

Operativna prognoza u DHMZ-u trenutno stanje i tehnički izazovi

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Mario Hrastinski**

Državni hidrometeorološki zavod

Služba za meteorološka istraživanja i razvoj operativnih prognostičkih modela

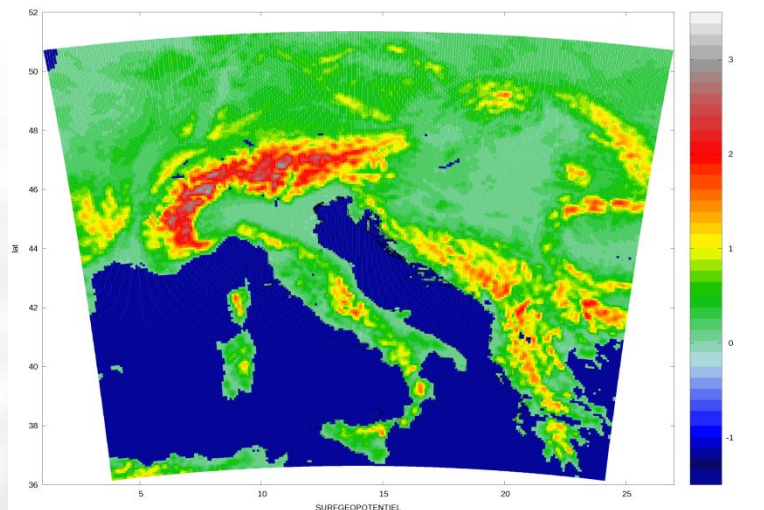
Operativna prognoza za potrebe korisnika mora biti:

1. temeljena na opće prihvaćenom, znanstveno utemeljenom i verificiranom numeričkom modelu atmosfere
2. pouzdana – svakodnevno dostupna na istom mjestu i na isti način
3. pravovremena – rezultati modela svakodnevno dostupni u isto vrijeme



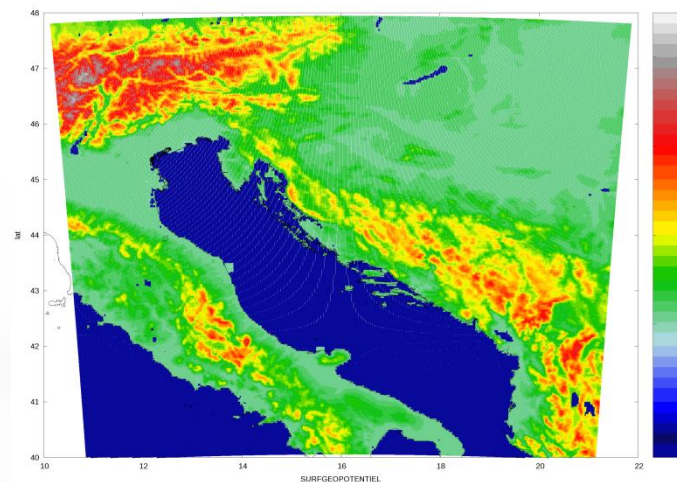
Ljudski kapaciteti
Računalni kapaciteti

0-24 sata nadzor rada modela (dežurni operater)



ALADIN-8

- 8km, 37 nivoa
- AL32T3, ALARO-3MT fizika
- 72 satna prognoza, satni ili trosatni izlaz

