SeaDataNet

PAN-EUROPEAN INFRASTRUCTURE FOR OCEAN & MARINE DATA MANAGEMENT

Black Sea Climatology

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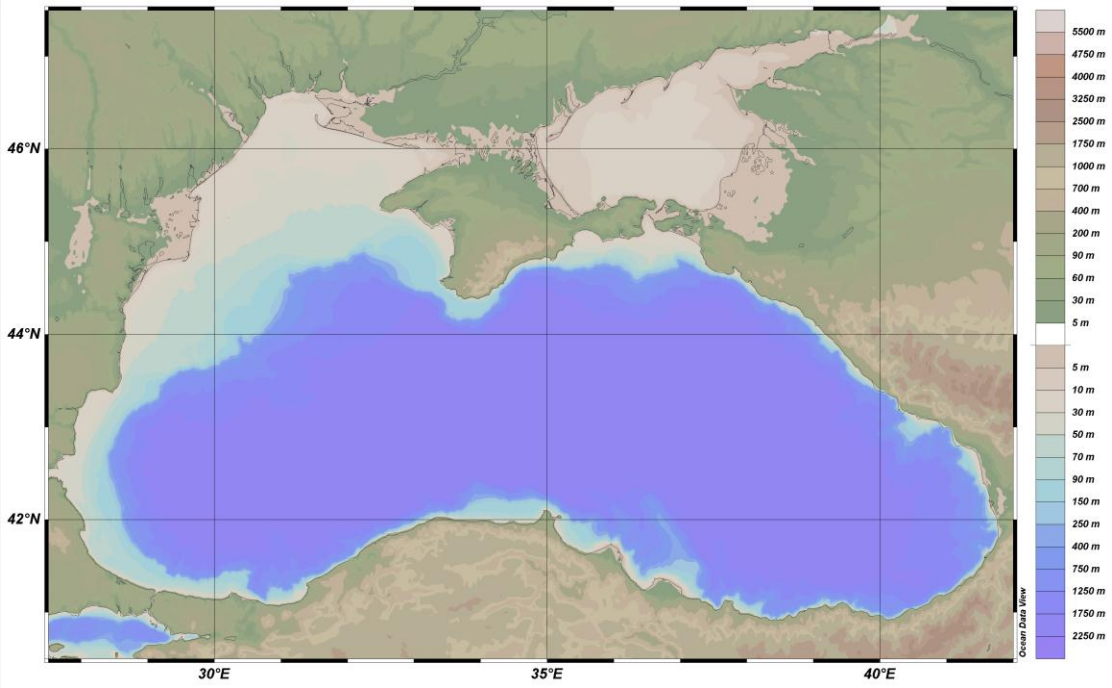
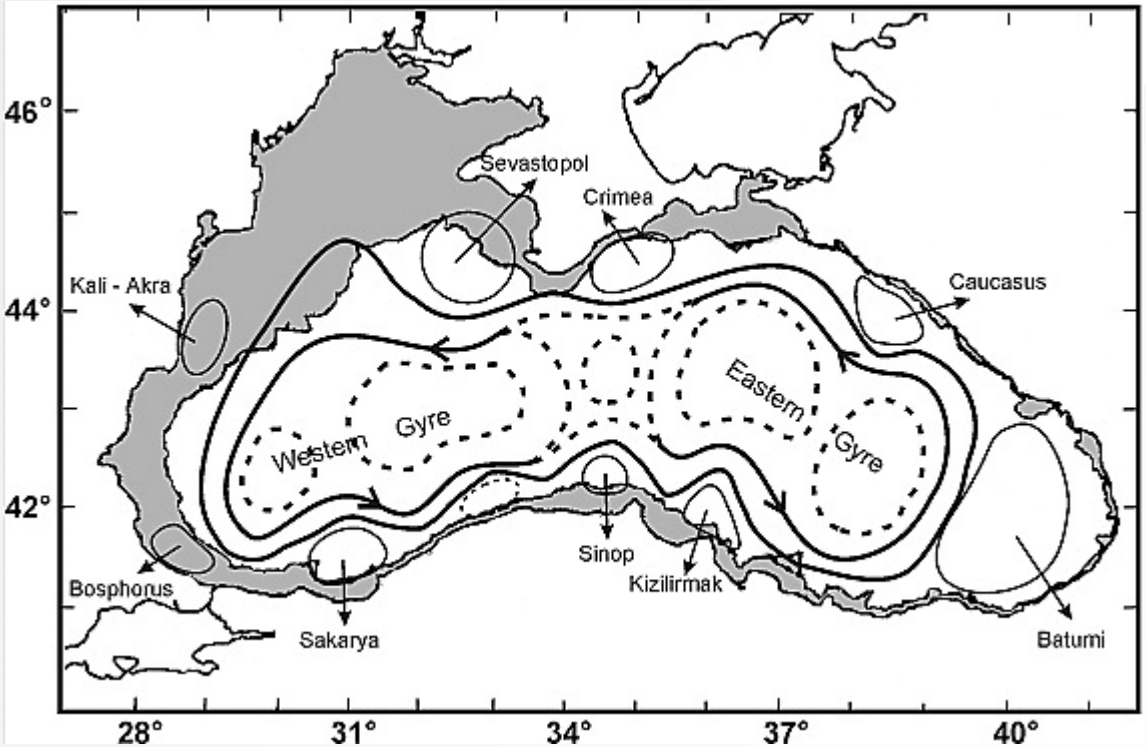
MEETING on PRODUCTS, Athens, Greece, April 8, 2015

