Data Assimilation Status in Romania

RC - LACE
Data Assimilation Working Days

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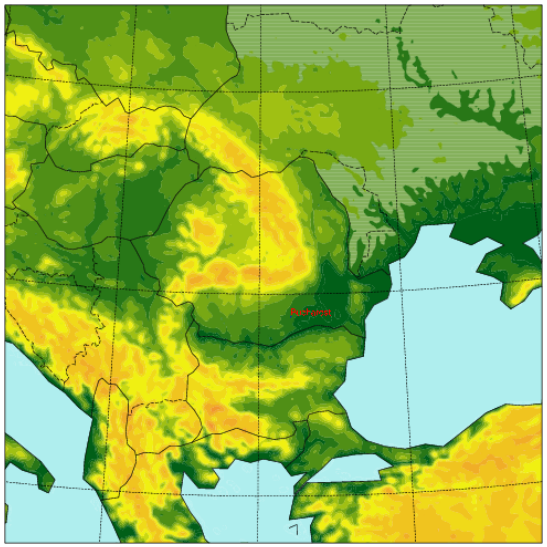
National Meteorological Administration

Assimilation setup



- Δx=6.5 km
- 240 x 240 grid points
- 49 vertical levels
- linear grid
- Lambert projection

- 6 hours assimilation cycle
- CI + LBC $\leftarrow$ ARPEGE model at every 3 hours
- $B_{matrix} \rightarrow$ computed using Ensemble method (march - august 2009)
- SST $\rightarrow$ from ARPEGE analysis
- CANARI $\rightarrow$ surface analysis based on SYNOP
- 3DVAR $\rightarrow$ data from OPLACE + local data
- cycle36t1-op2

METEO ROMANIA

MAY 2014

Observation:

- conventional data (including surface local data)
- satellite data: ATOVS/AMSU-A, ATOVS/AMSU-B (radiances from NOAA 16, 18), METEOSAT-9/SEVIRI radiances, AMDAR (T,u,v), GEOWIND from OPLACE system

Verification

MODE - **M**ethod for **O**bject - based **D**iagnostic **E**valuation

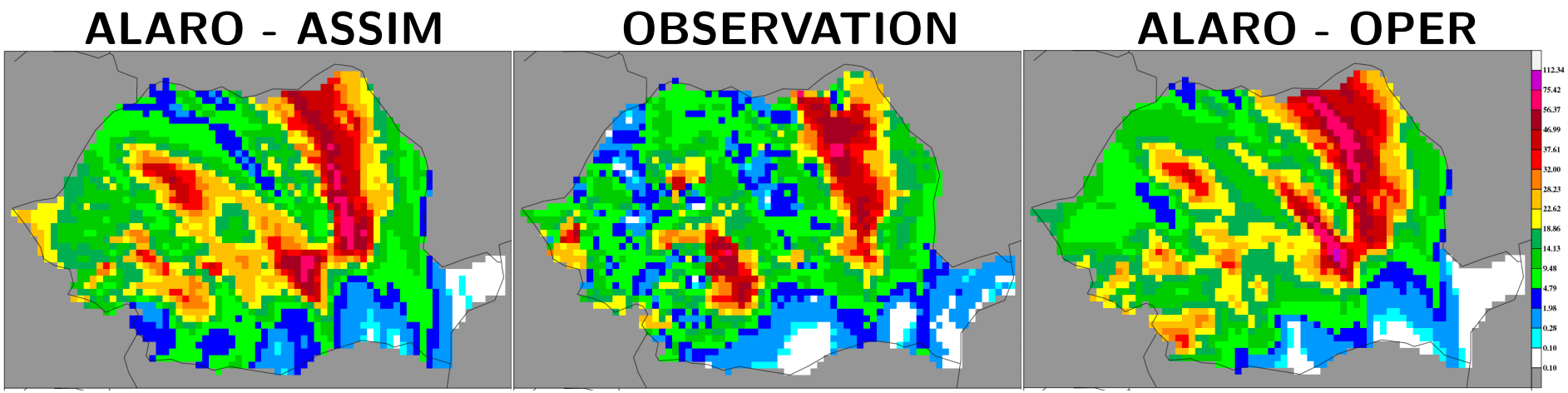
- provides diagnostic verification that is difficult to obtain using traditional verification measures: information about errors in location, size and intensity
- defines objects in both the forecast and observation fields (which are matched and compared to one another)
- summary statistics describing the objects and object pairs are produced; this statistics can be used to identify correlation and differences among objects $\rightarrow$ forecast strengths and weaknesses

Verification

- in what locations does the model have the best performance?
- what are the regimes in which the forecasts are better or worse?

Case Study: 15 May 2014

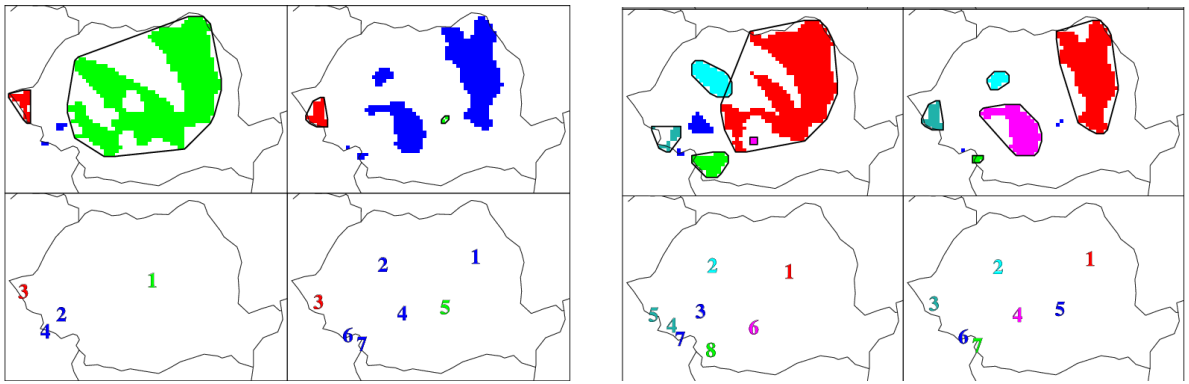
12 hours cumulated precipitation (06 - 18 UTC)