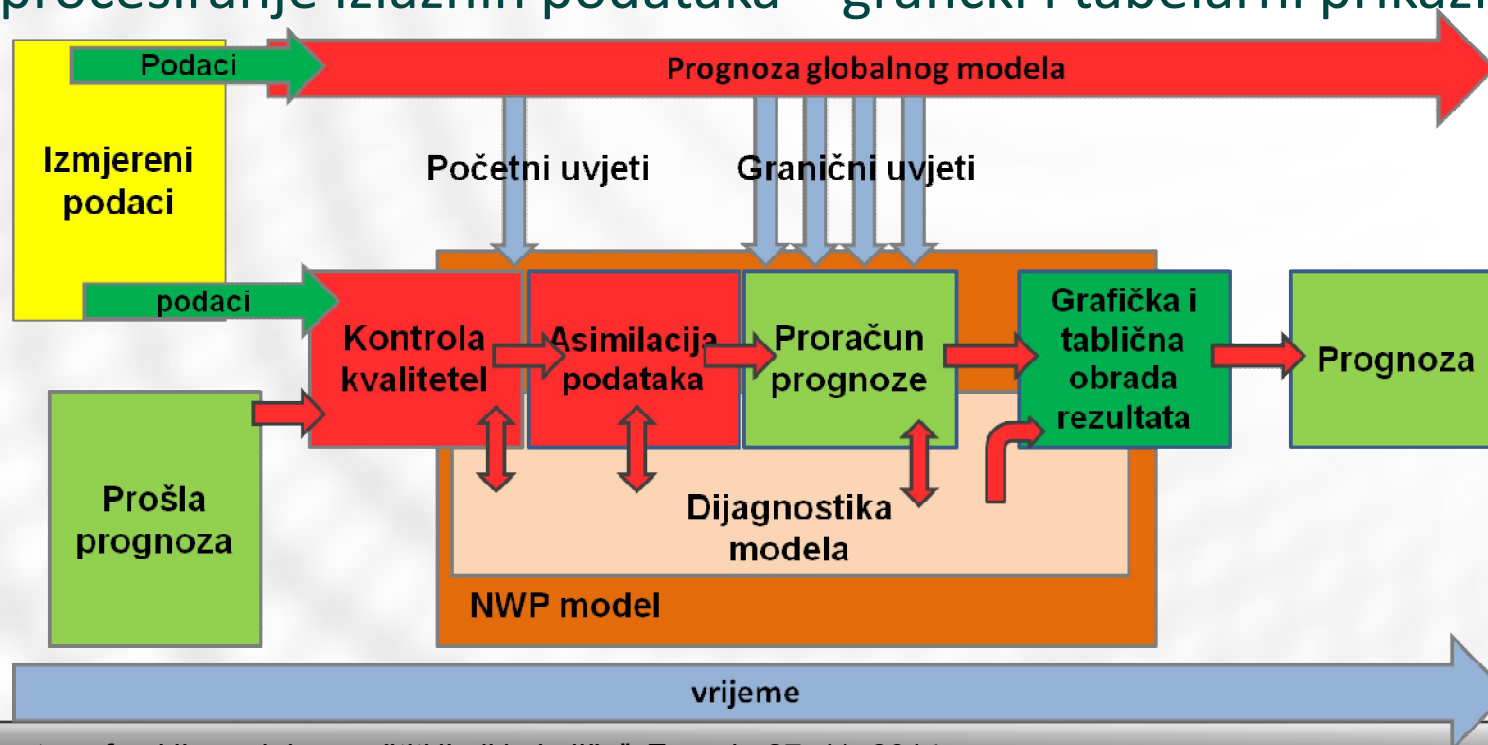


ALADIN-2

- 2km, 37 nivoa
 - AL32T3, ALARO+3MT fizika, nehidrostatski
 - 24 satna prognoza, satni izlaz
- ## HRDA
- dinamička adaptacija, 10m vjetar

Koraci operativne prognoze:

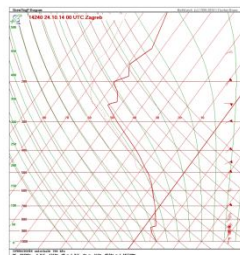
- prikupljanje izmjerenih podataka i njihova kontrola
- priprema rubnih uvjeta iz globalnog modela (ECMWF, ARPEGE)
- asimilacija podataka
- proračun modela
- procesiranje izlaznih podataka – grafički i tabelarni prikazi prognoze