Domain definition

- Domain coordinates: 40.5N-47.5N, 27.5E042E
- Maximum depth 2200



Domain definition: Black Sea upper layer circulation



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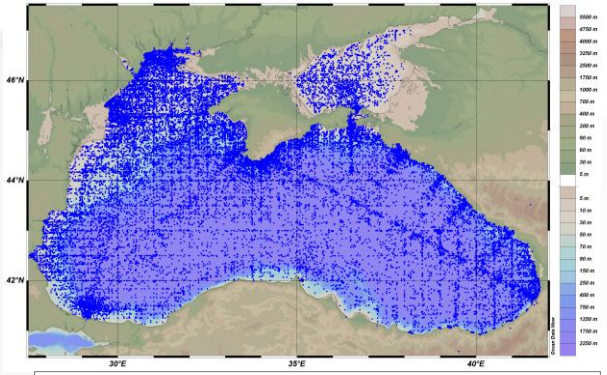
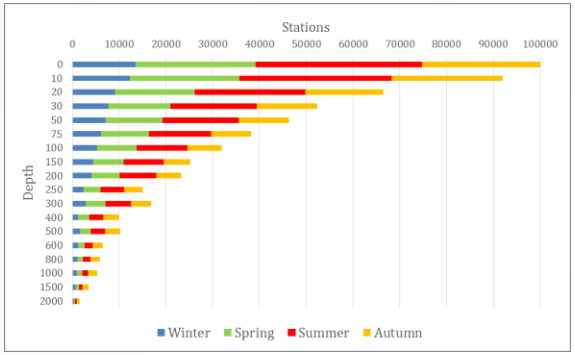
http://onlinelibrary.wiley.com/doi/10.1029/2002JC001508/full#jgrc9137-fig-0001

Time-space resolution

- Data availability:~104,400 stations, for period: 1900-2013
- Monthly maps: 0, 10, 20, 30, 50, 75, 100, 150, 200, 250m
- Annual maps: 300,400, 500, 600, 800, 1000, 1200, 1500, 2000 m
- Horizontal resolution: 0.1°

