

# Phasing report

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# 1 Introduction

Validation of Aladin 3Dvar assimilation and Arome assimilation both on cycle 37 (cy37\_t1.06) in Olive system. You could switch on olive variable SWAPP\_ODB\_TKVERSION=cy37.

## 2 Aladin 3Dvar

Summary of validation of cy37t1 for Aladin 3Dvar assimilation with surfex (in OLIVE). As reference was taken Olive double suite aladin-3dvar configuration of the date 8th June 2011. Reference experiment is **sxcoope1:bucanek/83YX**. Testing was done for cy37\_t1.05 then for cy37\_t1.06 and cy37t1. For testing purposes was prepared experiment which has inputs from reference exp. for tasks: dfi and prediction. Experiments:

- **sxcoope1:bucanek/83YW**: one assimilation run for cy35\_t1.05 than cy36\_t1.06 with inputs from reference experiment in dfi and prediction.
- **sxcoope1:bucanek/83ZK**: experiment for one month, cy36\_t1.06, namelists in yuki:~bucanek/Olive/83ZK/namelist.
- **sxcoope1:bucanek/83ZX**: cy37t1, crashes in grip\_api, version grib\_api.1.9.9

### 2.1 Observation preparation

In bator cy37\_t1.06 (cy37t1) change in precision, slight change of relative humidity numbers.

### 2.2 Fullpos of coupling files

Bit identity between cycles.

### 2.3 Surface analysis

Bit identity after canary. Only CLSHUMI.RELAT is influenced by precision of bator.

### 2.4 3dvar analysis

#### 2.4.1 Screening

Slight change in results, different handling of satellites, main differences<sup>1</sup> shown below. JO/n was the same.

NEW (83ZK)				OLD (83YX)							
Codetype	210	=== NOAA	17	208	SENSOR=HIRS	Codetype	210	=== NOAA	17	208	SENSOR=HIRS
Variable		DataCount		Jo_Costfunction		Variable		DataCount		Jo_Costfunction	
	RAD	14098		<u>427951.3791630</u>			RAD	14098		<u>427980.9636919</u>	
Codetype	210	=== NOAA	19	223	SENSOR=HIRS	Codetype	210	=== NOAA	19	223	SENSOR=HIRS
Variable		DataCount		Jo_Costfunction		Variable		DataCount		Jo_Costfunction	
	RAD	1406		<u>89894.09987031</u>			RAD	1406		<u>89901.41215840</u>	
Codetype	250	=== COSMIC-1		740		Codetype	250	=== COSMIC-1		740	
Variable		DataCount		Jo_Costfunction		Variable		DataCount		Jo_Costfunction	
	RO	298		<u>248.7289277615</u>			RO	298		<u>246.7615196247</u>	
Codetype	250	=== COSMIC-5		744		Codetype	250	=== COSMIC-5		744	
Variable		DataCount		Jo_Costfunction		Variable		DataCount		Jo_Costfunction	
	RO	600		<u>315.1146737117</u>			RO	600		<u>320.8814818677</u>	

<sup>1</sup>Differences are underlined

## 2.4.2 Minim

Without observation from hirs and cosmic, JO/n was the same. But not JOs. Example of differences (all observations used):