Podaci korišteni u asimilaciji



SYNOP

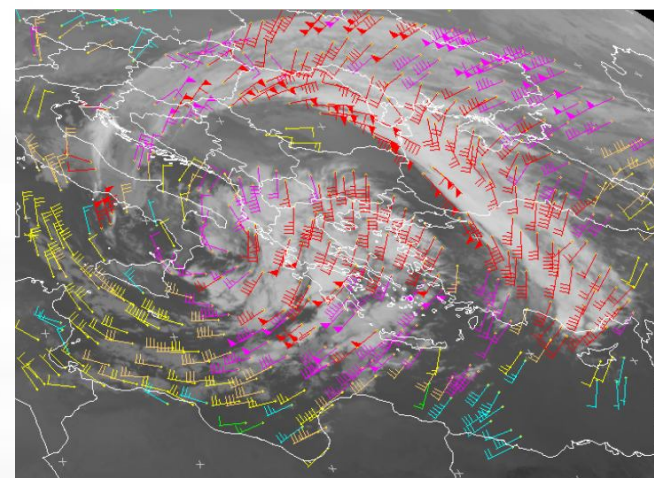
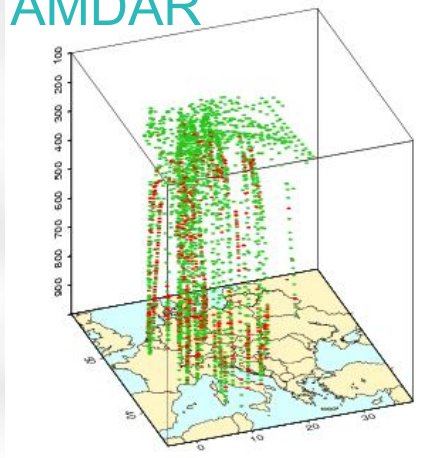


Radiosondaže

Meteorološki sateliti

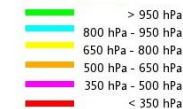


AMDAR



MPEF AMV 2014-10-24 06:45 UTC

Atmospheric Motion Vector



DOSTUPNOST PRODUKATA (UTC)

MODEL	Vrijeme inicijalizacije	Početni uvjeti	Rubni uvjeti	Vrijeme pokretanja	Vrijeme završetka	Dostupnost produkata
ALADIN-8	00	Asimilacija	ECMWF	02:55	03:25	03:30
ALADIN-8	06	Asimilacija	ECMWF	08:55	09:25	09:30
ALADIN-8	12	Asimilacija	ECMWF	14:55	15:25	15:30
ALADIN-8	18	Asimilacija	ECMWF	20:55	21:25	21:30
ALADIN-2	06	ALARO-8 (00UTC)	ALARO-8 (00UTC)	03:00	03:31	03:35

- *vihor* – proračun prognoze



Sistemske komponente	Vihor
Poslužitelj	SGI UV2000
Procesor	38 Intel E5, 6 jezgri, 2.9 GHz
Sistemska memorija	605 GB
Raspoloživost diska	7.1 Tb
Operativni sustav	SUSE Enterprise Server 11 SP2
Kompilatori	Intel Fortran and C++
Batch Queueing	PBS Pro for Linux

- ALADIN-8; 72h prognoza; 12 jezgri ~40 min
- Nova konfiguracija: 4km horizontalno, 73 nivoa vertikalno, nehidrostatika => 4x horizontalno (x i y) x 2x vertikalno x 3x vremenski korak (stabilnost) +NH ~**24x povećanje**

