

Assimilation on RC LACE Radar data
report from LACE stay in Budapest 2012/11 - 2012/12

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A Technical

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1 Introduction

Continual scientific research and increasing of resolution in recent numerical meteorological models go hand in hand. One of the main tasks today in assimilation system with rapid update cycle is constantly searching for new data sources, which have a very good 3D coverage and near real time accessibility. One of the meteorological devices which fully fulfill this requirements are meteorological radars.

Using radars in meteorology have very long tradition. One of the first radars for detection of airplanes was introduced by British naval in 1939 (Type 79). In Hungary 1946 Zoltan Bay done his First Moon-Radar Experiment in Europe. On 14-th February 1947 the first weather radar was installed in Washington D.C..

RC LACE radars assimilation status

Most progress in RC LACE countries in radar assimilation is done in OMSZ (Hungary) where is continual effort to have it in operative. Quality data assimilation team is already build by Roger Randriamampianina, Gergely Boloni, Máté Mile, Responsible person for preparing radars data is Roland Steib which is already making radar assimilation experiments on AROME. Also was prepared successful assimilation case study with Doppler Radar Wind with Hungary radars (RC LACE stage, November 2011).

In Croatia Antonio Stanešić and Tomislav Kovačić were prepare doppler radar wind assimilation in ALARO MFBUR for Croatia and Slovenia radars. Assimilation of radar reflectivity is still problematic, because obs operator is missing.

First tests with assimilation of one radar were done in ZAMG (Austria) by Yan Xin. This data wasnt use in these work because data belongs to Austrocontrol. Result of very close cooperation in many projects (OPERA, INCA, ...) is ongoing 5-minutes ODIM OPERA HDF5 radar volume data exchange between SHMU (Slovak republic), CHMU (Czech republic) and 10-minutes data from IMGW (Poland) established by Marian Jurasek, Petr Novak and Lukas Wojtas. This data also use as input for new developed nowcasting precipitation module of INCA2. On SHMU was installed and modified CONRAD to read OPERA ODIM HDF5 data to produce MFBUR files. It was not possible to use read_fmiopera.f90 or read_knmiradar.F90. We compare including structures inside programs with document "EUMETNET OPERA weather radar information model for implementation with the HDF5 file format" ¹⁾ we find so many discrepancies in it. Next degradation of native radar data is interpolation for each radar site to BATOR accepted 512x512 points MFBUR.

2 Preprocessing radar data

Before the stage we try collect doppler radar winds and radar reflectivity from the RC LACE countries for May 2012. Because in time of being in OMSZ was temporal problem with data from this month we choose another date for case study. For case study we choose 05-06-2012 at 00UTC for significant weather through RC LACE countries. Unluck data from Romania and Austria we were not able obtain. During the stage we investigate many problems with flaging, coding of preliminary radar data and that leads to continuous modification of used MFBUFRs. We do it in very close cooperation and coordination with local teams from Hungary, Croatia (which also preparing Slovenian data) and Slovak (which try to coverage conversion from ODIM OPERA HDF5 from Slovakia, Czech and for testing purpose from Poland, because they have in their hdf5 file the same number of rays on each elevations)