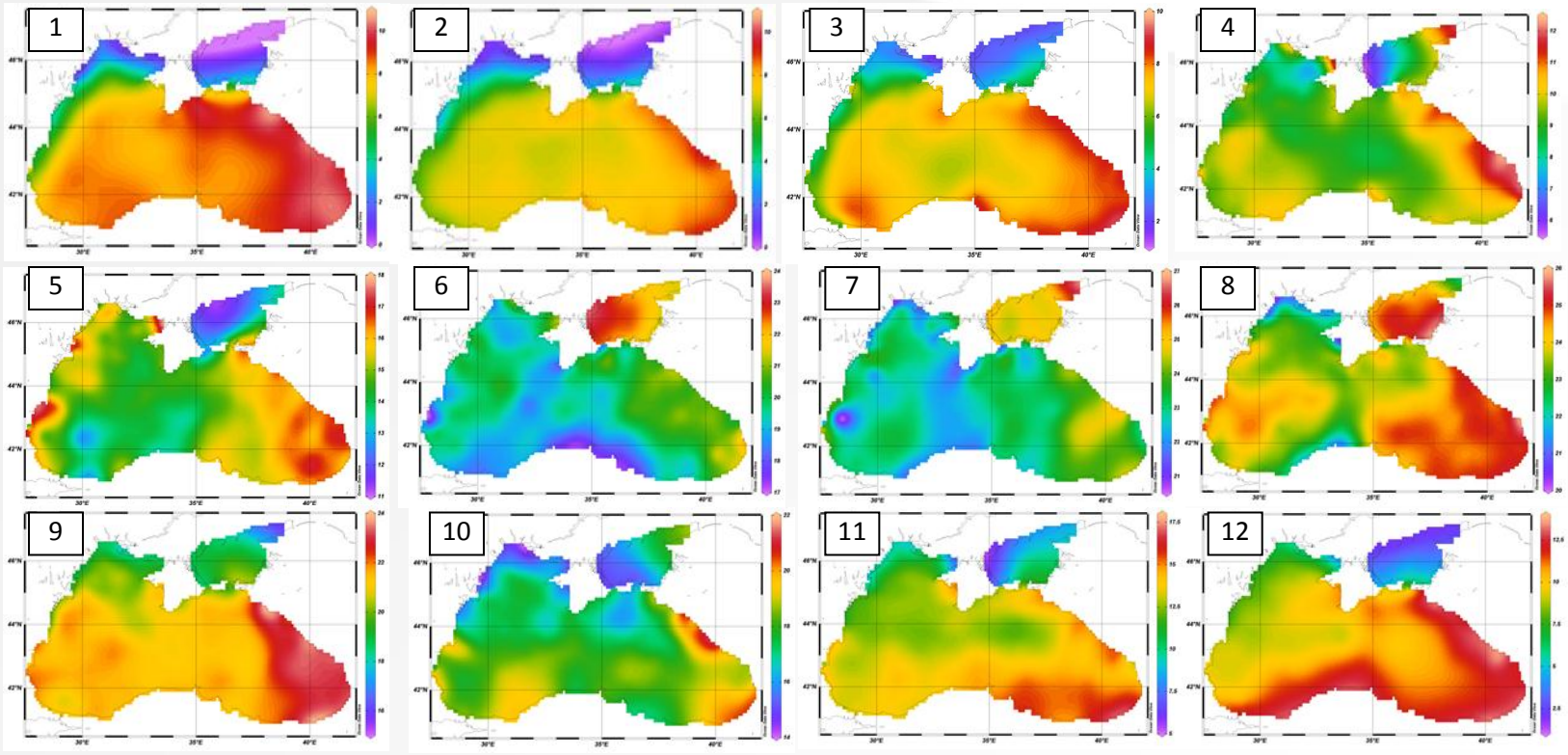




DIVA settings

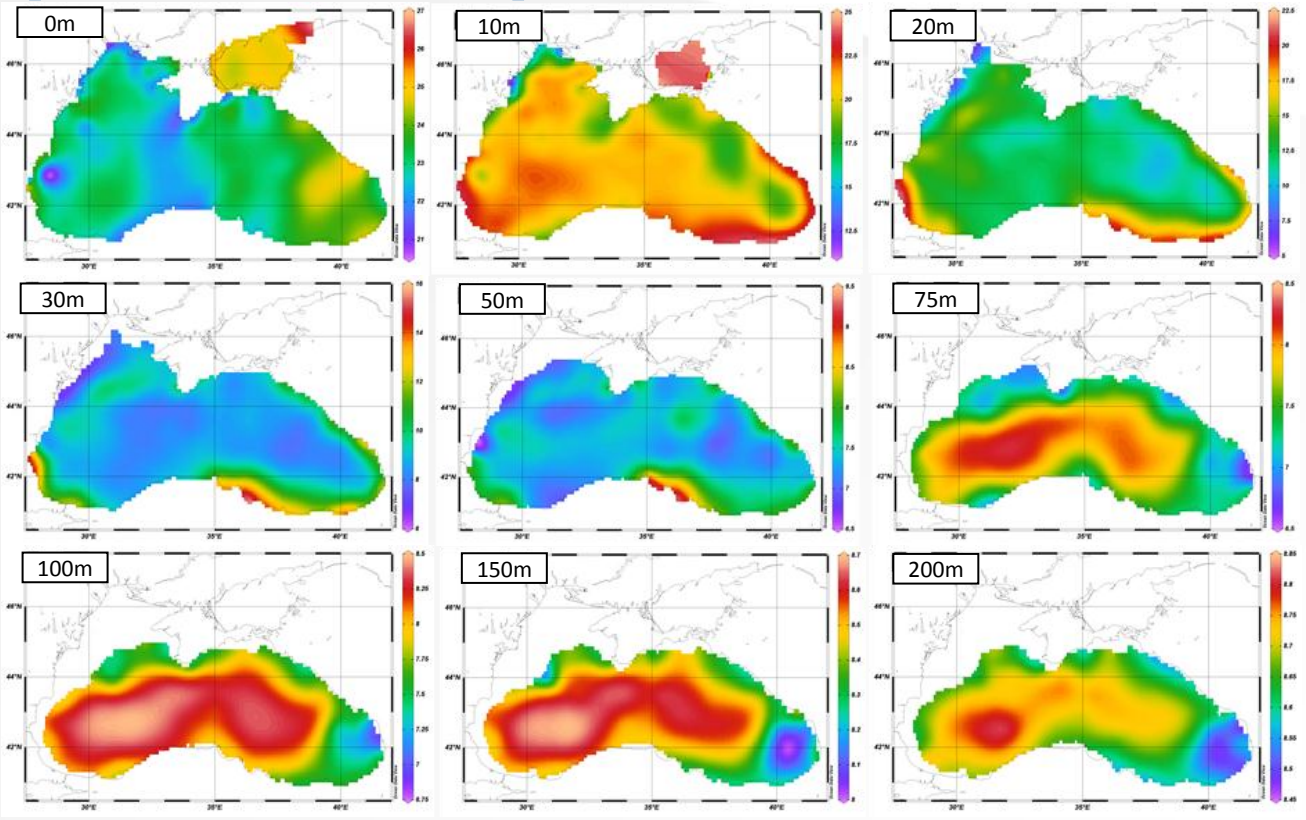
param.par		driver	
Lc: correlation length	1.5	Data extraction:	1
icoordchange	2	boundary lines and coastlines generation:	1
ispec	11	cleaning data on mesh:	0
ireg	2	minimal number of data in a layer	0
xori	27	Parameters estimation and vertical filtering:	0
yori	40.5	Minimal L	0.5
dx	0.1	Maximal L	2
dy	0.1	Minimal SN	0.1
nx	151	Maximal SN	5
ny	71	Analysis and reference field:	1
valex	-99	lowerlevel number	1
snr	0.5	upperlevel number	10
varbak	1	4D netcdf files generation:	11
		gnuplot plots	0
		Data detrending	0