NEW (83ZK)				OLD (83YX)			
Codetype	90	===	METEOSAT	54	METHOD=	WVCL	
Variable		DataCount		Jo_Costfunction			JO/n
U	2		0.1396013023191				0.07
Codetype	90	===	METEOSAT	56	METHOD=	VIS2	
Variable		DataCount		Jo_Costfunction			JO/n
U	4		0.1823592129649				0.05
Codetype	90	===	METEOSAT	56	METHOD=	IR3	
Variable		DataCount		Jo_Costfunction			JO/n
U	40		1.957984894591				0.05
Codetype	165	===	DRIBU Buoy Report				
Variable		DataCount		Jo_Costfunction			JO/n
U10	2		0.5351757817450D-01				0.03
Z	6		0.2156913035704				0.04
Codetype	210	===	METEOSAT 9	72	SENSOR=	MSG HR	
Variable		DataCount		Jo_Costfunction			JO/n
RAD	3263		247.9971137804				0.08
Codetype	90	===	METEOSAT	54	METHOD=	WVCL	
Variable		DataCount		Jo_Costfunction			JO/n
U	2		0.1229663516382				0.06
Codetype	90	===	METEOSAT	56	METHOD=	VIS2	
Variable		DataCount		Jo_Costfunction			JO/n
U	4		0.1739134414102				0.04
Codetype	90	===	METEOSAT	56	METHOD=	IR3	
Variable		DataCount		Jo_Costfunction			JO/n
U	40		1.778757491253				0.04
Codetype	165	===	DRIBU Buoy Report				
Variable		DataCount		Jo_Costfunction			JO/n
U10	2		0.3458329181186D-01				0.02
Z	6		0.2885806753595				0.05
Codetype	210	===	METEOSAT 9	72	SENSOR=	MSG HR	
Variable		DataCount		Jo_Costfunction			JO/n
RAD	3263		233.2353916173				0.07

The example of differences is shown in figure 1.

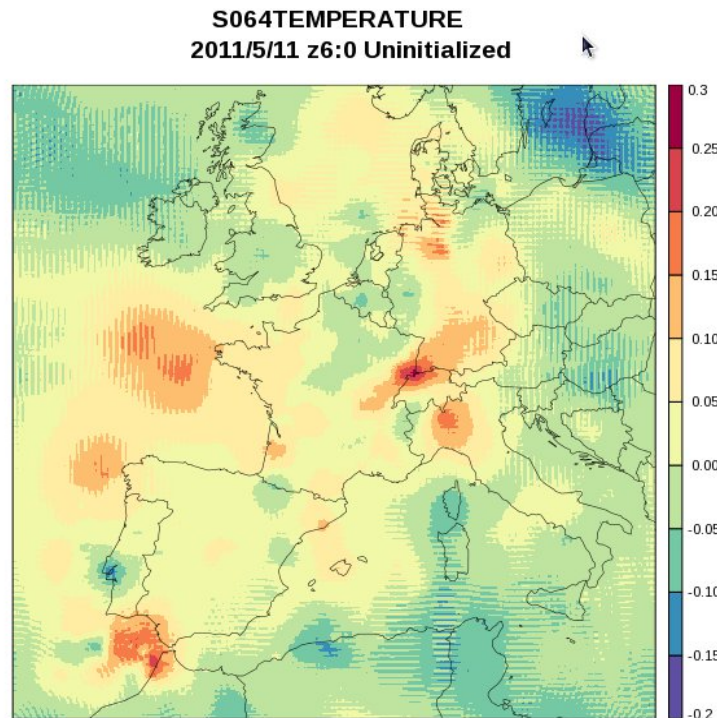


Figure 1: Difference of (83ZK - 83YX), S064TEMPERATURE [K]

## 2.5 Dfi

### 2.5.1 Bias\_idfi

For testing purposes the inputs were the same as for reference experiment. I got quite big differences. Spectral norms differences seems to be bigger than in experiment without surfex but gpnorms diff are smaller than in experiment without surfex. The changes in surfex physics may cause that.

With surfex:

```

-----
NEW (83YW)
-----
NORMS AT NSTEP CNT4 0
SPECTRAL NORMS - LOG(PREHYDS) 0.161508644026319E-03 OROGRAPHY 0.308644200944540E+04
LEV VORTICITY DIVERGENCE TEMPERATURE HUMIDITY KINETIC ENERGY
AVE 0.851765607630905E-05 0.913657610815155E-05 0.839530495457631E-01 0.290091603852061E-04 0.426882228563436E-01
-----
OLD (83YX)
-----
NORMS AT NSTEP CNT4 0
SPECTRAL NORMS - LOG(PREHYDS) 0.161220476786013E-03 OROGRAPHY 0.308644200944540E+04
LEV VORTICITY DIVERGENCE TEMPERATURE HUMIDITY KINETIC ENERGY
AVE 0.853806725073104E-05 0.100843796142629E-04 0.826471862621743E-01 0.294564392897844E-04 0.429307362016865E-01