List of used radar sites

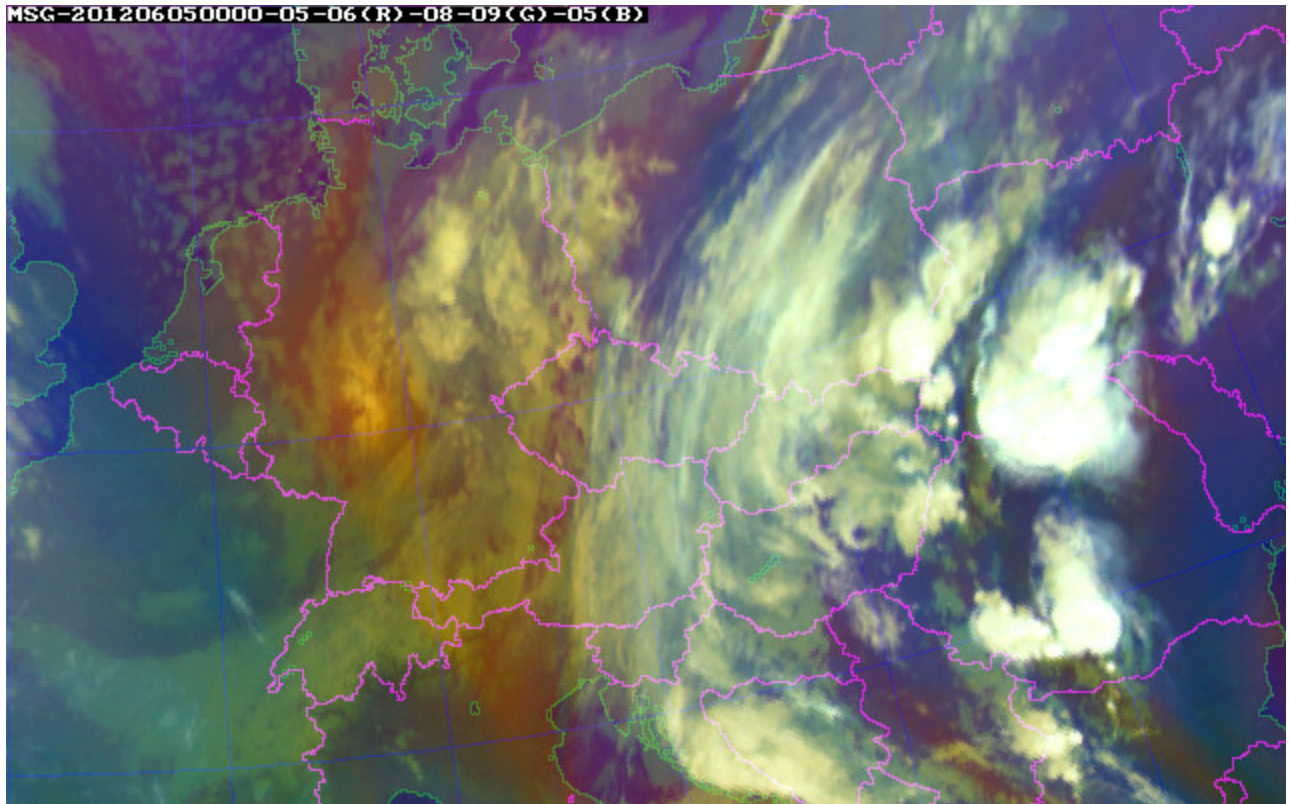
cc	ID	lat	lon	elev	name	
CR	14256	45.883	17.206	231	Bilogora	- DBZ
CR	14257	45.883	17.206	231	Bilogora	- VEL
CZ	11480	49.658	13.818	916	Brdy-Praha	- DBZ
CZ	11718	49.501	16.790	767	Skalky	- DBZ
HU	12843	47.429	19.182	163	Budapest	- DBZ
HU	12844	47.429	19.182	163	Budapest	- Radial wind
HU	12892	47.963	21.889	152	Napkor	- DBZ
HU	12893	47.963	21.889	152	Napkor	- Radial wind
HU	12921	49.501	16.790	767	Poganyvar	- DBZ
HU	12922	49.501	16.790	767	Poganyvar	- Radial wind
SI	14024	49.501	16.790	767	Lisca	- DBZ
SI	14025	49.501	16.790	767	Lisca	- Radial wind
SK	11812	48.256	17.153	600	Maly Javornik	- DBZ
SK	11813	48.256	17.153	600	Maly Javornik	- Radial wind
SK	11958	48.787	20.995	1262	Kojsovska hola	- DBZ
SK	11959	48.787	20.995	1262	Kojsovska hola	- Radial wind