Temperature Maps



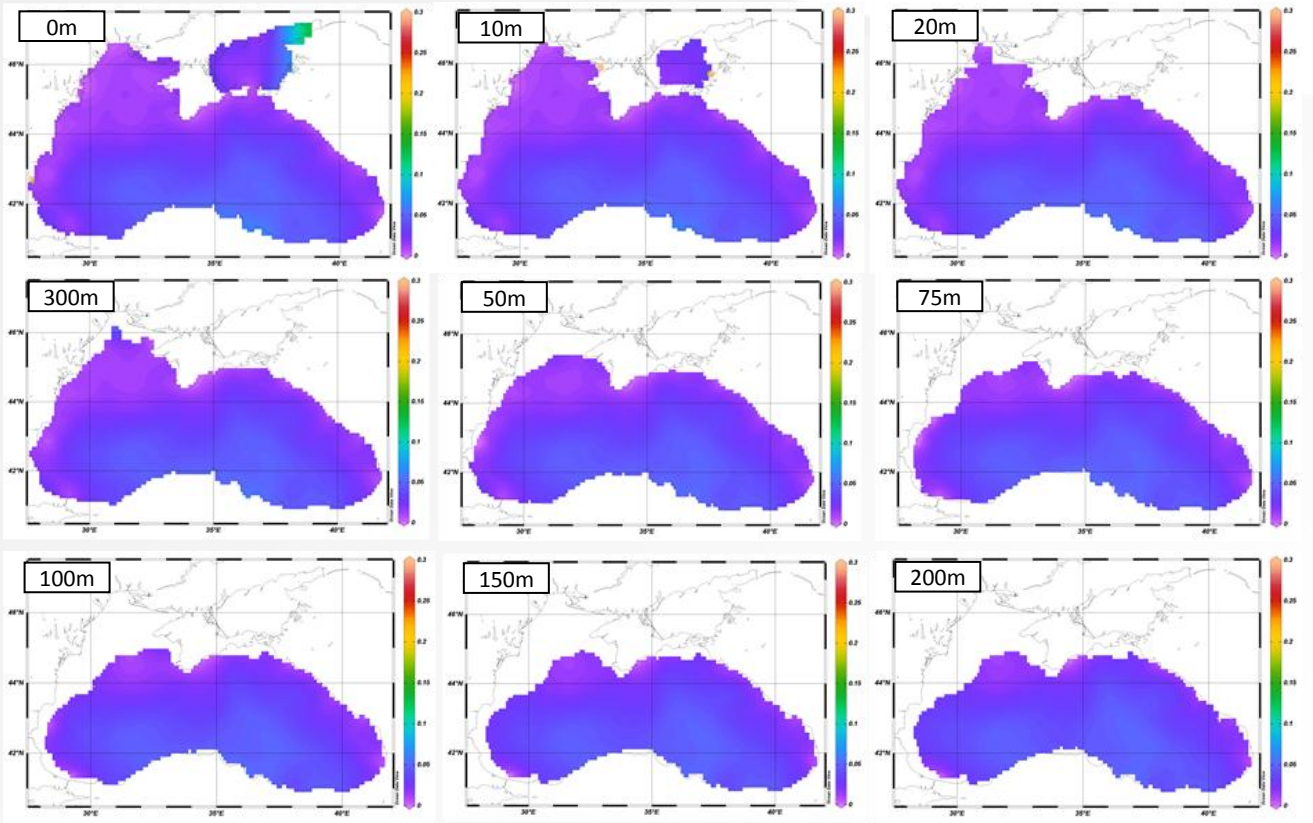
Monthly surface Temperature (automatic scaling is applied to highlight spatial features).

Temperature Maps



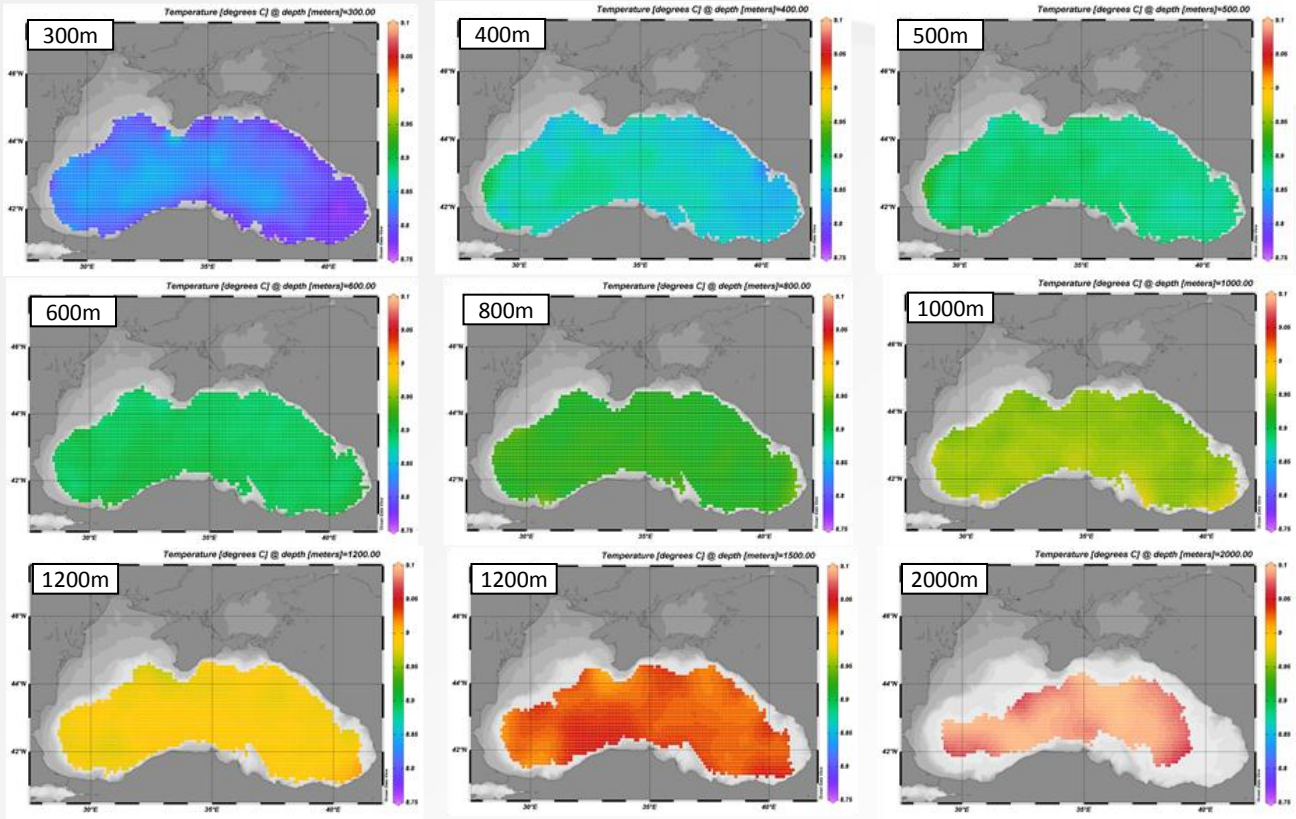
Temperature in July (automatic scaling is applied to highlight spatial features).

