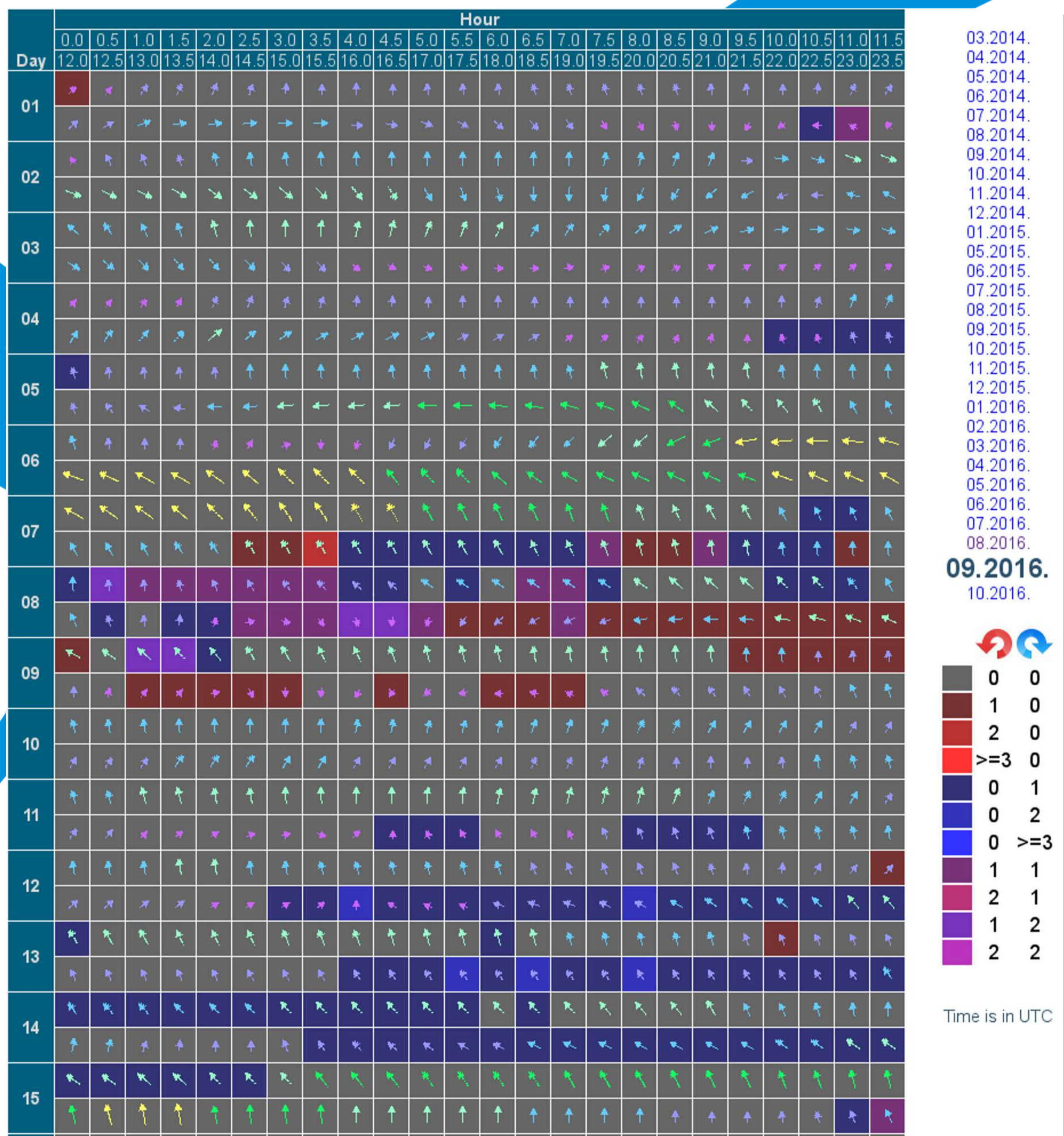# Database based Operational Eddy Detection in High-Frequency Radar Surface Velocities