```

Without surfex:

```

-----
83ZH - cy37_t1.05
-----
NORMS AT NSTEP CNT4 0
SPECTRAL NORMS - LOG(PREHYDS) 0.160857073587559E-03 OROGRAPHY 0.308574876257827E+04
LEV VORTICITY DIVERGENCE TEMPERATURE HUMIDITY KINETIC ENERGY
AVE 0.943132730899972E-05 0.100843796142629E-04 0.826471862621743E-01 0.304337361375417E-04 0.457293295613102E-01
-----
83ZG - reference, oper duplicate
-----
NORMS AT NSTEP CNT4 0
SPECTRAL NORMS - LOG(PREHYDS) 0.160912122657995E-03 OROGRAPHY 0.308574876257827E+04
LEV VORTICITY DIVERGENCE TEMPERATURE HUMIDITY KINETIC ENERGY
AVE 0.943194034369470E-05 0.100835387076292E-04 0.826628483330833E-01 0.304100957522541E-04 0.457315858935166E-01

```

## 2.5.2 Incr\_idfi

Again testing inputs are the same like in ref. exp. Differences were slightly smaller than in bias\_idfi.

## 2.6 Forecast

Testing with the same inputs as reference experiment. There were found differences in zero hour prediction CLS.... fields, it should be caused by adaptation in surfex physics, differences are mainly over lakes, figure 2. Extension zone on east side of domain contains 273.16 K in CLSTEMPERATURE previously 0 K. Prediction differences after 6 hours:

RECNAME	LSPEC1	MIN1	MAX1	MEAN_AE	MAX_AE	AE = absolute error (absolute difference)
NGRIB   NBITS	LSPEC2	MIN2	MAX2			
SURFPRESSION	T	1.1098E+01	1.1543E+01	1.0798E-05	1.3038E-04	experiment 83YW (new)
2 2   18 18	T	1.1098E+01	1.1543E+01			experiment 83YX (ref)
S064WIND.U.PHYS	T	-3.0109E+01	1.7998E+01	2.5914E-02	1.4961E+00	
2 2   18 18	T	-3.0127E+01	1.7999E+01			
S064TEMPERATURE	T	2.6845E+02	3.0098E+02	2.3727E-02	5.7228E-01	
2 2   18 18	T	2.6848E+02	3.0098E+02			
S064HUMI.SPECIFI	T	3.6415E-04	1.2568E-02	1.3332E-05	5.8963E-04	
2 2   18 18	T	3.6822E-04	1.2548E-02			
SURFTEMPERATURE	F	2.7075E+02	3.2635E+02	5.3075E-02	7.0460E+00	
2 2   16 16	F	2.7075E+02	3.2629E+02			
S064LIQUID_WATER	F	-3.9768E-19	3.3569E-04	6.5398E-08	5.9617E-05	
2 2   16 16	F	-3.9768E-19	3.4566E-04			
S064RAIN	F	-3.2304E-18	2.1530E-04	5.4031E-08	4.2108E-05	
2 2   16 16	F	-3.2304E-18	2.1979E-04			
CLSHUMI.RELATIVE	F	0.0000E+00	1.0000E+00	2.0950E-03	2.7587E-01	
2 2   16 16	F	0.0000E+00	1.0000E+00			

CLSTEMPERATURE	F	0.0000E+00	3.0782E+02	7.3658E+00	2.8675E+02	big max_ae due to extension zone set up to 273.16K
2 2   16 16	F	-1.3590E+01	3.0788E+02			
-----						
CLSHUMI.RELATIVE	F	0.0000E+00	1.0000E+00	3.9802E-05	4.3183E-01	
2 2   16 16	F	0.0000E+00	1.0000E+00			
-----						