METEO ROMANIA

Threshold $> 20\ l/m^2$

ASSIM OBS OPER OBS



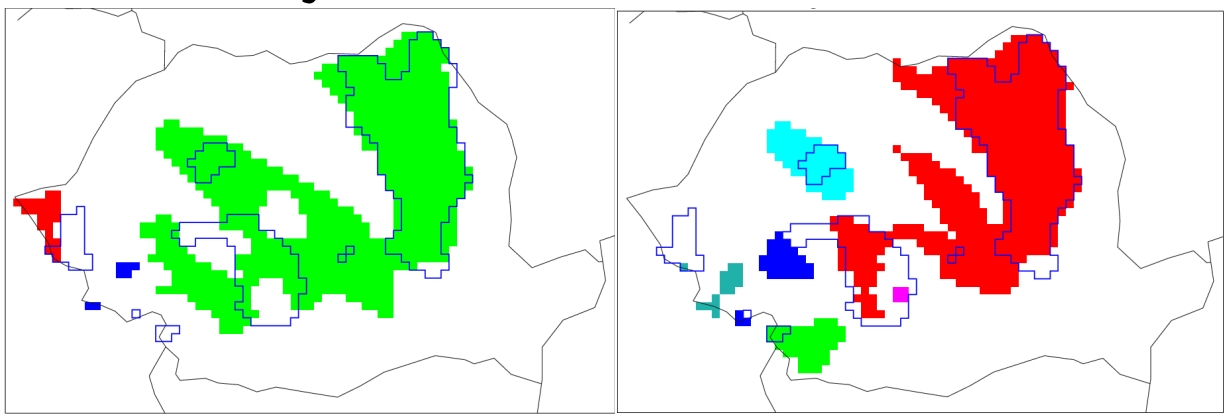
Total interest value computed for a pair of simple objects:

Fcst	Obs	Interest
3	3	0.9101
1	5	0.8668
4	6	0.6531
2	6	0.5743
2	3	0.5683

Fcst	Obs	Interest
1	1	0.9470
8	7	0.8879
2	2	0.8865
5	3	0.8655
6	4	0.8650
4	3	0.7047
7	7	0.6919
7	6	0.6630
4	6	0.5598

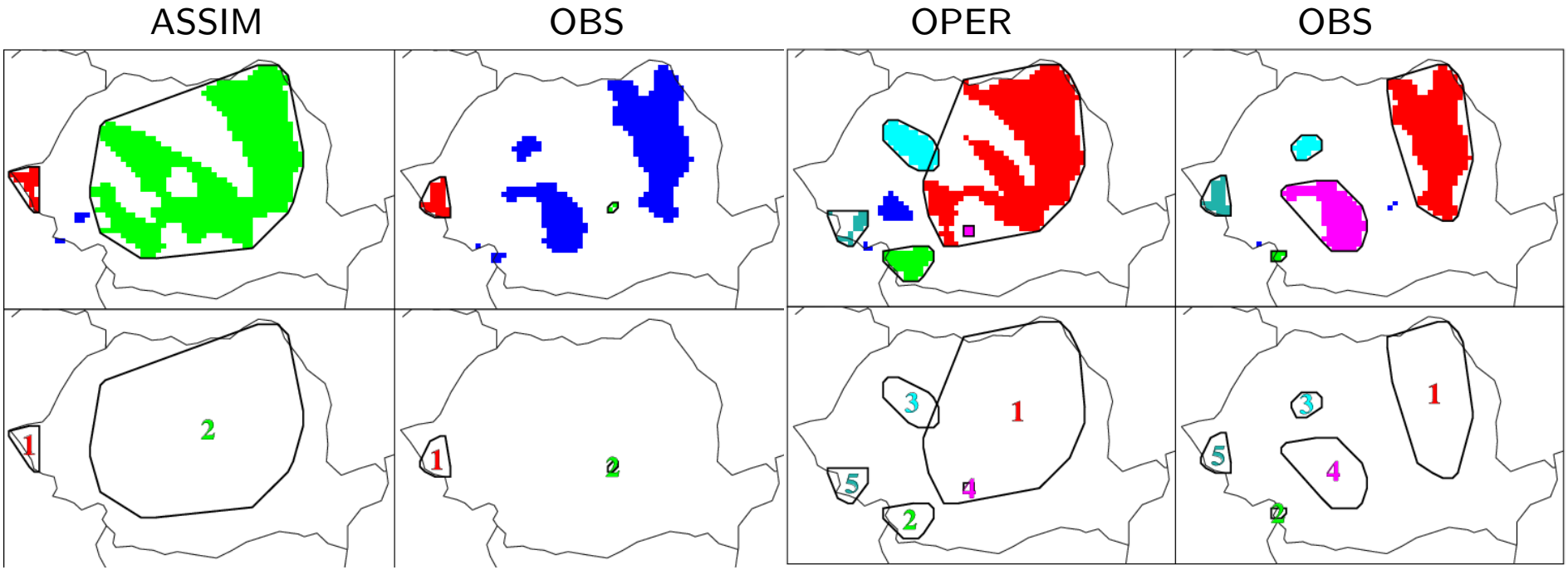
ASSIM OPER

Forecast Objects with Observation Outlines



ASSIM OPER

Cluster Object Information

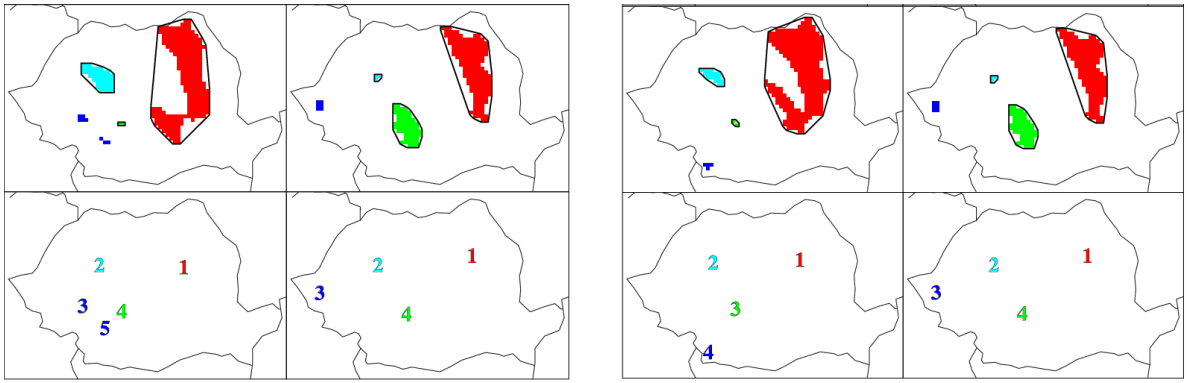


CLUS PAIR	CEN DIST	ANG DIFF	FCST AREA	OBS AREA	INTER AREA	UNION AREA	SYMM DIFF	FCST INT 50	OBS INT 50	FCST INT 90	OBS INT 90	TOT INTR
1	4.45	21.70	24	26	3	47	44	21.80	25.75	23.94	40.50	0.9101
2	7.92	14.64	711	2	2	711	709	28.32	24.35	48.29	24.55	0.8668