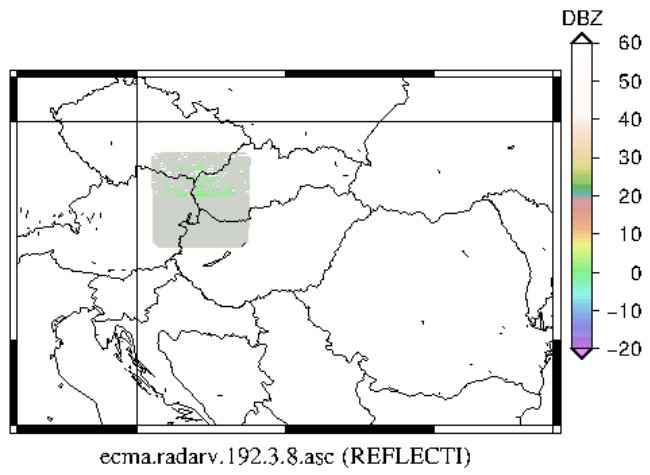
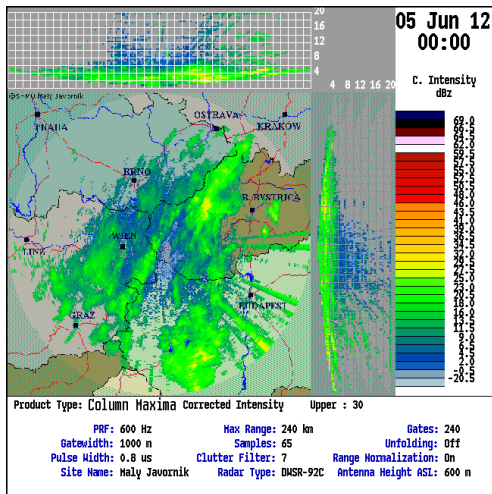
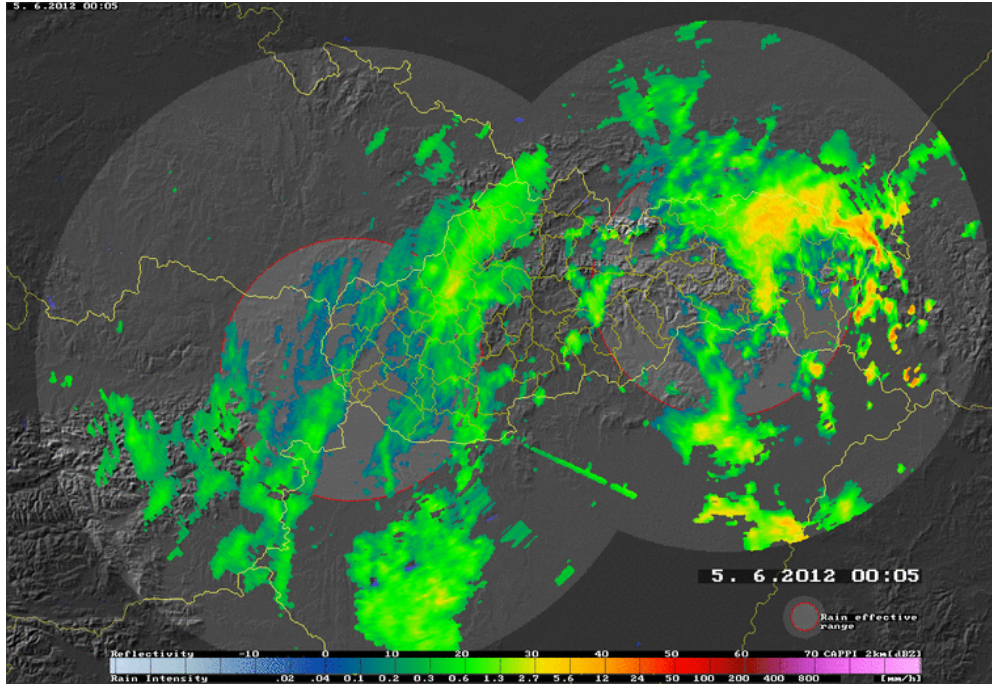
refdata.radarv