Temperature Maps



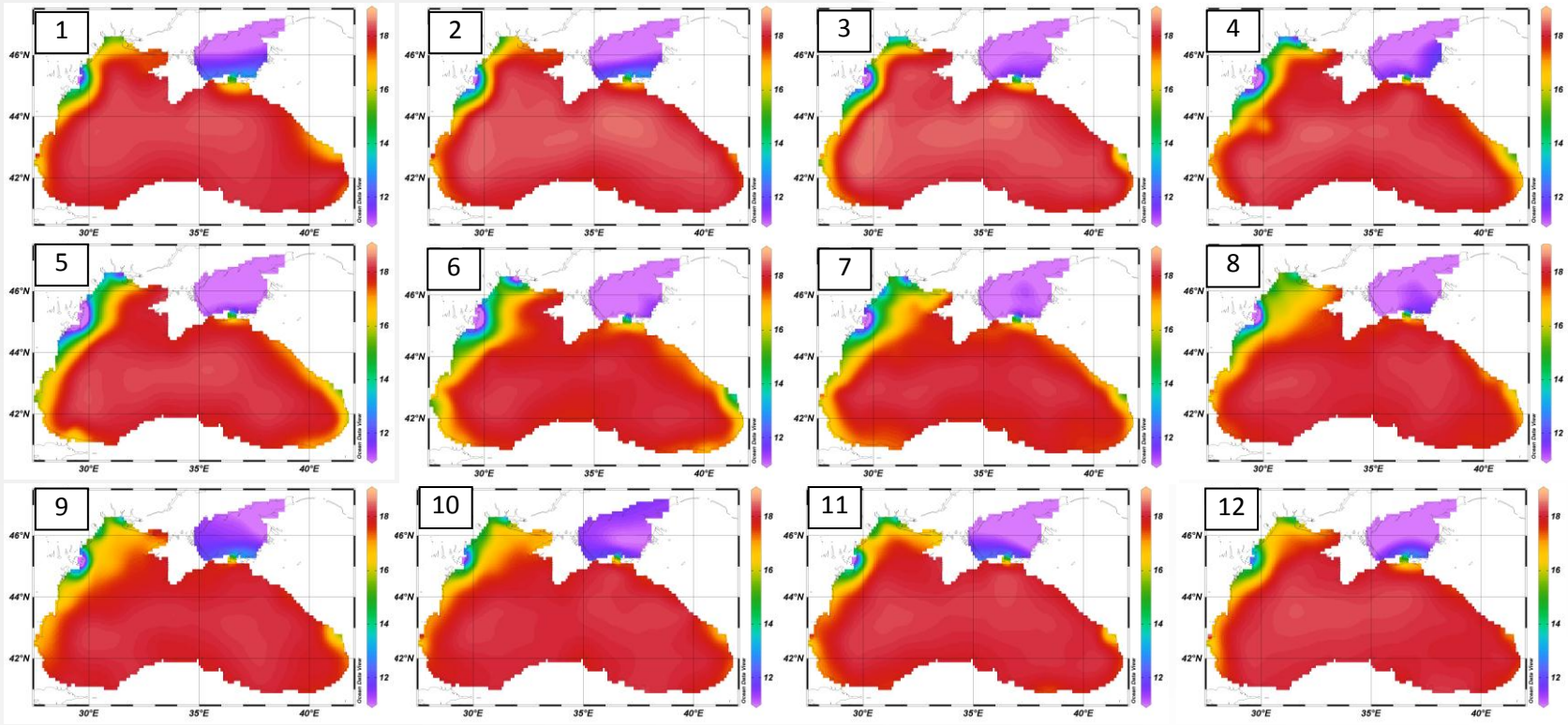
Temperature Relative Error in July

Temperature Maps



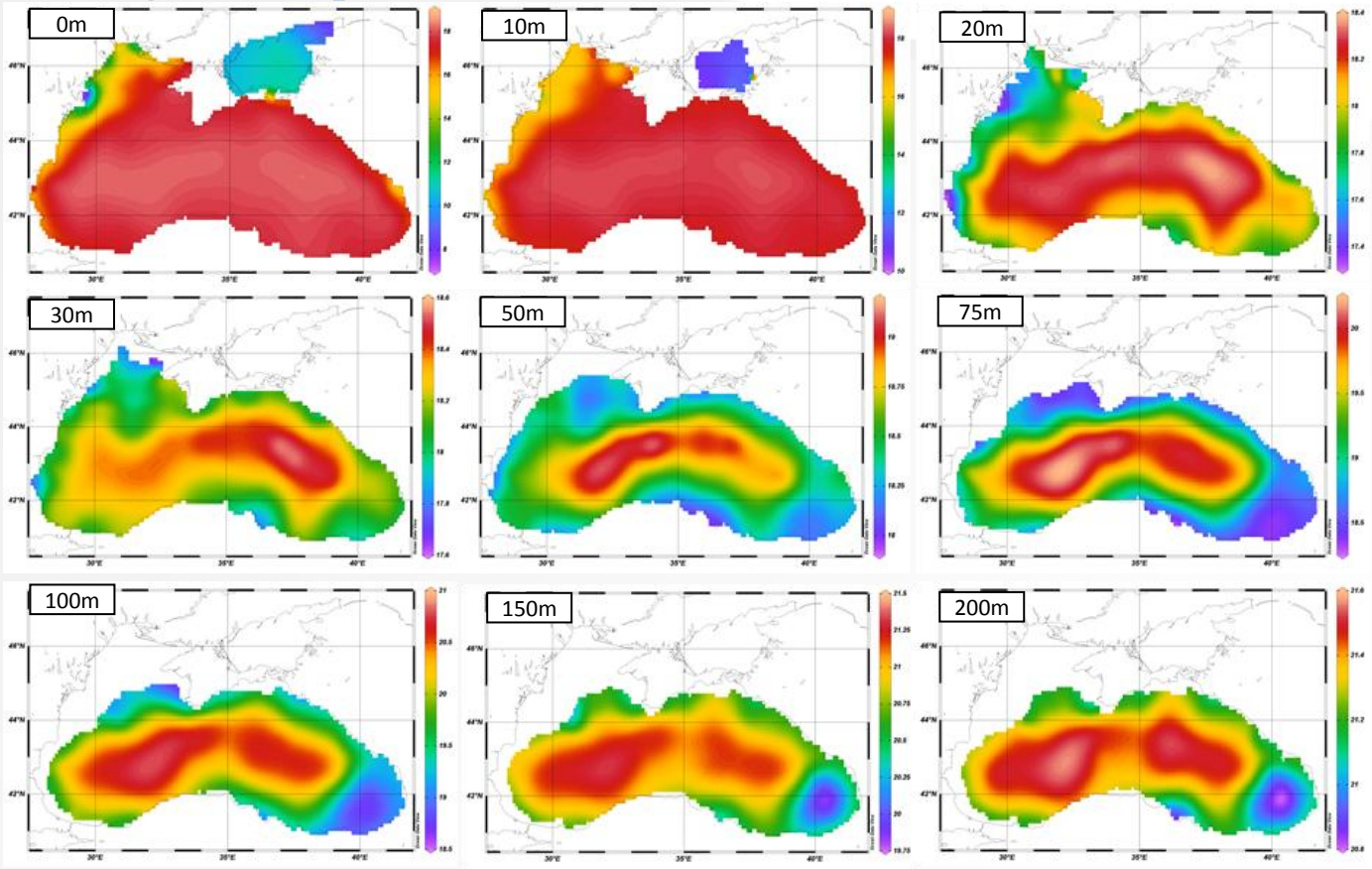
Annual Temperature

