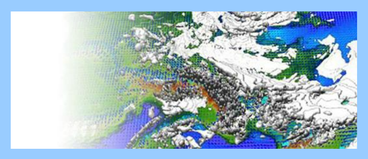
Verification of COSMO model forecast of temperature, pressure, wind speed and precipitation near seashore



COSMO / CLM / ART - User Seminar 2017

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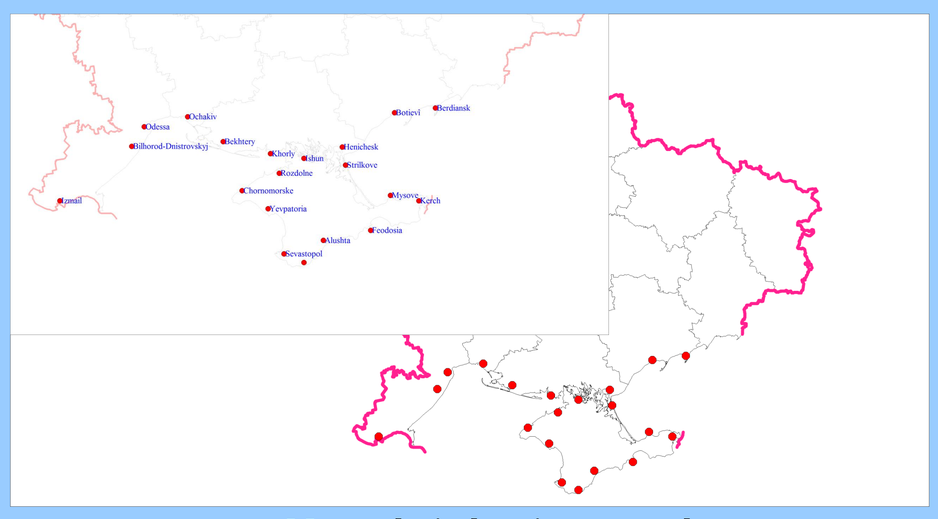
Introduction

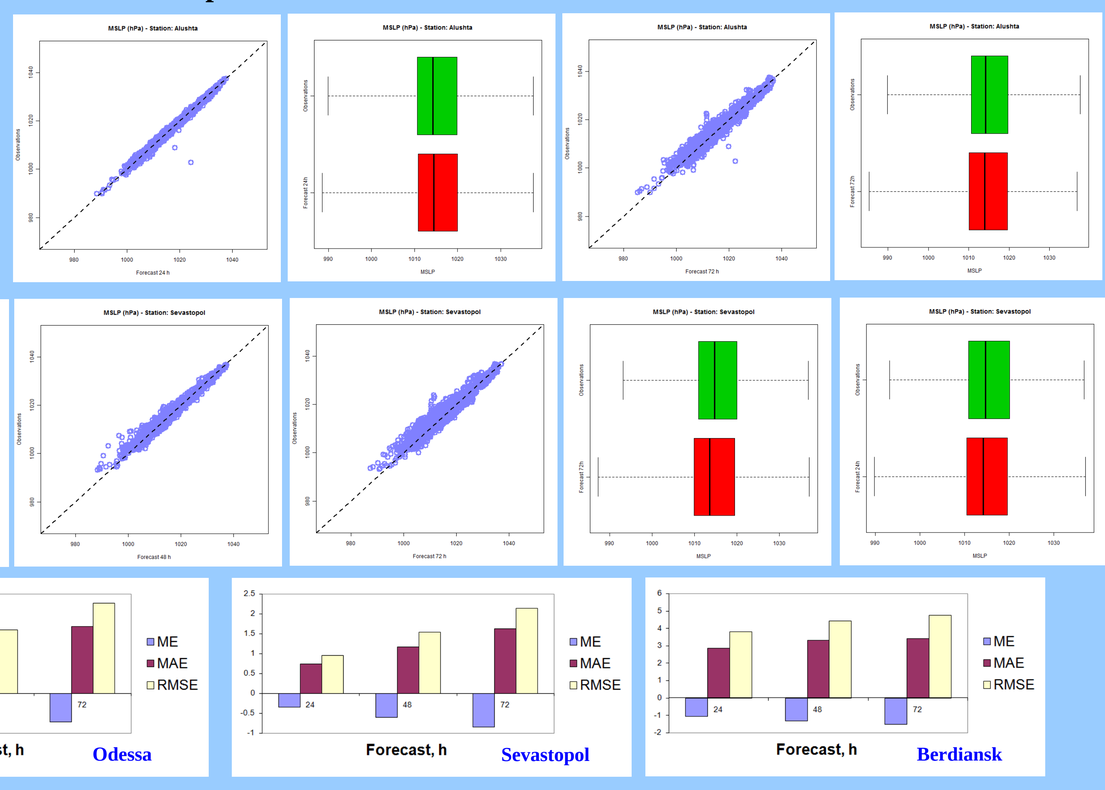
The challenging for the numerical weather prediction is forecasting in mountains, near sea coast and sensitivity of model to sharp changing from zonal to meridian circulation in the atmosphere. All these problems are being resolved through using of nested grids or more detailed spatial steps, different data assimilation techniques, more sophisticated physical parameterization and through increasing the number of updating input data from global model during day.