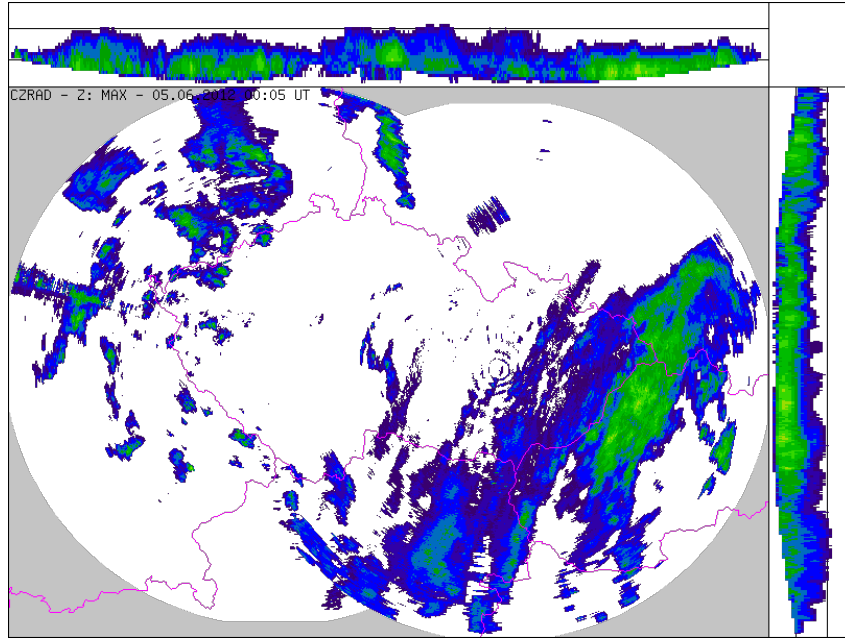
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12843	BUFR	radarv	{n_date}	{n_time}
12844	BUFR	radarv	{n_date}	{n_time}
12892	BUFR	radarv	{n_date}	{n_time}
12893	BUFR	radarv	{n_date}	{n_time}
12921	BUFR	radarv	{n_date}	{n_time}
12922	BUFR	radarv	{n_date}	{n_time}
14256	BUFR	radarv	{n_date}	{n_time}
14257	BUFR	radarv	{n_date}	{n_time}
14024	BUFR	radarv	{n_date}	{n_time}
14025	BUFR	radarv	{n_date}	{n_time}

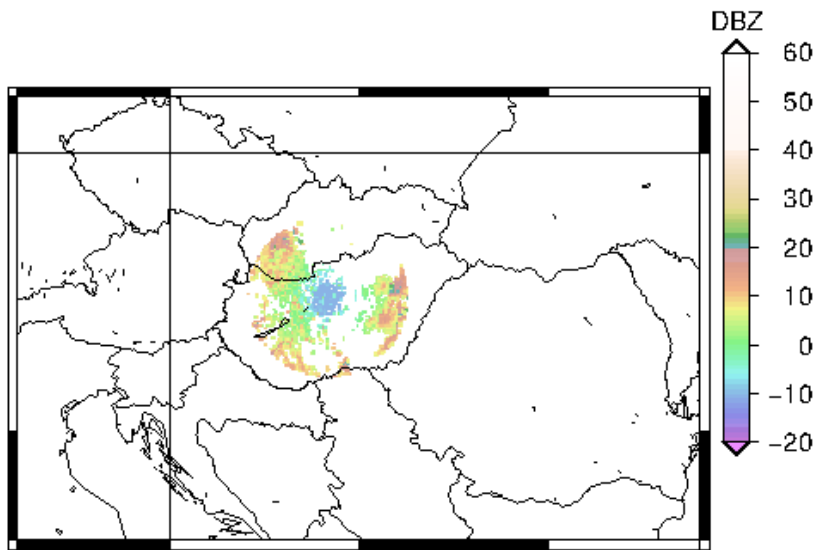
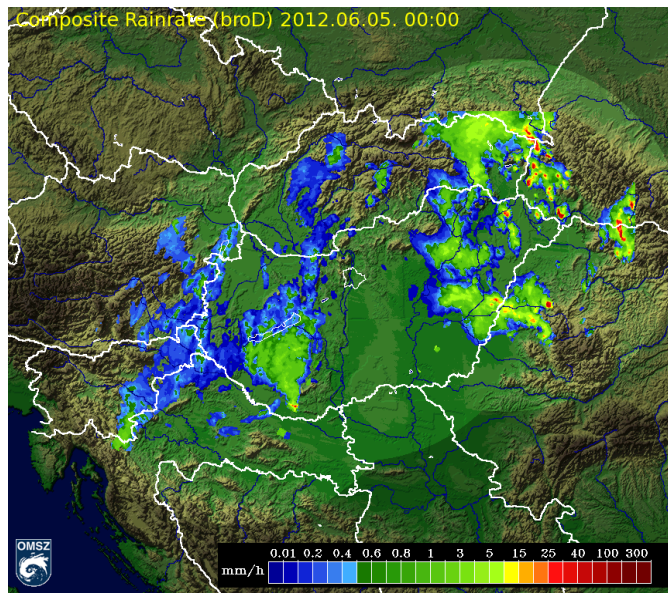
3 Case study