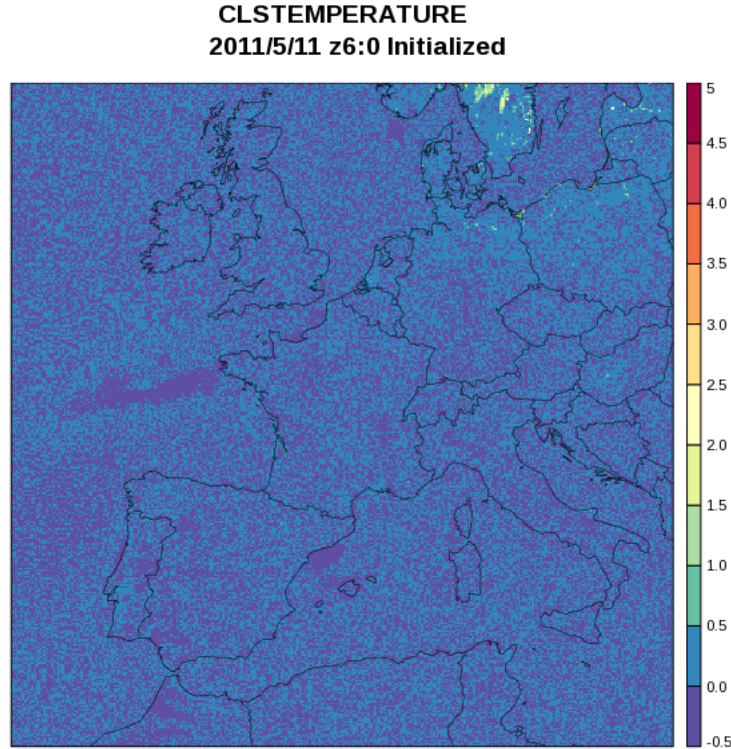


Figure 2: Difference [K] test-ref: 83YW-83YX ICMHALAD+0000

## 2.7 Scores

Period was chosen as 20110511-20110611, scores were computed against (SYNOP+RANOM) and TEMP and ECMWF analysis (ECMWF). Comparison between 83ZK (new) and 83YX (ref) gives neutral scores against TEMP and ECMWF, not shown. Scores of mean square error and bias for 83ZK and 83YX are more less neutral as could be seen in figure 3 (against SYNOP+RADOM).

## 2.8 Conclusion

Cy37t1 has problem with grib\_api 1.9.9 so Canari bit identity (only CLSHUMI.RELAT influenced by bator). Screening and minim not bit reproducibility, examples of Jo values are shown in section 2.4. Dfi and Forecast (2.5 and 2.6) norms differ quite a lot, partly caused by developments in surfex physics. Scores are neutral for upper air fields. Surface fields scores are slightly different but I think we can say **cy37\_t1.06 VALIDATED**.

— *Eqm P83YX.r 00/SYNOP+RADOME*      — *Eqm P83ZK.r 00/SYNOP+RADOME*  
- - *BiaisP83YX.r 00/SYNOP+RADOME*      - - *BiaisP83ZK.r 00/SYNOP+RADOME*