- *zemlja* – arhivsko računalo

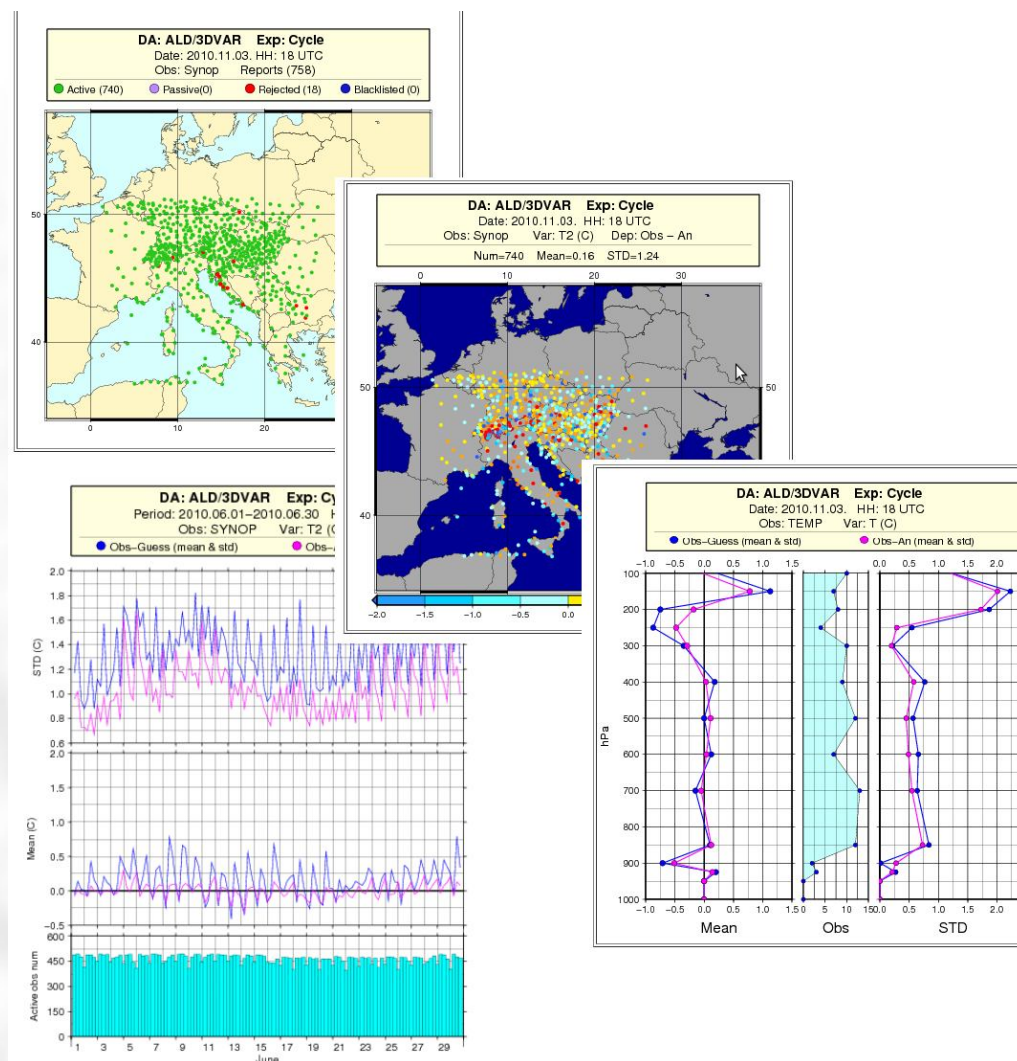


- Quantum Scalar i500; Linux server; RAID6
- 32 TB prostora na diskovima; redoviti backup na trake
- 184 LTO-4 trake; 4 čitača; automatska migracija podataka (robot)
- 1mj. archive ~350GB; godina ~4TB

- *noa* – računalo za naknadnu obradu (crtanje, tablice, html...)

- *radar* – FTP server

Nadzor rada - asimilacija



Status operative modela ALADIN na racunalu VIHORU (172.20.1.77) do +72 sata za 06 UTC

Stanje u Fri Oct 24 09:29:00 UTC 2014

<u>TRENUTNI RUN</u>	<u>gotovi 00 UTC run</u>	<u>gotovi 06 UTC run</u>	<u>gotovi 12 UTC run</u>	<u>gotovi 18 UTC run</u>	<u>TRENUTNI RUN</u>
Termin	COUPLING-EC	ELSCFHR08	ICMSHR08	ICMSHRDA-1h	
+00	05:58	07:00	+00 09:06 +01 09:07 +02 09:07	+00 09:09 +01 09:09 +02 09:09	
+03	05:59	07:00	+03 09:07 +04 09:08 +05 09:08	+03 09:09 +04 09:09 +05 09:10	
+06	05:59	07:01	+06 09:08 +07 09:09 +08 09:09	+06 09:10 +07 09:10 +08 09:11	
+09	06:09	07:01	+09 09:09 +10 09:10 +11 09:10	+09 09:11 +10 09:12 +11 09:12	
+12	06:11	07:01	+12 09:10 +13 09:11 +14 09:11	+12 09:12 +13 09:13 +14 09:13	
+15	06:12	07:01	+15 09:11 +16 09:12 +17 09:12	+15 09:14 +16 09:14 +17 09:14	
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+72	06:19	07:05	+72 waiting	+72 waiting	
		ASSIM-ICMSHR08INIT	09:05		
		PSEUDO_HR08_1h	waiting		