All experiments was done AROME CY36T1 (500x320 60 Levels
EDELX=EDELY=2488.667)

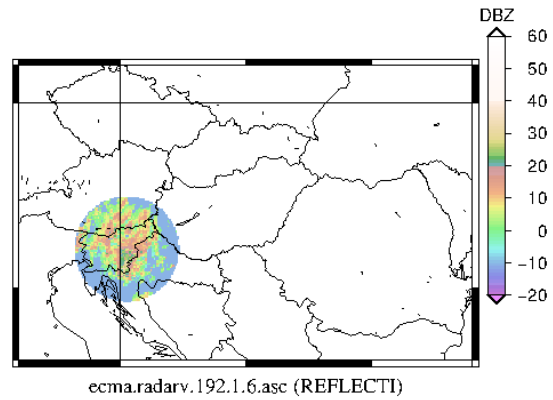
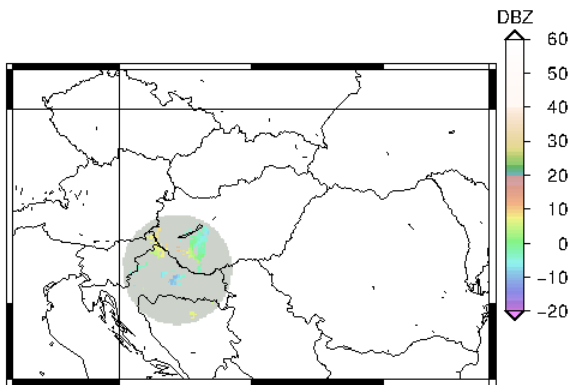
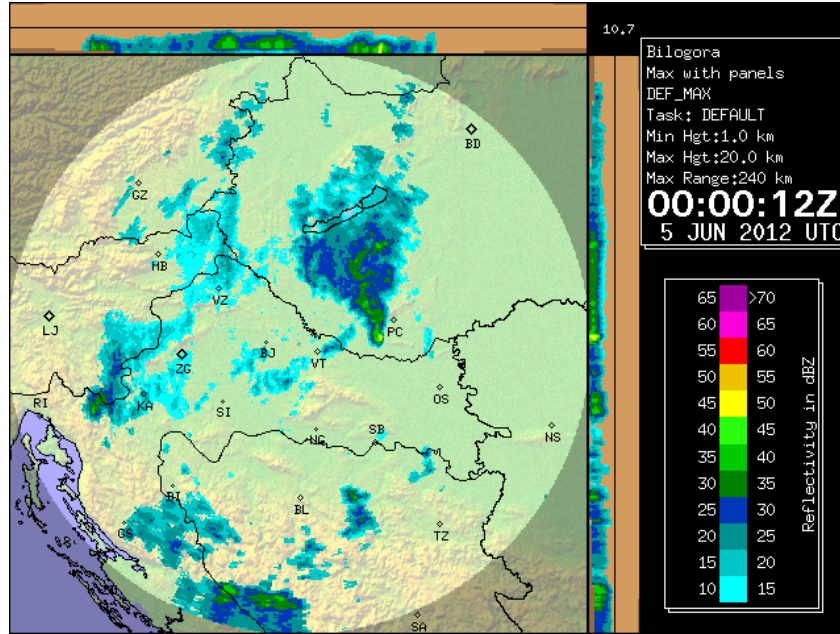








ecma.radarv.192.all.asc_out (REFLECTI)