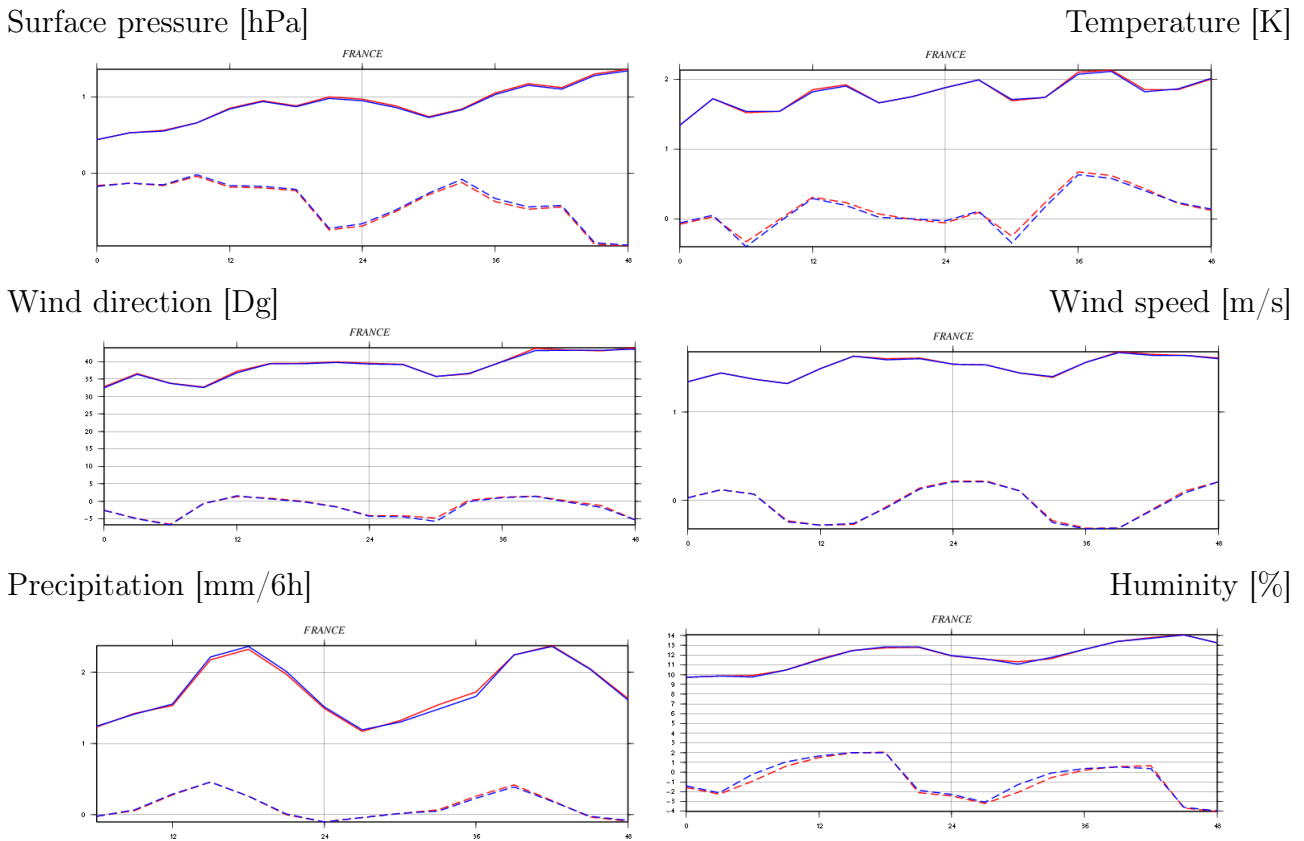


Figure 3: Scores against SYNOP and RADOME, blue is new exp. and reference is red

### 3 Arome

Arome assimilation experiment was prepared on cy37\_t1.06 using namset object in Olive, **experiment 8406**. Reference experiment is created from double suite on 20110701 **exp. 8402**. Namelist are in yuki: `~bucanek/Olive/8406/namelist`. They are cleaned from dead blocks but not from unnecessary empty blocks.

#### 3.1 coupling, couplingsurf, coupling\_fc, coupling\_ana2

Bit identity in case of the same input files like in ref. experiment. (coupling\_fc, coupling\_ana2 has inputs from reference, be careful when copying exp 8406)

#### 3.2 surfan

Bit identity, only clshumi.relat is slightly changed due to precision of bator.