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In the frame of project HAZADR (Strengthening common reaction capacity to fight sea pollution of oil, toxic and hazardous substances in Adriatic Sea) two high frequency radars are installed. Radars measure surface currents, wave height and direction every half hour. Measurements are shown on project web page (http://jadran.izor.hr/hazadr/).
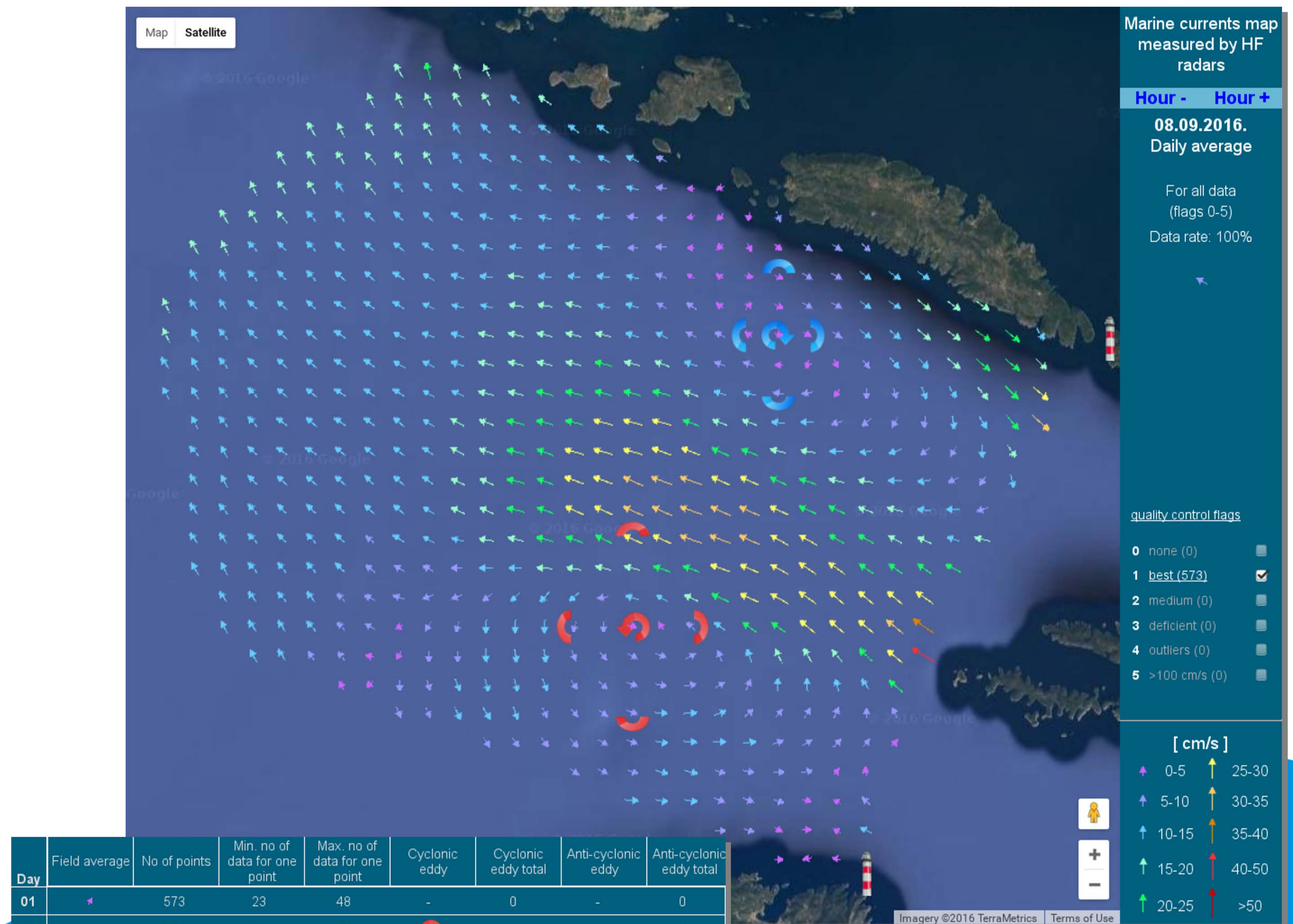
Eddy Detection

For data storage we use Oracle database 11.2 with Locator. Inside database are created procedures for eddy detection. Principle of detection is detection of changed directions in spatial fields of vectors. Procedure identifies eddy centre and provisional eddy borders onto only four main directions (north, east, south, west). For eddy detection field of daily averages is used. Also 6 hours average field can be used. Procedure is automatically executed after data insertion and averages calculation with crontab server mechanism. Detected eddies are also shown (number and type: cyclonic and anticyclonic) onto tables with averages.

Detected eddies onto daily averaged field

Time axis of 6hrs averages with eddies

Conclusion

Operational eddy detection can help us to improve our understanding of surface currents and improve surface currents predictions.

Day	Field average	No of points	Min. no of data for one point	Max. no of data for one point	Cyclonic eddy	Cyclonic eddy total	Anti-cyclonic eddy	Anti-cyclonic eddy total
01		573	23	48	0	-	0
02		573	21	48	🌀	1	-	0
03		573	21	48	0	-	0
04		573	20	47	0	-	0
05		573	23	48	0	-	0
06		573	6	48	0	-	0
07		573	18	48	0	-	0
08		573	25	48	🌀	1	🌀	1
09		573	22	48	0	-	0
10		573	23	48	0	-	0
11		573	23	48	0	-	0
12		573	12	48	0	🌀	1
13		573	17	47	0	🌀	1
14		573	16	47	0	🌀	1
15		573	24	48	0	-	0
16		573	3	48	0	-	0
17		573	19	48	0	🌀	1
18		573	7	48	0	🌀	1
19		573	13	47	0	🌀	1
20		573	14	48	0	🌀	1
21		573	5	48	0	-	0
22		573	10	47	0	-	0
23		573	10	47	0	-	0