(O) assim/rundir/Bator/00/out.batodb.radarv.00

cc	TOTAL	SELECTED
HU	16045	16045
HR	3799	3799
SI	4861	4861
SK	16694	16694

CZ		
RC LACE		

(P) arp/namelist/namscc.h

NAMLIST NAMSCC - OBSERVATION SCREENING CONTROL PARAMETERS

RMIND_RADAR

RFIND_RADAR

(P) arp/obs_preproc/defrun.F90 is set up

USE YOMSCC : RMIND_RADAR, RFIND_RADAR

RMIND_RADAR = 0.075_JPRB*RA/RDEGREES ! AROME

RFIND_RADAR = 0.150_JPRB*RA/RDEGREES ! AROME

IOBTYP=13

29-HUM

192-RFCL

195-DOW

(O) assim/rundir/131/00/scrNODE.001_01.00

SCREENING STATISTICS

STATUS SUMMARY OF REPORTS OB.TYP=13:

CC	REPORTS	ACTIVE	PASSIVE	REJECTED	BLACKLISTED
HU	16045	630	873	15415	0
CR	3799	98	0	3701	0
SI	4861	226	75	4635	0
SK					
CZ					
RC LACE					

STATUS SUMMARY OF DATA OB.TYP=13:

CC	REPORTS	ACTIVE	PASSIVE	REJECTED	BLACKLISTED
HU	58048	1992	0	56056	0
HR	61616	321	0	61295	0
SI	51281	851	0	50430	0
SK					
CZ					
RC LACE					

EVENT SUMMARY OF REPORTS:

cc	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HU	3371								12371						
HR	3213								488						
SI	3087								1576						
SK															
CZ															
RC LACE															

- 1=NO DATA IN THE REPORT
- 2=ALL DATA REJECTED
- 3=BAD REPORTING PRACTICE
- 4=REJECTED DUE TO RDB FLAG
- 5=ACTIVATED DUE TO RDB FLAG
- 6=ACTIVATED BY WHITELIST
- 7=HORIZONTAL POSITION OUT OF RANGE
- 8=VERTICAL POSITION OUT OF RANGE
- 9=TIME OUT OF RANGE
- 10=REDUNDANT REPORT
- 11=REPORT OVER LAND
- 12=REPORT OVER SEA
- 13=MISSING STATION ALTITUDE
- 14=MODEL SUR. TOO FAR FROM STAT. ALT.
- 15=REPORT REJECTED THROUGH THE NAMELIST
- 16=FAILED QUALITY CONTROL

EVENT SUMMARY OF DATA:

cc	2	3	10	26
HU	11854	12055	14595	21956
HR	29898	30574	26104	1499
SI	22126	22163	19360	4870
SK				
CZ				
RC LACE				

- 1=MISSING VERTICAL COORDINATE
- 2=MISSING OBSERVED VALUE
- 3=MISSING FIRST GUESS VALUE
- 4=REJECTED DUE TO RDB FLAG
- 5=ACTIVATED DUE TO RDB FLAG
- 6=ACTIVATED BY WHITELIST
- 7=BAD REPORTING PRACTICE
- 8=VERTICAL POSITION OUT OF RANGE
- 9=REFERENCE LEVEL POSITION OUT OF RANGE
- 10=TOO BIG FIRST GUESS DEPARTURE
- 11=TOO BIG DEPARTURE IN ASSIMILATION
- 12=TOO BIG OBSERVATION ERROR
- 13=REDUNDANT DATUM
- 14=REDUNDANT LEVEL
- 15=REPORT OVER LAND
- 16=REPORT OVER SEA
- 17=NOT AN ANALYSIS VARIABLE
- 18=DUPLICATED DATUM/LEVEL
- 19=TOO MANY SURFACE DATA/LEVELS
- 20=MULTI LEVEL CHECK
- 21=LEVEL SELECTION
- 22=VERTICAL CONSISTENCY CHECK
- 23=VERTICAL COORDINATE CHANGED FROM Z TO P
- 24=DATUM REJECTED THROUGH THE NAMELIST
- 25=COMBINED FLAGGING
- 26=DATUM REJECTED DUE TO REJECTED REPORT
- 27=VARIATIONAL QC PERFORMED
- 28=OBS ERR INCREASED
- 29=CLOUD CONTAMINATION
- 30=RAIN CONTAMINATION

NUMBER OF VARIABLES IN DIFFERENT OBSERVATION TYPES OB.TYP =13:

cc	29	192	195
HU	17630	17630	22788
HR	29898	29898	1820
SI	22824	22824	5633
SK			
CZ			
RC LACE			

NUMBER OF DEPARTURES IN DIFFERENT OBSERVATION TYPES:

cc	29	192	195
HU	5776	17527	22690
HR	0	29222	1820
SI	698	22793	5627
SK			
CZ			
RC LACE			

NUMBER OF MISSING DEPARTURES IN DIFFERENT OBSERVATION TYPES:

cc	29	192	195
HU	11854	103	98
HR	29898	676	0
SI	22126	31	6
SK			
CZ			
RC LACE			

Diagnostic JO-table (JOT) Obstype 13 === RADAR, meteorological radar

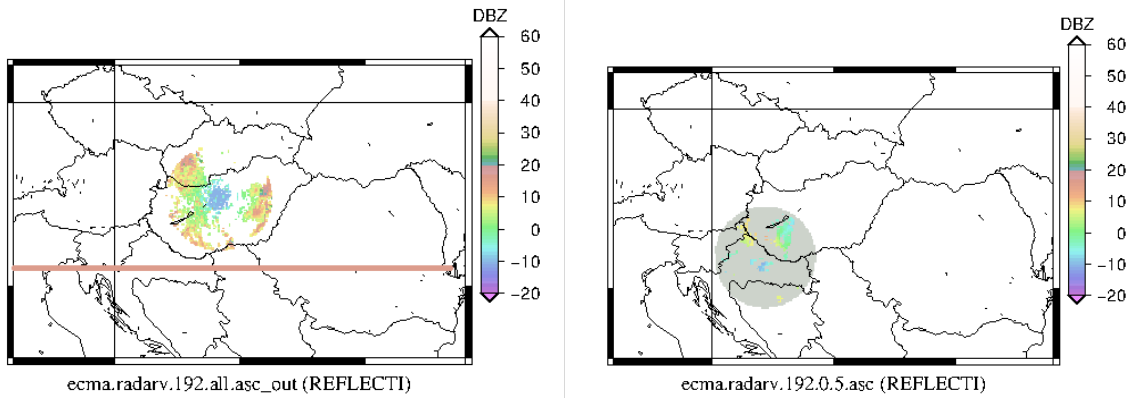
RFL

cc	DataCount	Jo_Costfunction	JO/n	ObsErr	BgErr
HU	17527	18638797.62856	1063.43	0.150E+01	0.000E+00
HR	29222	35551697.94012	1216.61	0.150E+01	0.000E+00
SI	22793	21585419.47752	947.02	0.150E+01	0.000E+00
SK					
CZ					
RC LACE					

