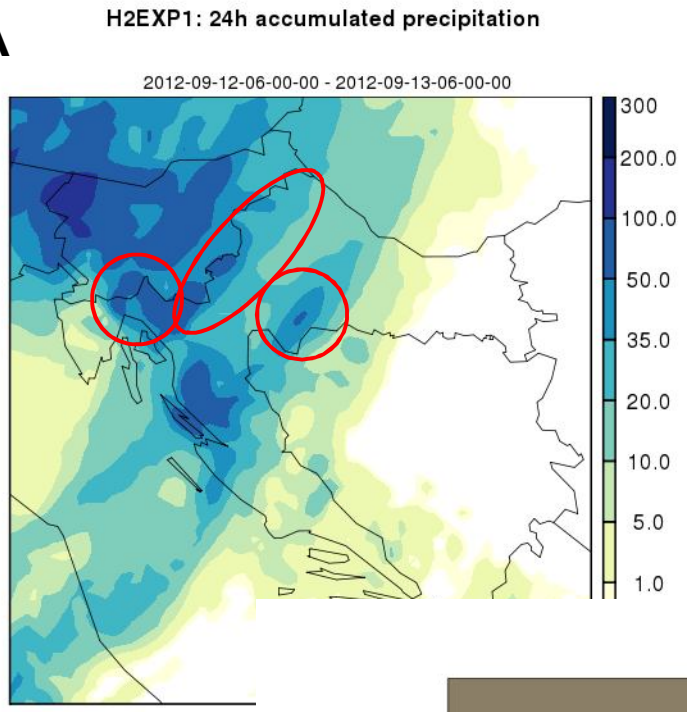
- Heavy precipitation event 12-13 September at north Adriatic area with 24-hourly precipitation exceeding 100 mm
- Maximum of over 250 mm of precipitation recorded in Rijeka area