CLUS PAIR	CEN DIST	ANG DIFF	FCST AREA	OBS AREA	INTER AREA	UNION AREA	SYMM DIFF	FCST INT 50	OBS INT 50	FCST INT 90	OBS INT 90	TOT INTR
1	6.60	41.83	526	277	266	537	271	31.95	32.70	53.55	50.14	0.9470
2	4.10	12.70	44	5	5	44	39	25.05	23.40	30.97	25.16	0.8879
3	1.41	67.77	63	19	19	63	44	26.14	26.20	35.47	40.34	0.8865
4	5.83	45.15	4	111	4	111	107	22.23	31.70	22.91	50.90	0.8650
5	7.06	50.51	16	26	1	41	40	23.70	25.75	26.71	40.50	0.7990

Threshold $> 30\ l/m^2$

ASSIM OBS OPER OBS



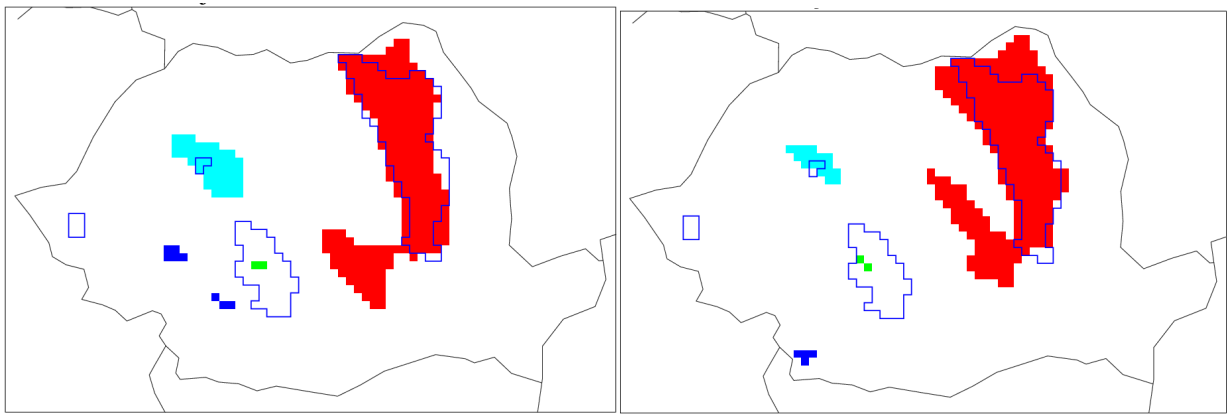
Total interest value computed for a pair of simple objects:

Fcst	Obs	Interest
1	1	0.9807
4	4	0.8286
2	2	0.8248
5	4	0.5813

Fcst	Obs	Interest
1	1	0.9649
3	4	0.8753
2	2	0.8481

ASSIM OPER

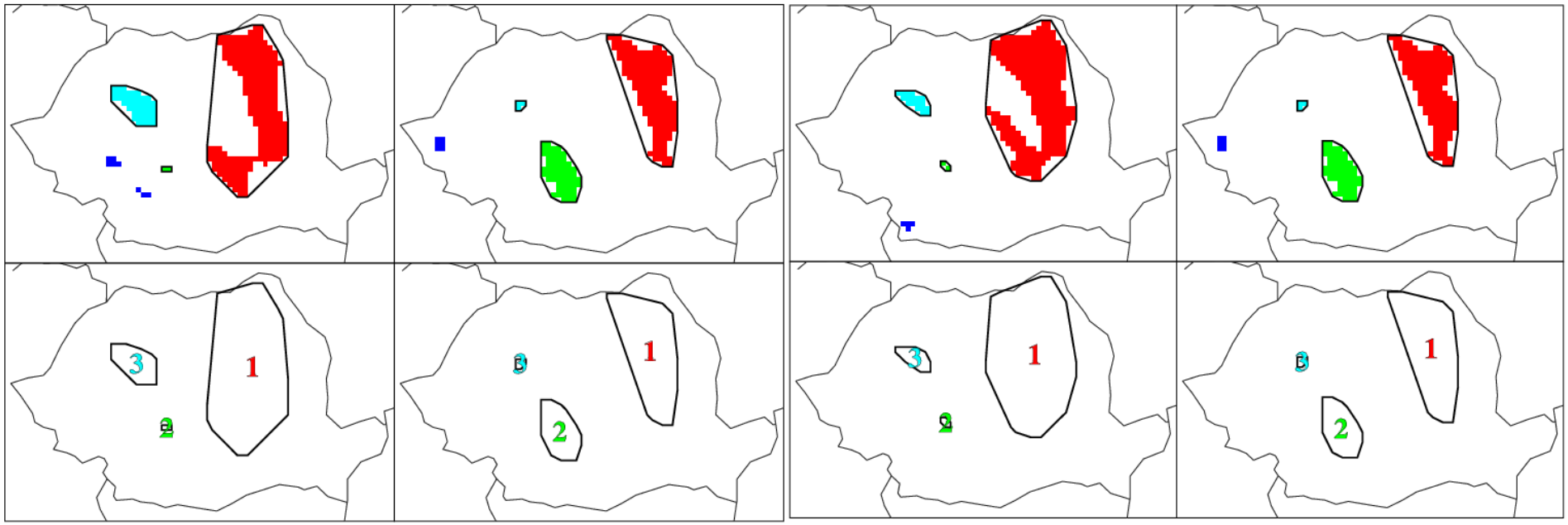
Forecast Objects with Observation Outlines



ASSIM OPER

Cluster Object Information

ASSIM OBS OPER OBS



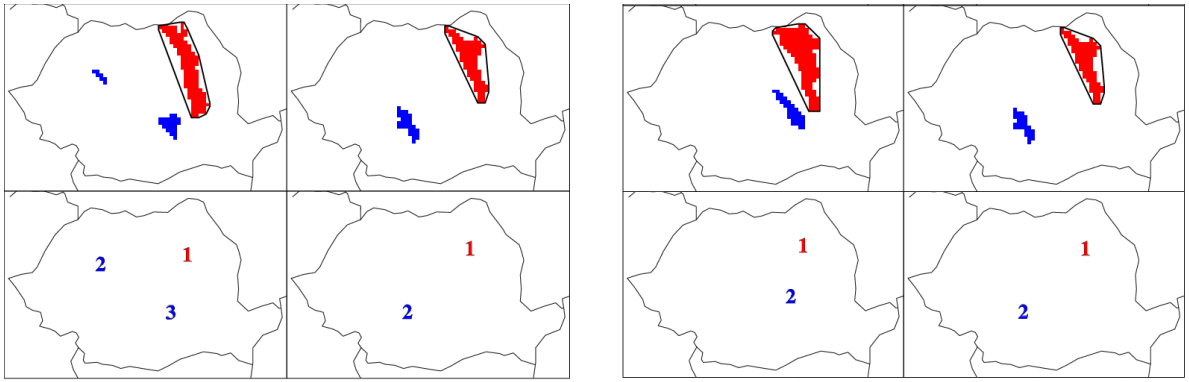
CLUS PAIR	CEN DIST	ANG DIFF	FCST AREA	OBS AREA	INTER AREA	UNION AREA	SYMM DIFF	FCST INT 50	OBS INT 50	FCST INT 90	OBS INT 90	TOT INTR
1	3.58	20.55	245	162	148	259	111	41.76	41.45	55.92	52.00	0.9807
2	1.00	65.57	2	58	2	58	56	38.32	42.00	41.16	52.06	0.8286
3	1.08	83.52	44	3	3	44	41	36.14	40.00	42.17	41.36	0.8248