#### 3.3 forecast

Like in aladin case there are differences in zero hour prediction in CLS... fields due to surfex changes (inputs are the same as in reference). Prediction for 3 hours:

```

-----
REC�      LSPEC1  MIN1      MAX1      MEAN_AE   MAX_AE
NGRIB | NBITS  LSPEC2  MIN2      MAX2
-----

```

SURFPRESSION	T	1.1097E+01	1.1543E+01	4.4141E-07	1.9475E-04	exp. 8406 (new)
2 2   18 18	T	1.1097E+01	1.1543E+01			exp. 8402 (ref)
-----						
S058WIND.U.PHYS	T	-1.4475E+01	1.3281E+01	4.4014E-03	7.6077E-01	
2 2   18 18	T	-1.4473E+01	1.3281E+01			
-----						
S057TEMPERATURE	T	2.6934E+02	2.9976E+02	2.7116E-03	2.6273E-01	
2 2   18 18	T	2.6933E+02	2.9976E+02			
-----						
S057HUMI.SPECIFI	F	1.4348E-03	1.2021E-02	2.2387E-06	4.4328E-04	
2 2   16 16	F	1.4352E-03	1.1992E-02			
-----						
S057CLOUD_WATER	F	-6.7763E-21	7.2500E-04	3.5639E-08	1.0654E-04	
2 2   16 16	F	-6.7763E-21	7.0512E-04			
-----						
S060RAIN	F	-2.0920E-22	9.8636E-04	6.3107E-09	1.3545E-04	
2 2   16 16	F	-1.0461E-22	9.5405E-04			
-----						
CLSTEMPERATURE	F	0.0000E+00	2.9651E+02	3.9732E+00	2.8458E+02	
2 2   16 16	F	-1.1423E+01	2.9651E+02			
-----						
CLSHUMI.RELATIVE	F	0.0000E+00	1.0000E+00	6.3188E-04	4.5428E-01	
2 2   16 16	F	0.0000E+00	1.0000E+00			
-----						

### 3.4 3Dvar analyse

#### 3.4.1 Screening

Olive variable SWAPP\_DEBUG\_NOBS=1 could not be forgot in main page of experiment. More less the same behavior like in aladin case. Different handling of noaa 19. Small difference in Jo values of h2. Bigger difference for NOAA 19:

NEW (8406)				OLD (8402)							
Codetype	210	NOAA	19	223	SENSOR=HIRS	Codetype	210	NOAA	19	223	SENSOR=HIRS
Variable	DataCount		Jo_Costfunction		Variable	DataCount		Jo_Costfunction			
RAD	13946			348024.7378775	RAD	13946			348038.1954539		

#### 3.4.2 Minim

Due to differences in screening analyses could not be the same. Differences are of the same order like in aladin case.

#### 3.4.3 Pseudotraj

Inputs are the same like in reference! Small difference in PRESS.DEPART, VERTIC.DIVER, CLOUD\_WATER, ICE\_CRYSTAL, RAIN, SNOW, GRAUPEL, TKE.

RECN	LSPEC1	MIN1	MAX1	MEAN_AE	MAX_AE
NGRIB   NBITS	LSPEC2	MIN2	MAX2		
S057PRESS.DEPART	T	-5.8723E+01	4.3446E+01	3.0103E-07	1.7419E-06
2 2   24 18	T	-5.8723E+01	4.3446E+01		
-----					
S058VERTIC.DIVER	T	-3.3845E+00	5.6796E+00	5.5088E-08	3.6911E-07
2 2   24 18	T	-3.3845E+00	5.6796E+00		
-----					
S058CLOUD_WATER	F	-3.3881E-21	6.2528E-04	5.4186E-13	1.8562E-11
2 2   24 16	F	-3.3881E-21	6.2528E-04		
-----					
S054RAIN	F	-8.9997E-22	1.1938E-03	2.7855E-13	3.5441E-11
2 2   24 16	F	-8.9997E-22	1.1938E-03		

### 3.5 Conclusion

I hope that assimilation is now working, not passed last step of 8406/2011051103/production/fc\_i/ when I was leaving office. So Arome assimilation more less works with mentioned differences to reference.