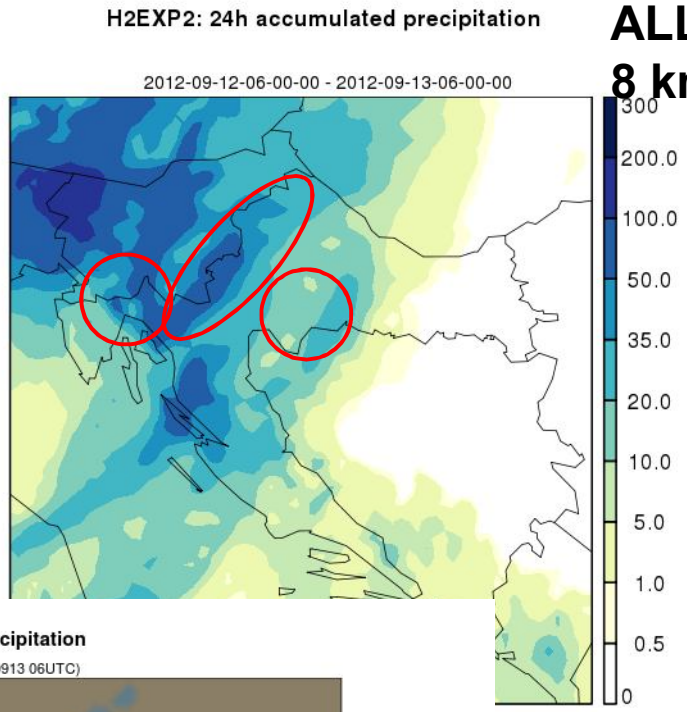


# IOP 2

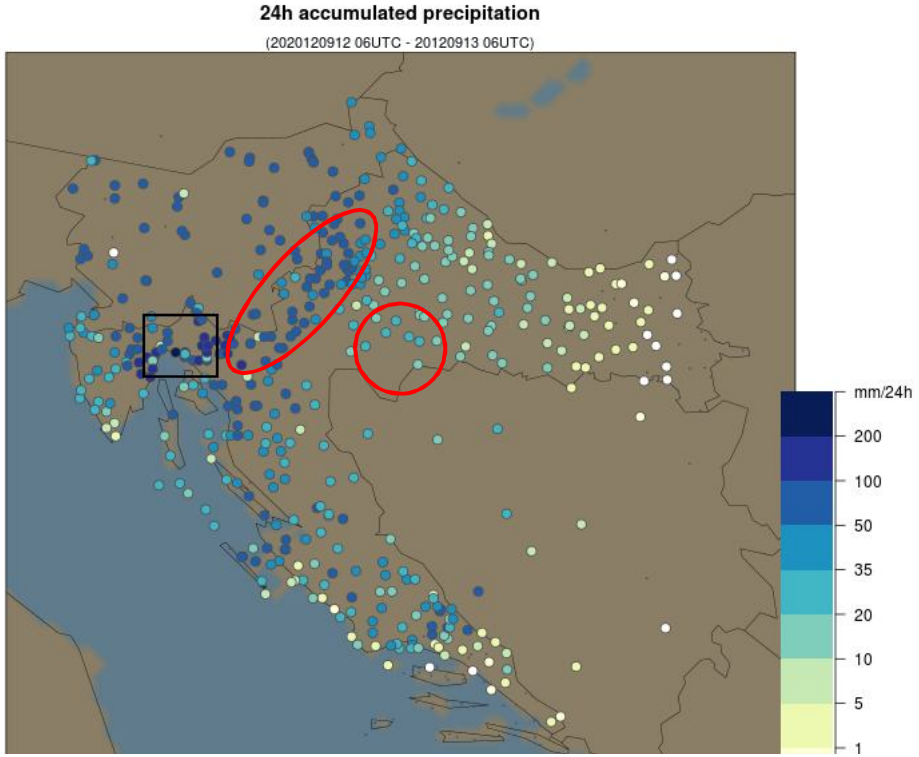
- Same as before: impact of DA of different obs types low
  - Exp1 – ALADIN 8km, NO DA
  - Exp 2 –ALADIN 8km ALL
  - Exp1_hr22 – ALADIN 2km, LBC from Exp1
  - Exp2_hr22 – ALADIN 2km, LBC from Exp2
- 2 weeks "warm up" cycle
- Inital time of model forecast: 12 Sep 00 UTC