Salinity maps



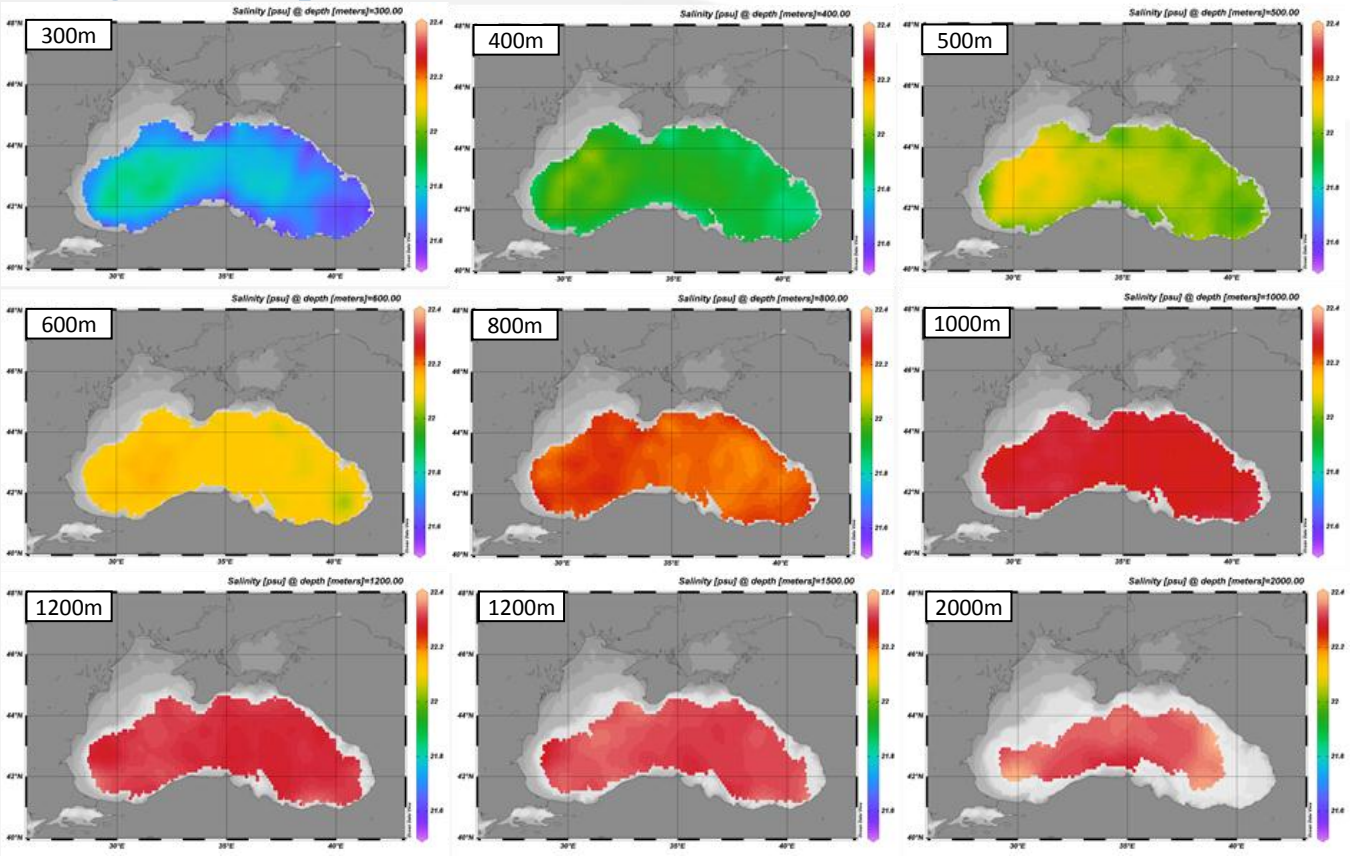
Monthly surface salinity

Salinity Maps



Salinity in July (automatic scaling is applied to highlight spatial features).