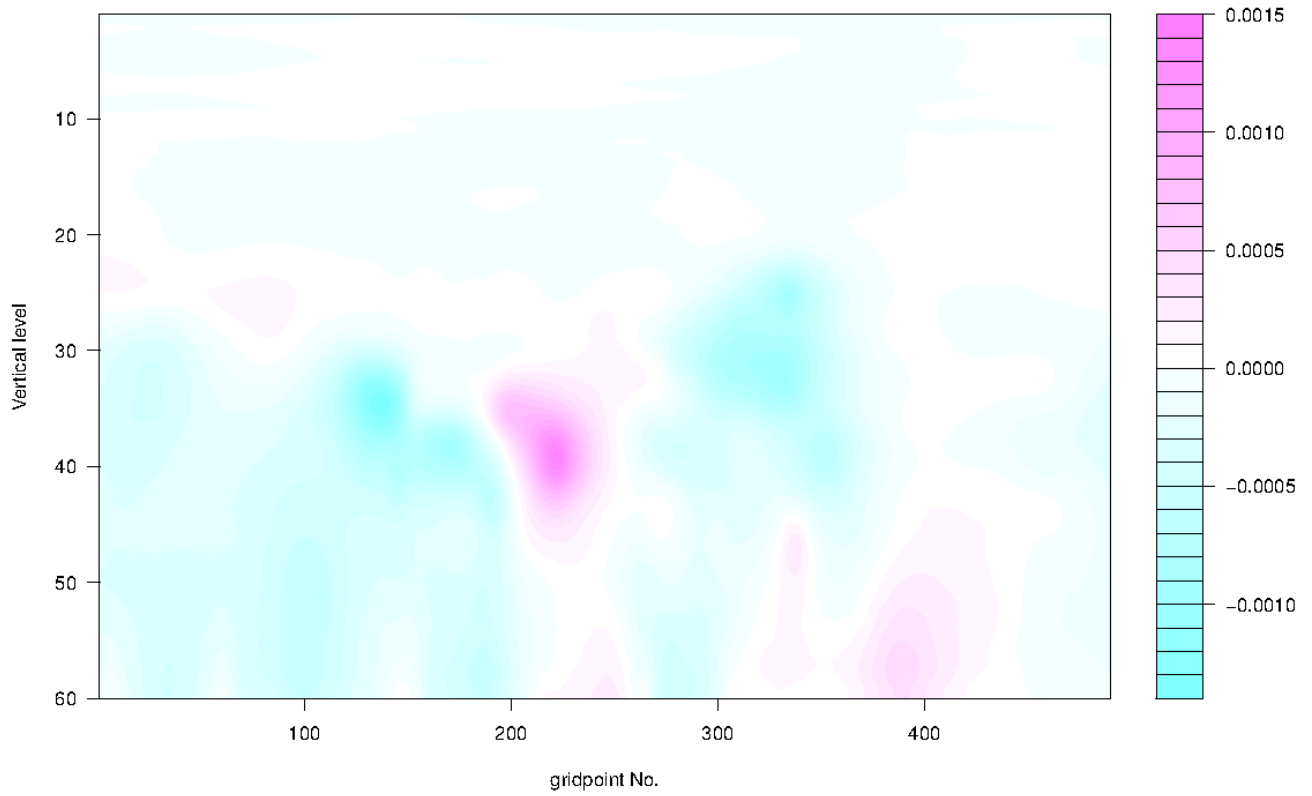
DOW

cc	DataCount	Jo_Costfunction	JO/n	ObsErr	BgErr
HU	22690	135682.0729648	5.98	0.157E+01	0.000E+00
HR	1820	4212.486658205	2.31	0.157E+01	0.000E+00
SI	5627	47194.84865402	8.39	0.155E+01	0.000E+00
SK					
CZ					
RC LACE					

Cross section of Specific Humidity difference between Hungarian radars (POS2) and Croatian radars (POS2)



HUMI.SPECIFI vertical cross-section at Y=240



1) Daniel B. Michelson, Rafał Lewandowski, Maciej Szewczykowski and Hans Beekhuis - EUMETNET OPERA weather radar information model for implementation with the HDF5 file format (http://www.knmi.nl/opera/opera3/OPERA_2008_03_WP2.1b_ODIM_H5_v2.1.pdf)

2) http://srnwp.met.hu/Annual_Meetings/2011/download/monday/posters/EWGLAM_poster.pdf

3) http://mine.nowcasting.eu/arome/exp_info.php

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