**NO DA**
**8 km**

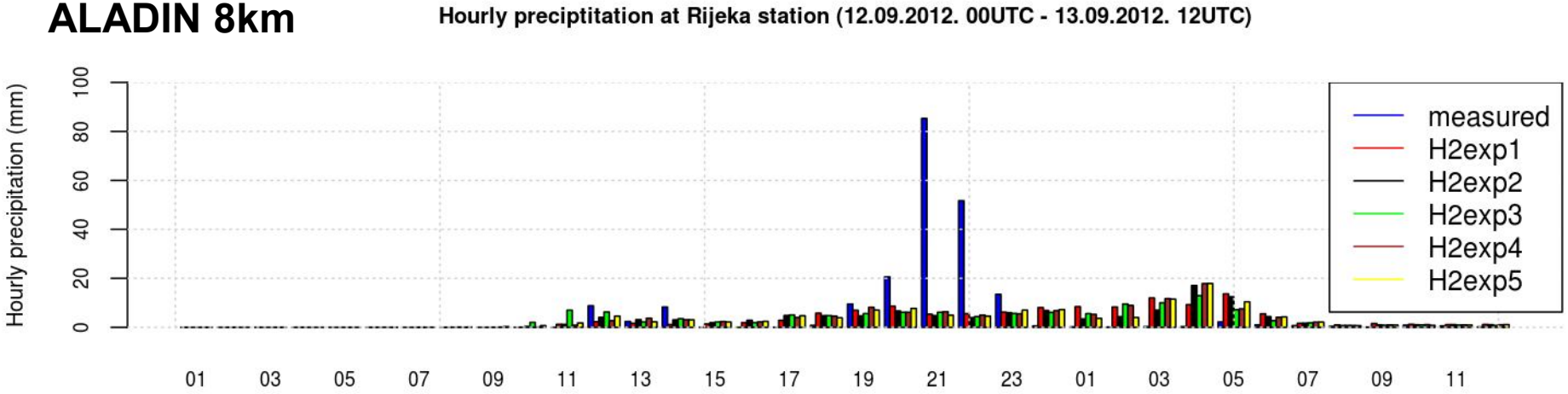


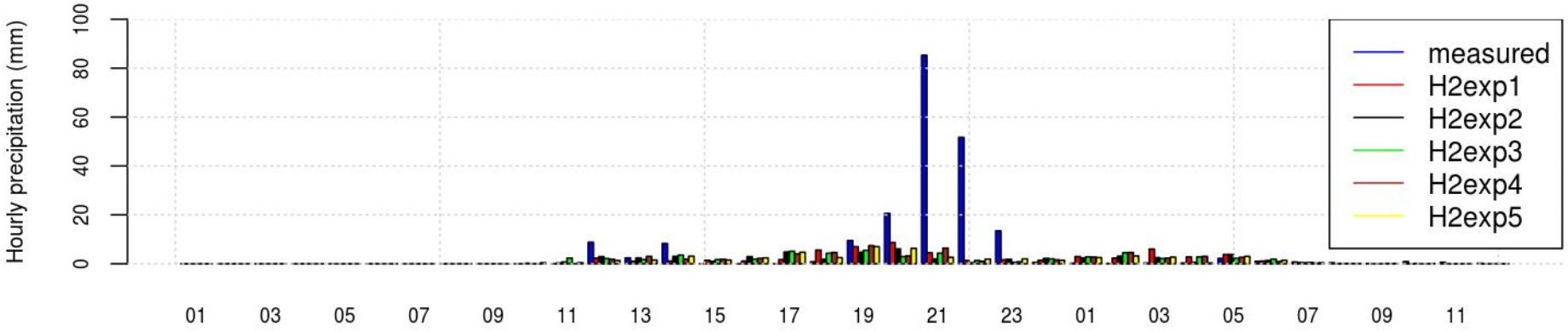

**ALL**
**8 km**



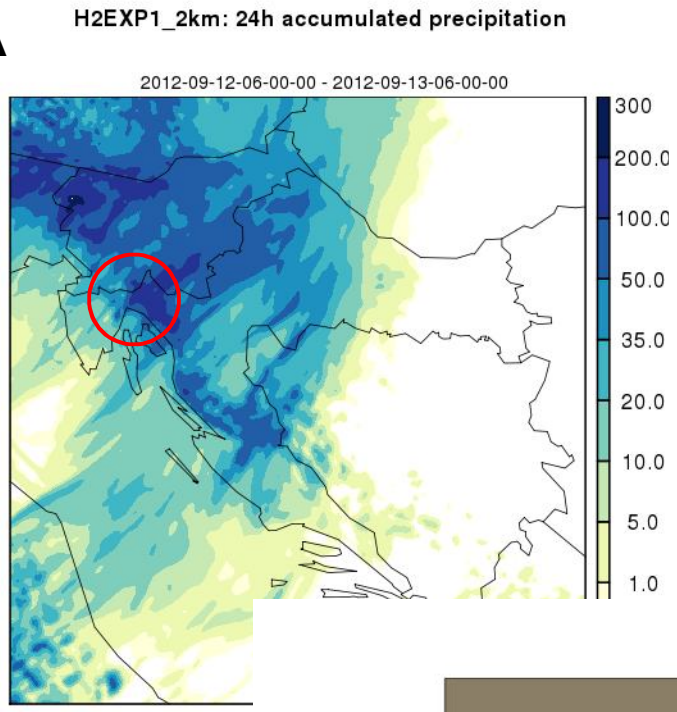
## Area (30x40km)
## ALADIN 8km



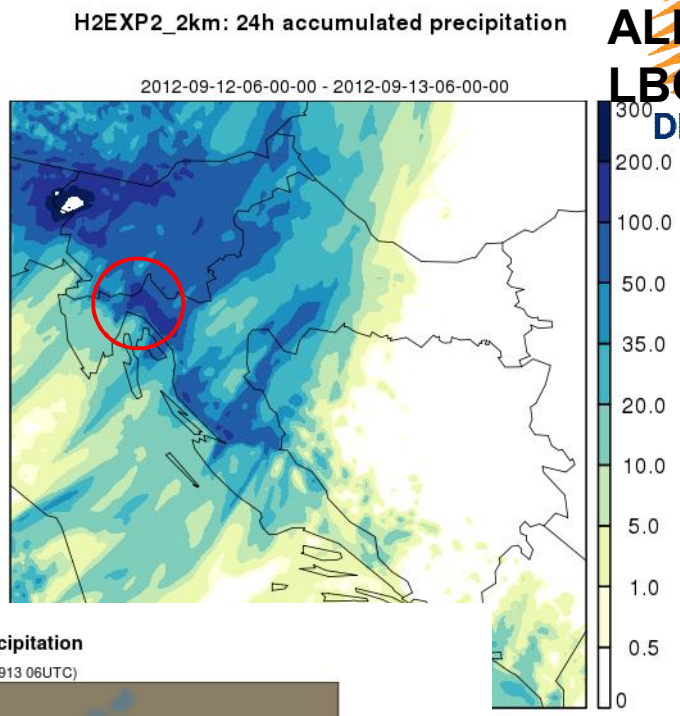

## Point
## ALADIN 8km



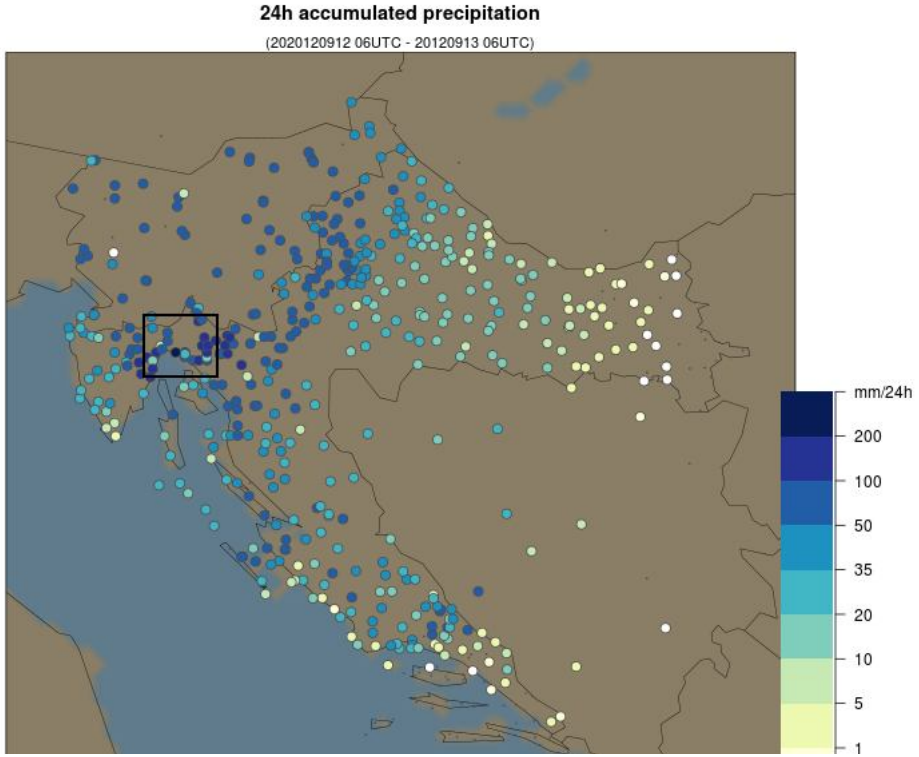
**NO DA LBC**



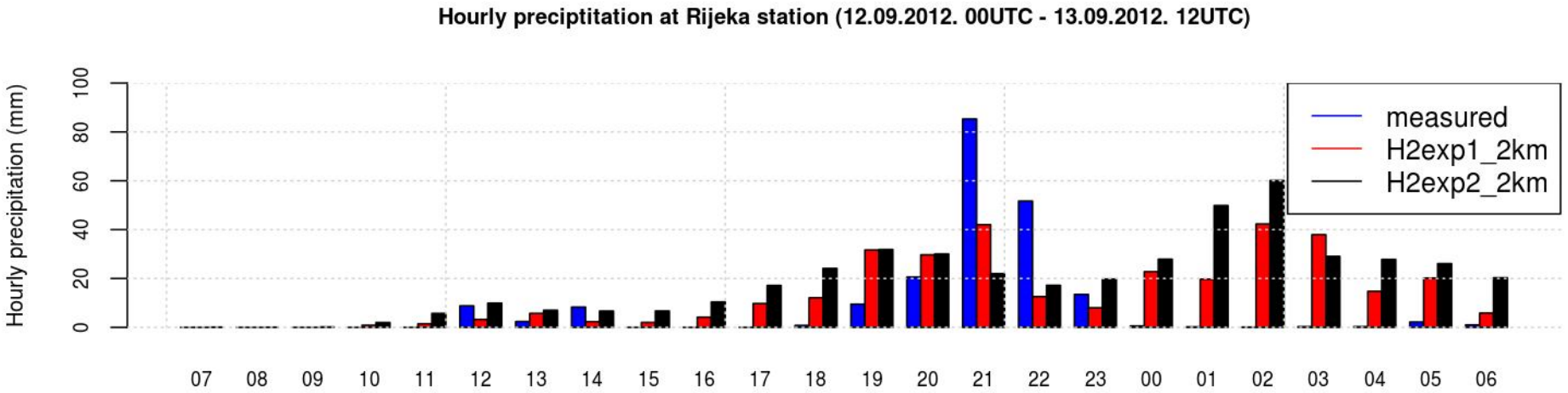