Salinity Maps



Annual Salinity

Comparison with pre-existing products

Name of product	Year of issue	Underlying data	Horizontal Resolution	Vertical Levels	Available Climatologies
MEDATLAS	2002	~51,000 stations (1890-1998)	0.25°x0.25° (~40x40km)	28	Temperature: Monthly (0-300m) Seasonal (400-800m) Annual (>800m) Salinity: Seasonal (0 - 800m) Annual (> 800m)
WORLD OCEAN ATLAS 2013 (WOA13): Black Sea domain	2013	~36,000 (1955-2012)	0.25°x0.25° (~40x40km)	67	Monthly (0-1500m) Seasonal Annual
WOA CLIMATIC ATLAS OF THE SEA OF AZOV 2008	2008	34,517 marine stations (1891-2006),	10x10 km	3	Monthly
SeaDataNet 1 products: Black Sea Climatic Maps	2008	~158,000 stations (1890 - 2007)	20'x30'	19	Monthly (0-300m) Annual (> 300m)
SeaDataNet 2 products: Black Sea Climatologies	2015	~104,400 stations (1900-2013)	0.1°x0.1°	19	Monthly (0-250m) Annual (>250m)

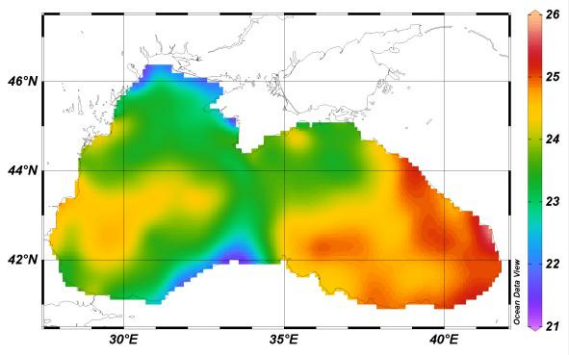
Validation against pre-existing products

		WOA13				SDN1			
		Temperature		Salinity		Temperature		Salinity	
	Depth	AvDev	MaxDev	AvDev	MaxDev	AvDev	MaxDev	AvDev	MaxDev
Monthly fields	0	0.55	5.45	0.35	4.79	0.37	3.46	0.15	6.12
	10	0.65	4.99	0.22	4.14	0.40	4.49	0.08	1.20
	20	0.67	5.72	0.08	1.12	0.64	7.31	0.06	0.71
	50	0.31	3.12	0.12	0.59	0.25	3.70	0.08	0.48
	75	0.19	1.23	0.21	0.94	0.14	1.83	0.13	0.92
	100	0.15	1.15	0.21	1.03	0.10	0.70	0.16	0.79
	150	0.10	0.69	0.14	0.85	0.05	0.44	0.11	0.98
	200	0.09	0.79	0.08	0.67	0.03	0.26	0.07	0.58
	250	0.09	0.83	0.05	0.37	0.02	0.17	0.05	0.34
Annual fields	300	0.02	0.06	0.03	0.10				
	400	0.01	0.07	0.03	0.12				
	500	0.01	0.05	0.03	0.10				
	600	0.00	0.02	0.01	0.06				
	800	0.00	0.02	0.01	0.03				
	1000	0.01	0.02	0.01	0.04				
	1200	0.00	0.02	0.01	0.04				
	1500	0.01	0.02	0.01	0.08				
	2000	0.01	0.07	0.02	0.07				

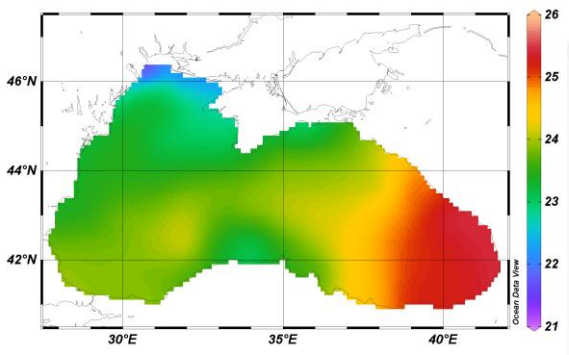
Problems in monthly fields for upper layers, very good correspondence of annual fields.