Aladin monitor produkata zemlja.gric.dhz.hr

2012

2013

Mjesec/Dan	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
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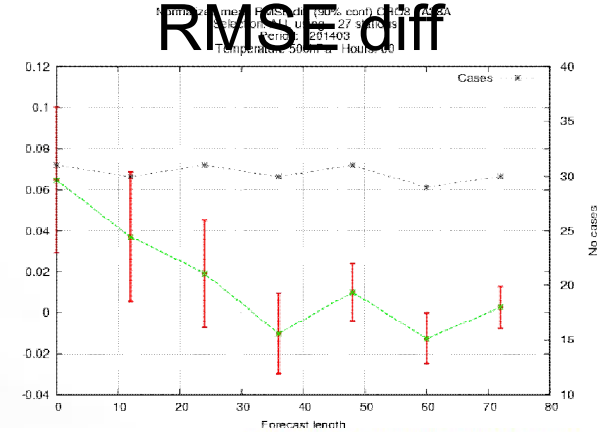
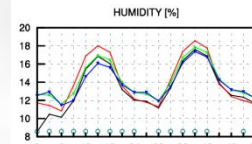
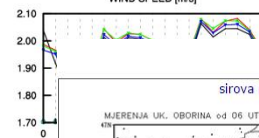
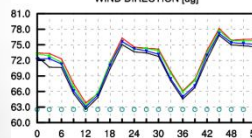
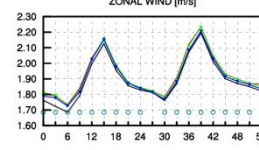
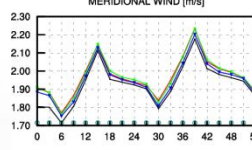
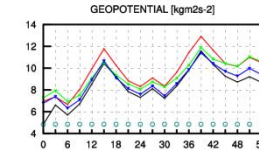
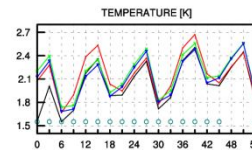
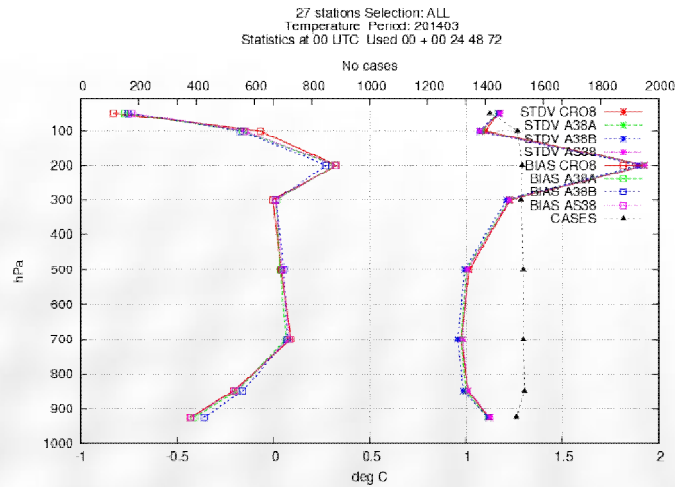
ECMWF ● MF ■ | OK ● Kasni ● Nema ● Kriva velicina ●

ECMWF statistika: Ukupno: 365 | OK: 361 [98.9 %] | Kasni: 4 [1.1 %] | Nema: 0 [0.0 %] | Kriva velicina: 0 [0.0 %] || MF statistika: Ukupno: 365 | OK: 332 [91.0 %] | Kasni: 19 [5.2 %] | Nema: 14 [3.8 %] | Kriva velicina: 0 [0.0 %]