Time axis of daily averages with eddies

Visualisation Using Geoserver with database driven dynamic layers

Future improvements and development

Procedure for eddy detection can be improved mainly to decrease false detected eddies. In smaller number of cases eddies are not detected. For detection improvement temporal sequence of detected eddies can be used (if for example eddies is detected in two 6h averages in the row, then one don't have eddies, and next have, probably in that one without eddies exist but it is not detected). Execution speed of procedure is very short, so procedure can be executed with every data input (every half hours). Operational detection is onto daily averages and also onto 6 hour averages.
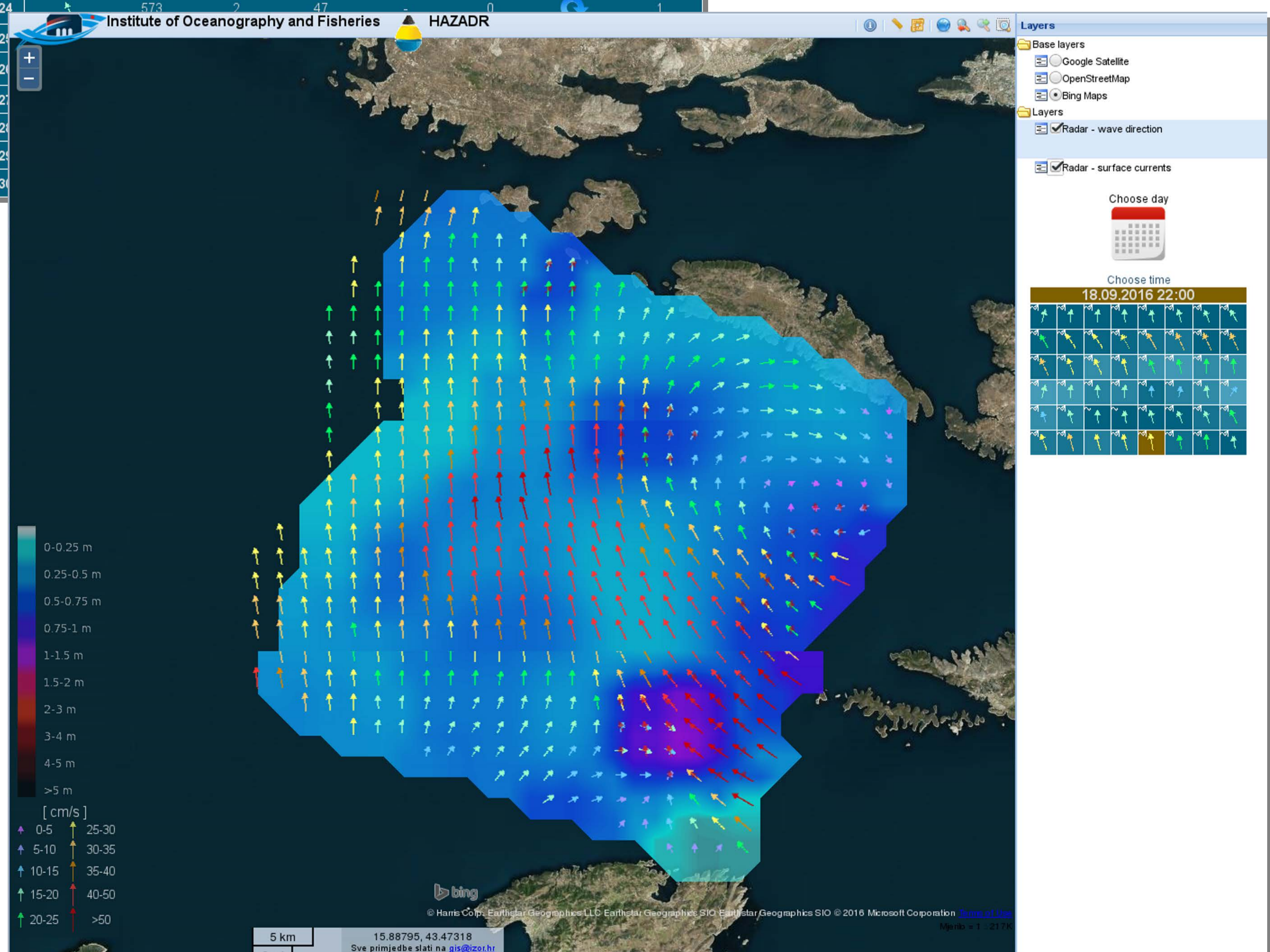
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