Validation: Temperature differences, 0m, Aug

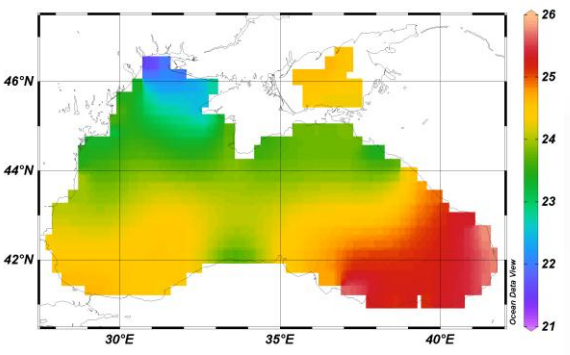
SeaDataNet2

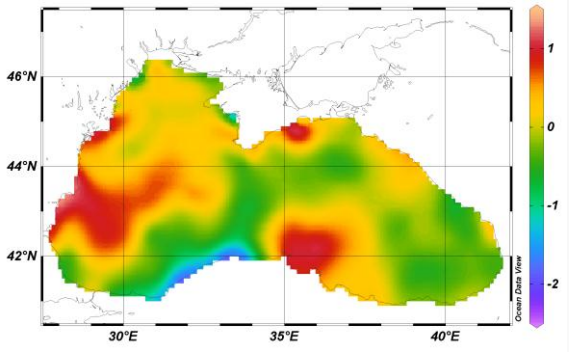


SeaDataNet1

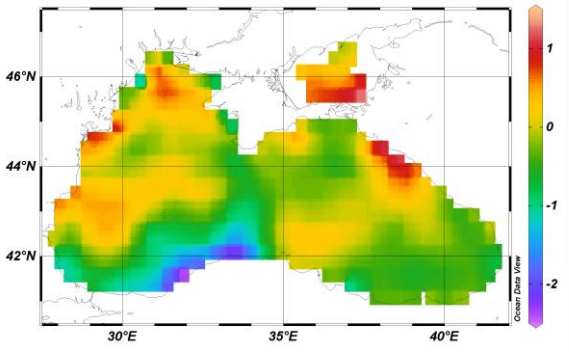


WOA13





SeaDataNet2 – Seadatanet1

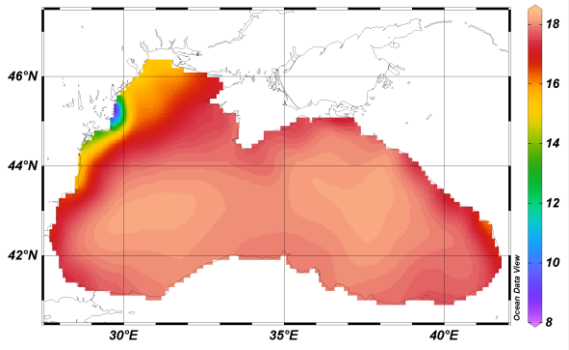


SeaDataNet2 – WOA13

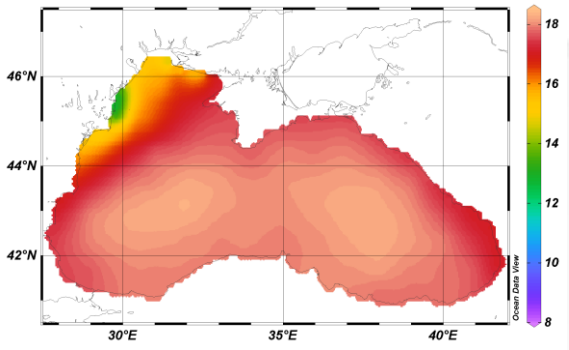
Differences observed all over the basin. WOA and Seadatanet1 fields are more smoothed though there are significant differences between them as well.

Validation: Salinity differences, 0m, Aug

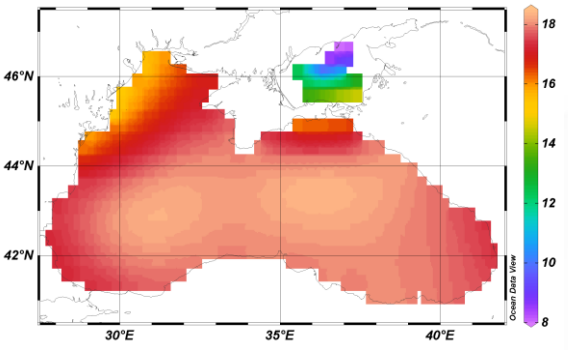
SeaDataNet2

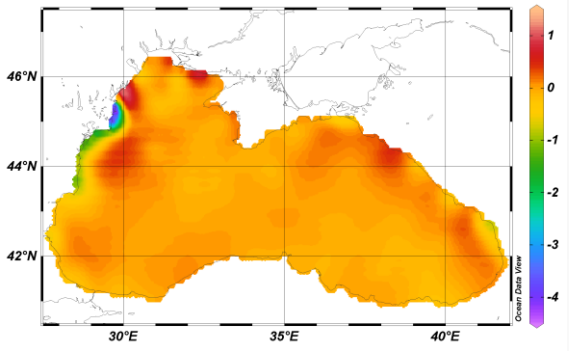


SeaDataNet1

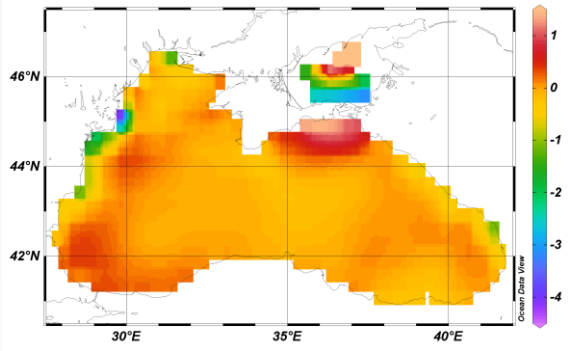


WOA13





SeaDataNet2 – Seadatanet1



SeaDataNet2 – WOA13

Maximum Salinity differences are observed in area affected by Danube inflow

Conclusions

- The main advantage of the current product is better resolution and better representativeness of underlying data compared to most of pre-existing products
- Calculation were done with typical DIVA settings
- The main Black Sea features (e.g. Rim Current, Cold Intermediate Layer) are well recognized in the Temperature and Salinity climatic fields
- Visual analysis of maps revealed problems with quality of obtained monthly climatic fields in upper layers. These problems are confirmed by results of validation against pre-existing products
- Validation of annual fields against WOA13 showed very good correspondence
- Further improvement of quality of monthly fields is required. It should include:
  - Analysis of found on maps artefact in order to reveal and exclude erroneous data
  - Tuning DIVA parameters (suggestions are welcome)


Thank you