CLUS PAIR	CEN DIST	ANG DIFF	FCST AREA	OBS AREA	INTER AREA	UNION AREA	SYMM DIFF	FCST INT 50	OBS INT 50	FCST INT 90	OBS INT 90	TOT INTR
1	2.27	16.61	292	162	155	299	144	42.45	41.45	59.53	52.00	0.9649
2	2.09	20.57	2	58	2	58	56	33.55	42.00	36.77	52.06	0.8753
3	0.68	77.79	18	3	2	19	17	34.70	40.00	39.85	41.36	0.8481

METEO ROMANIA

Threshold $>$ 40 l/m^2

ASSIM OBS OPER OBS

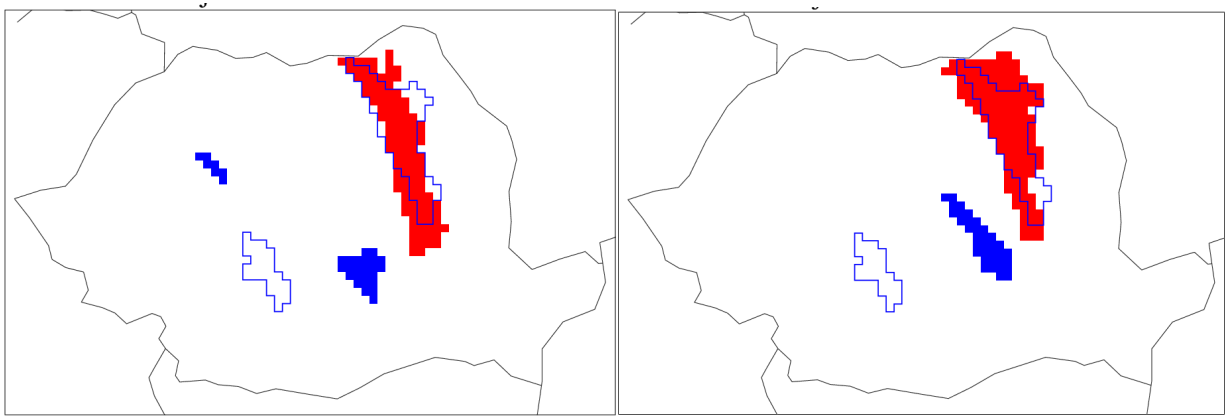


Total interest value computed for a pair of simple objects:

Fcst	Obs	Interest	Fcst	Obs	Interest
1	1	0.9938	1	1	0.9759

ASSIM OPER

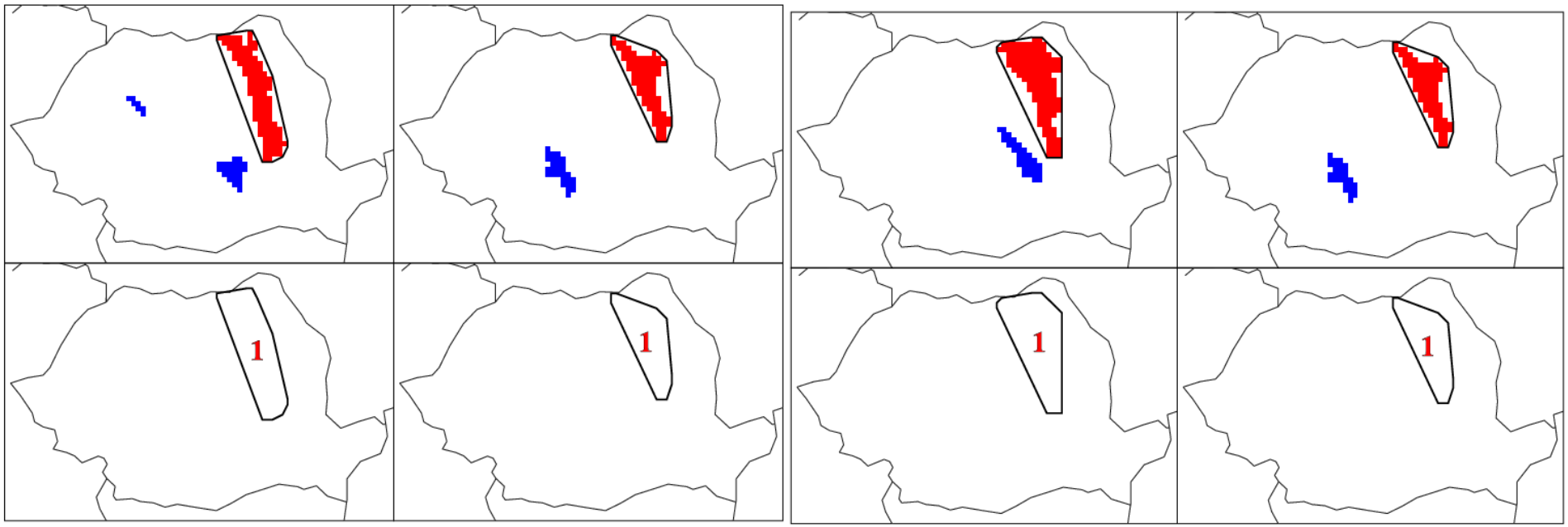
Forecast Objects with Observation Outlines