**ALL LBC**



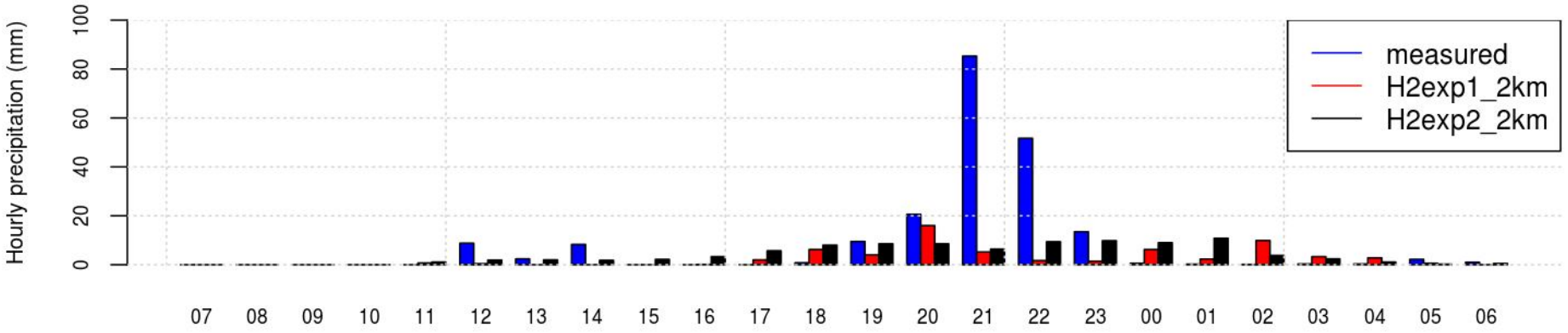

DHMZ



## Area (20x20km)
## ALADIN 2km




## Point
## ALADIN 2km



# Summary

- Influence of DA was tested on two HPE during IOP 16 and IOP 2
- Small positive influence of DA at forecast of HPE during IOP16, neutral impact for IOP 2
  - Better forecast of hourly amount of precipitation in experiments with data assimilation
  - Some precitpitation structures better forecasted
- For both IOPs better forecast with ALADIN 2km
- Need for DA at higher resolution
- Include high resolution data (e.g. radar data) and use rapid update cycle (3h?)
- Upgrade verification methods

# Thank you for your attention