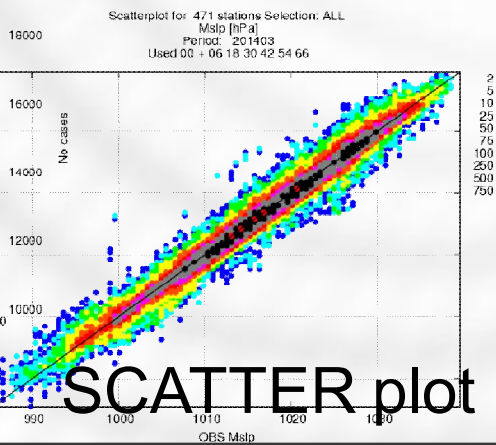
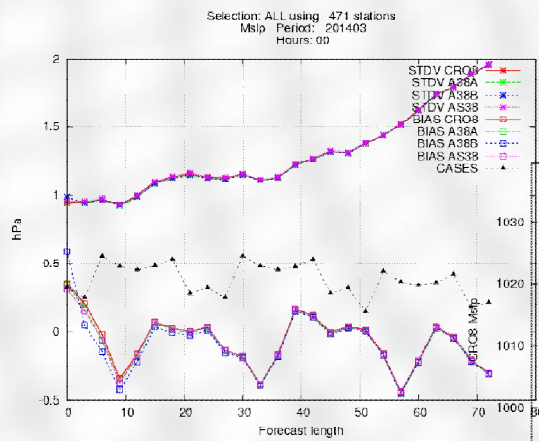
Operativna verifikacija



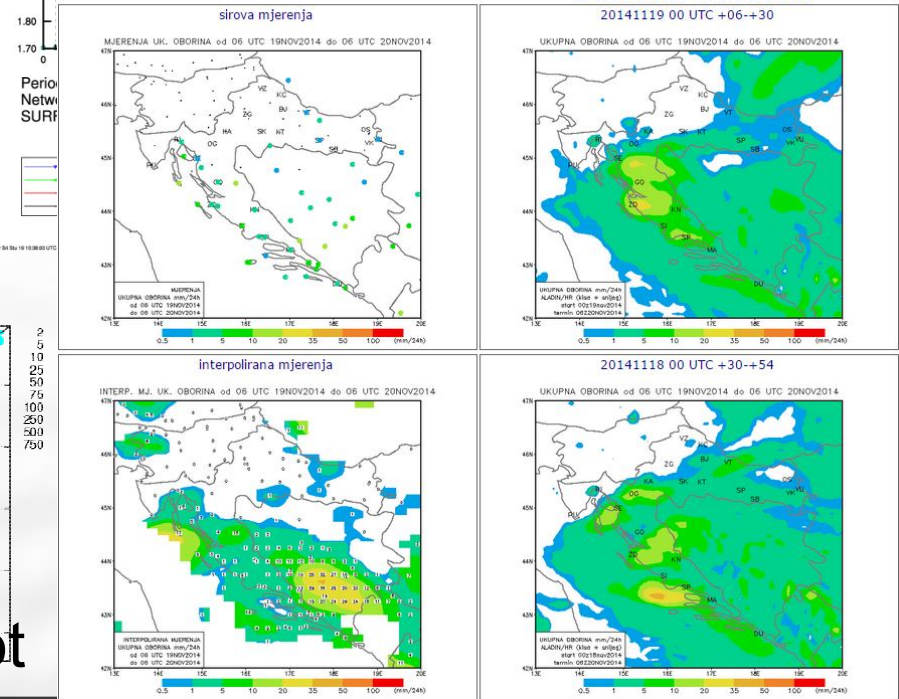
Evolution of scores with forecast range



BIAS, RMSE, STD



SCATTER plot



- Promjena rezolucije modela - predoperativna faza
 - 8km -> 4km
 - 37 nivoa -> 73 nivoa
 - HRDA 2km -> HRDA 1km
 - Nove postavke “fizike” modela
 - Nehidrostatika
- Asimilacijski ciklus 3h, nova mjerenja (Radari, ZTD-GNSS, sateliti)