ASSIM OPER

Cluster Object Information

ASSIM OBS OPER OBS



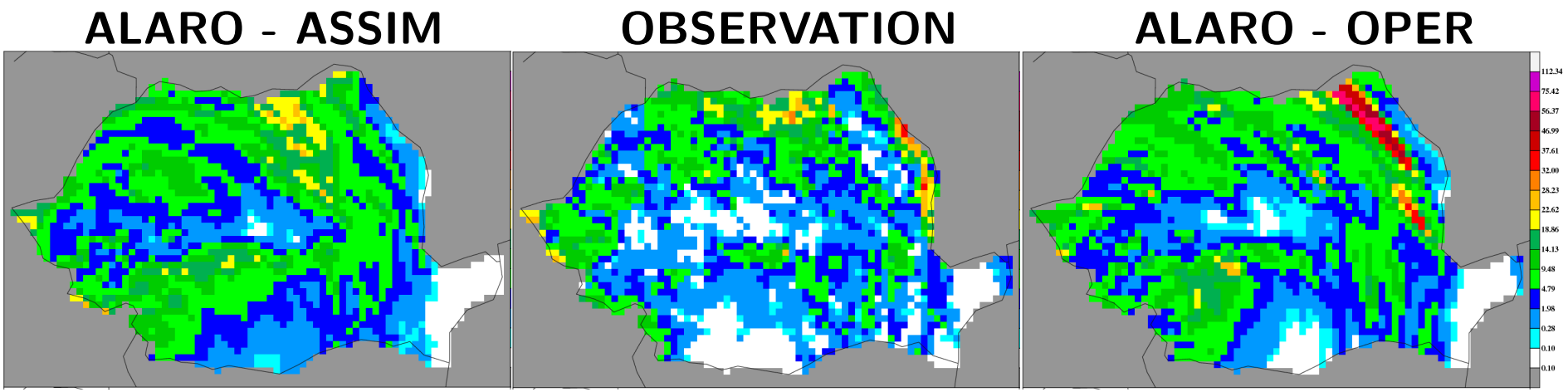
CLUS PAIR	CEN DIST	ANG DIFF	FCST AREA	OBS AREA	INTER AREA	UNION AREA	SYMM DIFF	FCST INT 50	OBS INT 50	FCST INT 90	OBS INT 90	TOT INTR
1	1.73	4.57	114	86	69	131	62	47.56	47.05	58.45	54.85	0.9938

CLUS PAIR	CEN DIST	ANG DIFF	FCST AREA	OBS AREA	INTER AREA	UNION AREA	SYMM DIFF	FCST INT 50	OBS INT 50	FCST INT 90	OBS INT 90	TOT INTR
1	0.97	4.79	137	86	77	146	69	47.95	47.05	59.76	54.85	0.9759

METEO ROMANIA

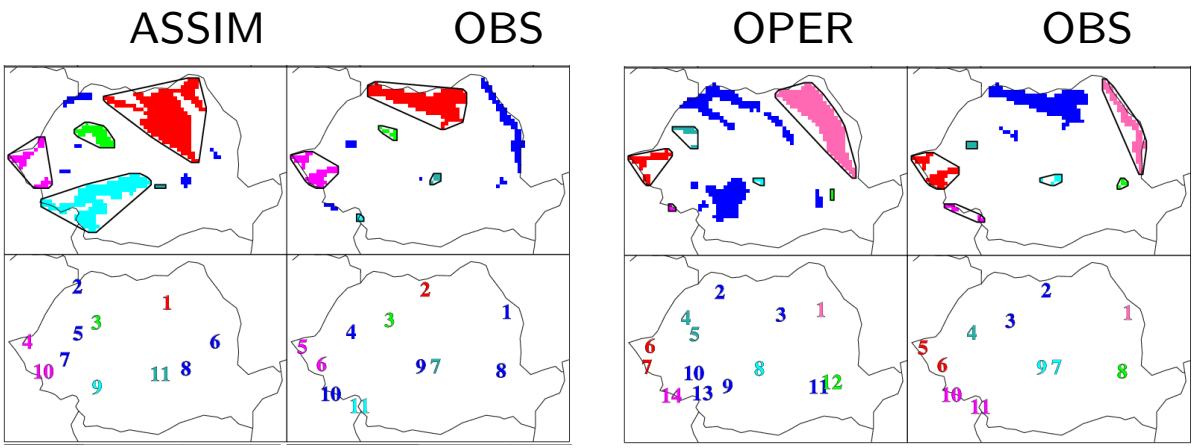
Case Study: 15 May 2014

12 hours cumulated precipitation (18 - 30 UTC)



METEO ROMANIA

Threshold $> 10\ //m^2$

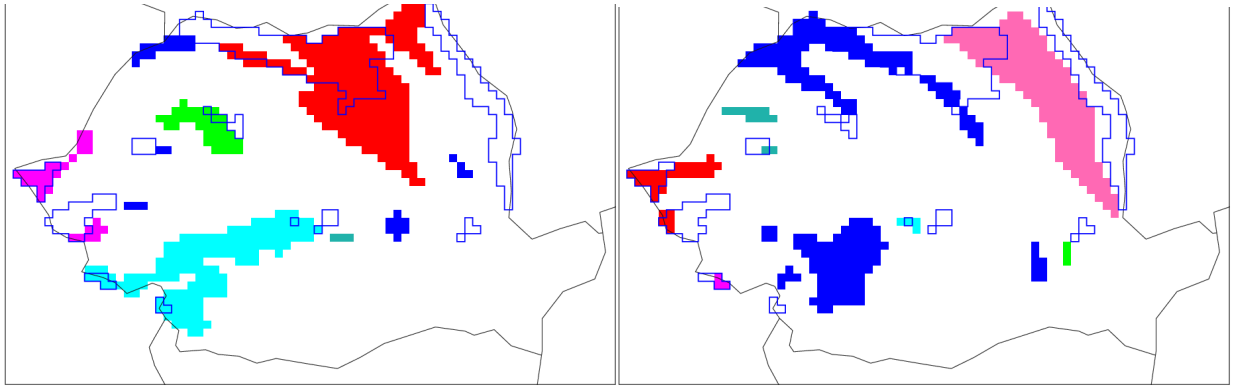


Total interest value computed for a pair of simple objects:

Fcst	Obs	Interest	Fcst	Obs	Interest
1	2	0.9663	14	10	0.9712
4	5	0.9658	6	5	0.9590
10	6	0.9247	5	4	0.9289
3	3	0.9066	8	9	0.9083
9	11	0.8305	7	6	0.8537
4	6	0.7682	6	6	0.7760
11	7	0.7159	12	8	0.7569
10	10	0.6936	8	7	0.7395
5	4	0.6850	14	11	0.7261
6	8	0.6834	4	4	0.7214
7	4	0.6504	1	1	0.7189
3	4	0.6272	13	11	0.6885
7	6	0.6248	11	8	0.6540
11	9	0.6087	7	5	0.6337

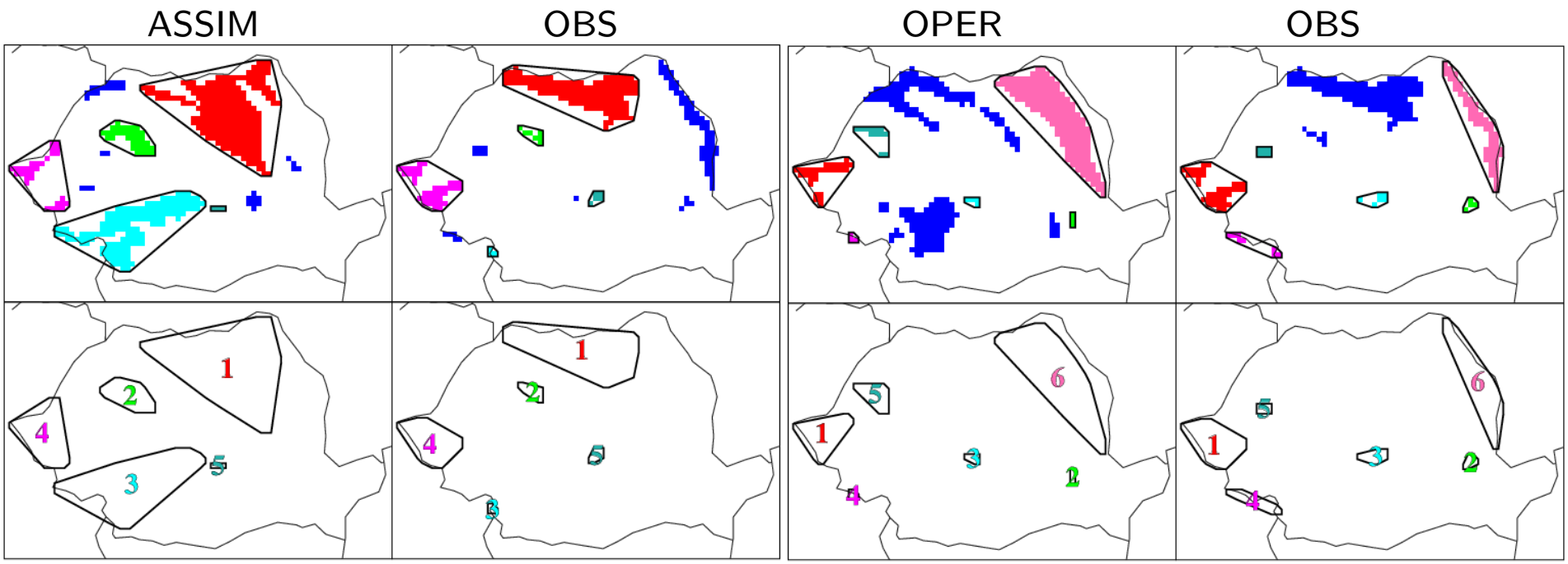
ASSIM OPER

Forecast Objects with Observation Outlines



ASSIM OPER

Cluster Object Information

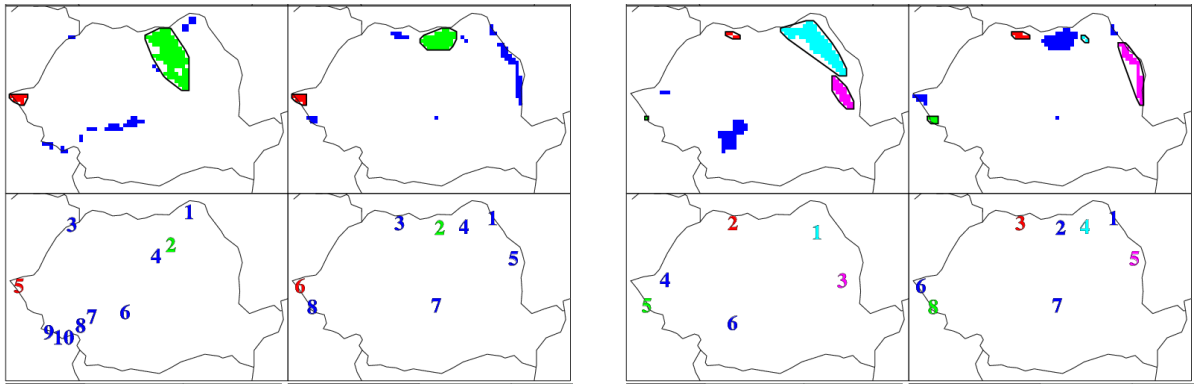


CLUS PAIR	CEN DIST	ANG DIFF	FCST AREA	OBS AREA	INTER AREA	UNION AREA	SYMM DIFF	FCST INT 50	OBS INT 50	FCST INT 90	OBS INT 90	TOT INTR
1	7.55	14.92	228	135	89	274	185	14.86	14.30	20.76	21.17	0.9663
2	2.97	3.95	35	7	3	39	36	11.61	10.90	13.53	17.32	0.9066
3	7.38	66.23	149	3	3	149	146	12.89	11.70	17.94	12.58	0.8305
4	2.12	34.26	31	39	16	54	38	14.09	13.20	19.24	22.04	0.9962
5	2.83	45.00	3	5	0	8	8	14.18	13.40	14.37	21.04	0.7159

CLUS PAIR	CEN DIST	ANG DIFF	FCST AREA	OBS AREA	INTER AREA	UNION AREA	SYMM DIFF	FCST INT 50	OBS INT 50	FCST INT 90	OBS INT 90	TOT INTR
1	2.42	65.17	30	39	15	54	39	13.06	13.20	19.78	22.04	0.9731
2	3.54	45.00	3	4	0	7	7	12.39	10.05	13.19	11.70	0.7569
3	2.89	25.98	4	6	1	9	8	11.46	12.35	12.23	20.50	0.9813
4	2.56	22.70	3	8	3	8	5	13.71	13.10	13.99	15.57	0.9362
5	3.05	42.71	12	6	1	17	16	15.83	12.05	18.65	14.40	0.8779
6	6.48	11.96	168	60	1	227	226	16.32	18.75	48.10	28.27	0.7189

Threshold $> 15\ l/m^2$

ASSIM OBS OPER OBS

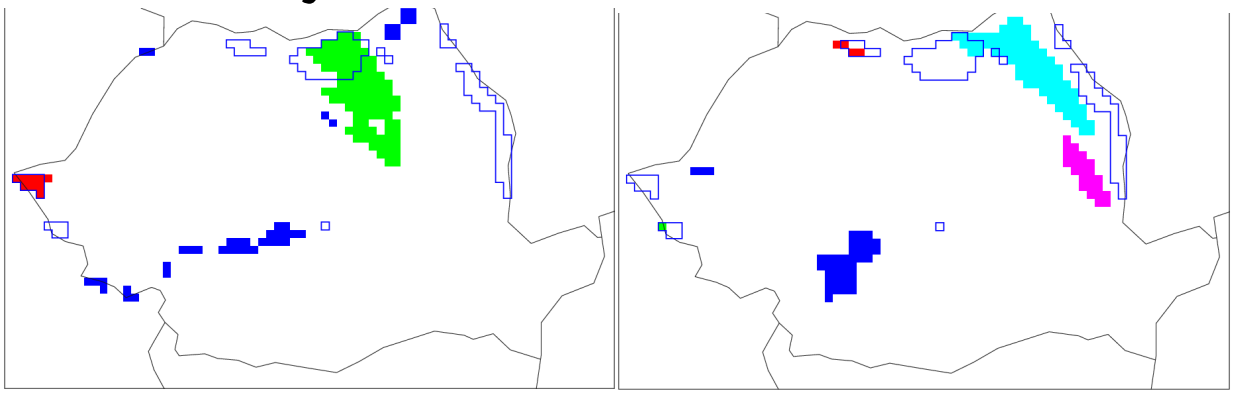


Total interest value computed for a pair of simple objects:

Fcst	Obs	Interest	Fcst	Obs	Interest
5	6	1.0000	2	3	0.9676
2	2	0.8895	5	8	0.8986
5	8	0.6943	1	4	0.8745
1	1	0.6514	3	5	0.7653
2	4	0.6122	4	6	0.6469
1	4	0.5806	1	1	0.6027
4	2	0.5302	5	6	0.5664

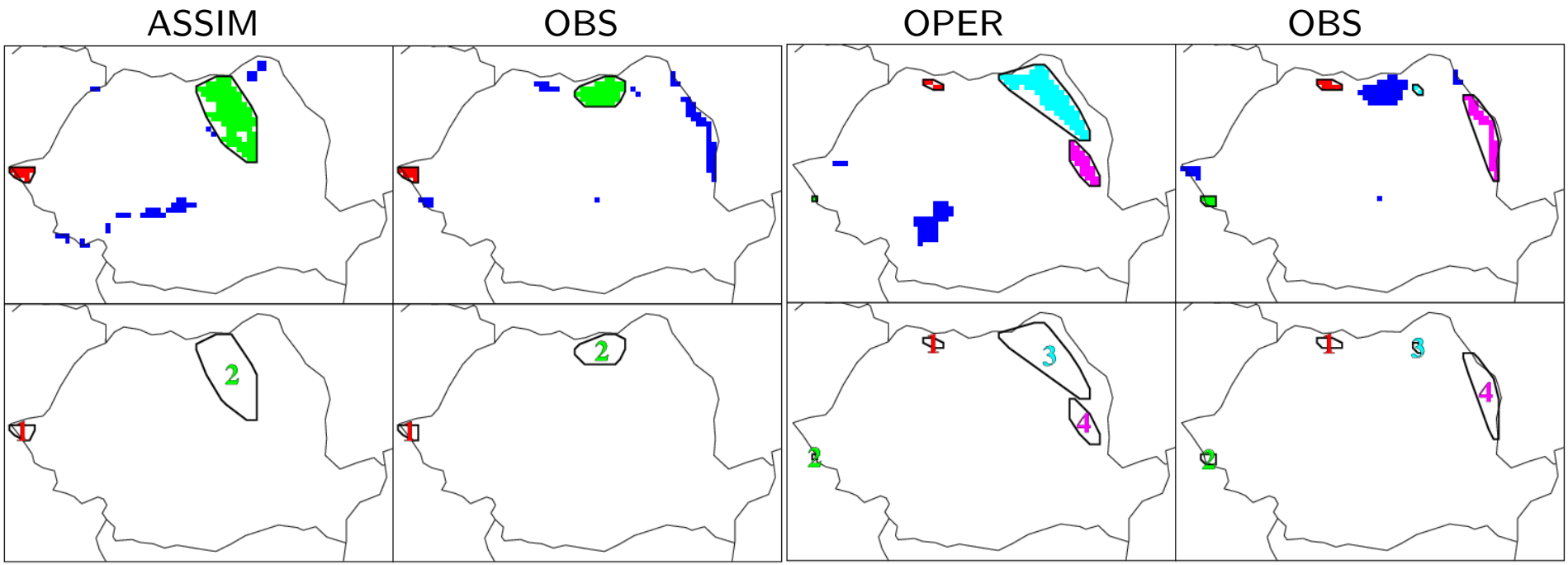
ASSIM OPER

Forecast Objects with Observation Outlines



ASSIM OPER

Cluster Object Information



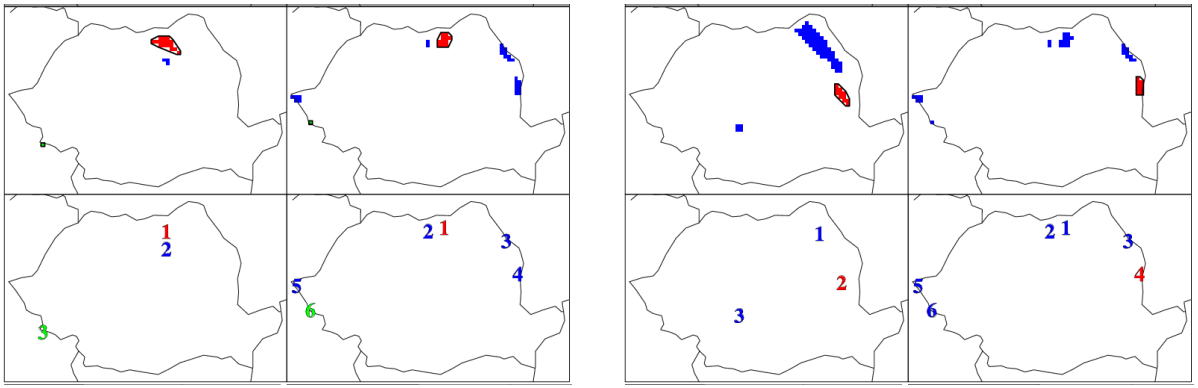
CLUS PAIR	CEN DIST	ANG DIFF	FCST AREA	OBS AREA	INTER AREA	UNION AREA	SYMM DIFF	FCST INT 50	OBS INT 50	FCST INT 90	OBS INT 90	TOT INTR
1	0.31	15.12	9	8	8	9	1	18.09	20.05	20.40	23.73	1.0000
2	5.94	74.68	99	40	28	111	83	18.67	19.00	22.16	24.70	0.8895

CLUS PAIR	CEN DIST	ANG DIFF	FCST AREA	OBS AREA	INTER AREA	UNION AREA	SYMM DIFF	FCST INT 50	OBS INT 50	FCST INT 90	OBS INT 90	TOT INTR
1	1.40	7.94	4	7	3	8	5	17.40	20.00	18.72	21.62	0.9676
2	1.21	15.07	1	5	1	5	4	24.72	20.30	24.72	24.94	0.8986
3	4.27	5.25	80	2	1	81	80	30.71	20.40	58.50	22.88	0.8745
4	6.57	12.23	24	32	0	56	56	22.37	24.90	33.43	30.66	0.7653

METEO ROMANIA

Threshold $> 20\ l/m^2$

ASSIM OBS OPER OBS



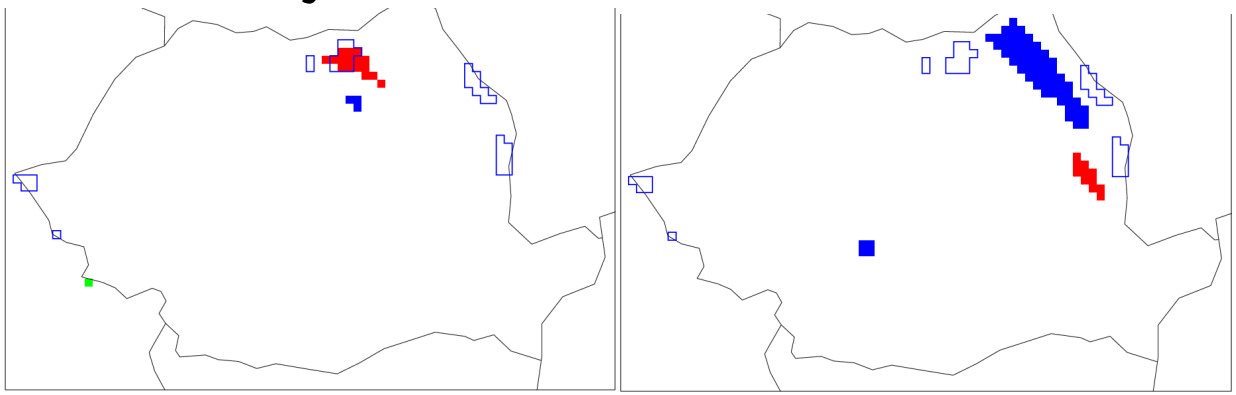
Total interest value computed for a pair of simple objects:

Fcst	Obs	Interest
1	1	0.9380
3	6	0.7080
2	2	0.6798
2	1	0.5880
1	2	0.5804

Fcst	Obs	Interest
2	4	0.7700
1	3	0.6376

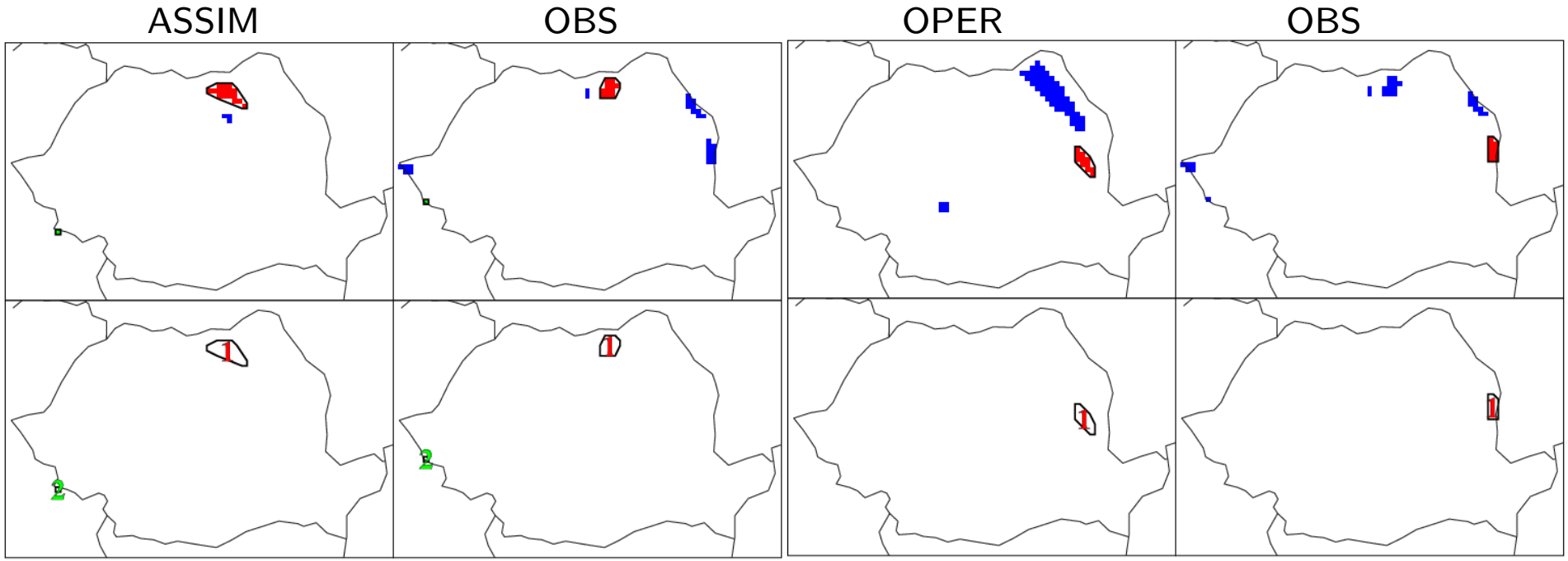
ASSIM OPER

Forecast Objects with Observation Outlines



ASSIM OPER

Cluster Object Information



CLUS PAIR	CEN DIST	ANG DIFF	FCST AREA	OBS AREA	INTER AREA	UNION AREA	SYMM DIFF	FCST INT 50	OBS INT 50	FCST INT 90	OBS INT 90	TOT INTR
1	1.63	81.13	16	11	8	19	11	20.83	24.10	25.02	30.20	0.9380
2	7.21	0.00	1	1	0	2	2	20.90	26.90	20.90	26.90	0.7080

CLUS PAIR	CEN DIST	ANG DIFF	FCST AREA	OBS AREA	INTER AREA	UNION AREA	SYMM DIFF	FCST INT 50	OBS INT 50	FCST INT 90	OBS INT 90	TOT INTR
1	4.67	28.73	11	9	0	20	20	30.64	27.20	36.01	30.70	0.7700

Conclusions

- as a general conclusion, the assim model shows a slight improvement comparing with oper model;
- for the first 12 hours, both models overestimated the amount of precipitation on the mountains (especially on the Curvature Carpathians); also the impact of assim model is quite visible in the western part of the country (the precipitation amount is increased with the respect to observation);
- for the next 12 hours, in the eastern part, both models failed to simulate correctly the forecasted area of precipitation in respect with the observed one; for assim model the precipitation amount is slightly reduced on the mountains.

Future plans

- computation of B_{matrix} on the new domain ($\Delta x = 5$km, L60)
- pre-operational data assimilation cycle on the new domain

Thank you!