Here shown the results of forecast verification of temperature, MSLP, wind speed and daily sums precipitation for the northern coasts of Black and Azov Seas for the period from January to December of 2013 for the COSMO model with horizontal resolution of 14 km.

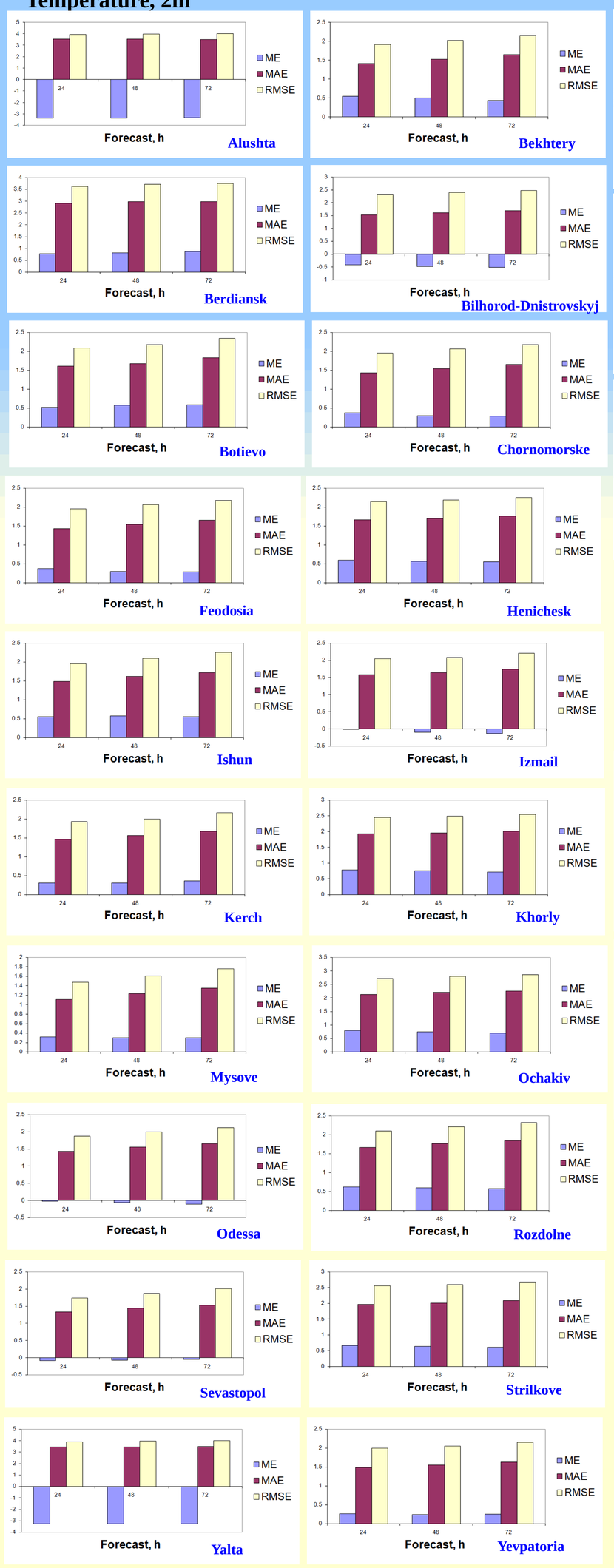


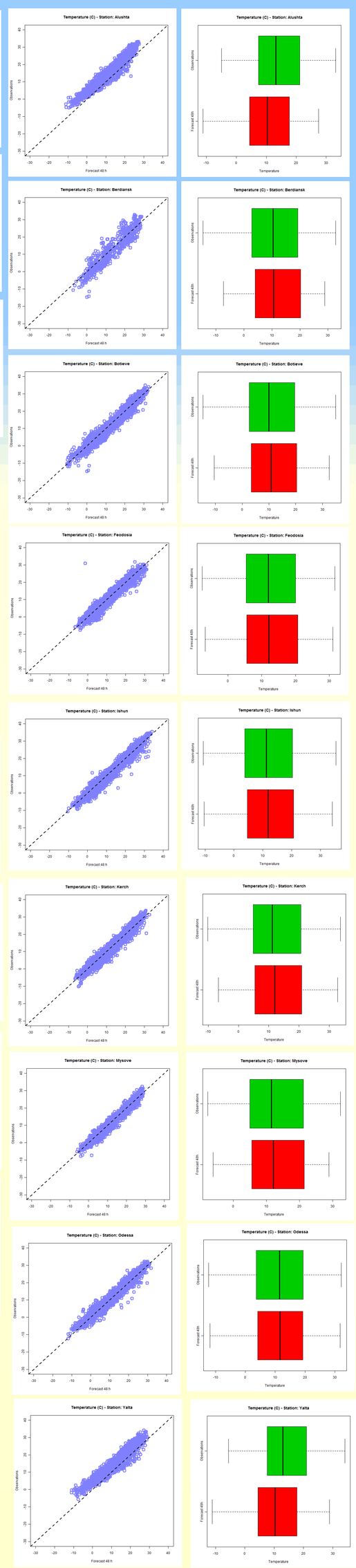
Meteorological stations network

Mean sea level pressure

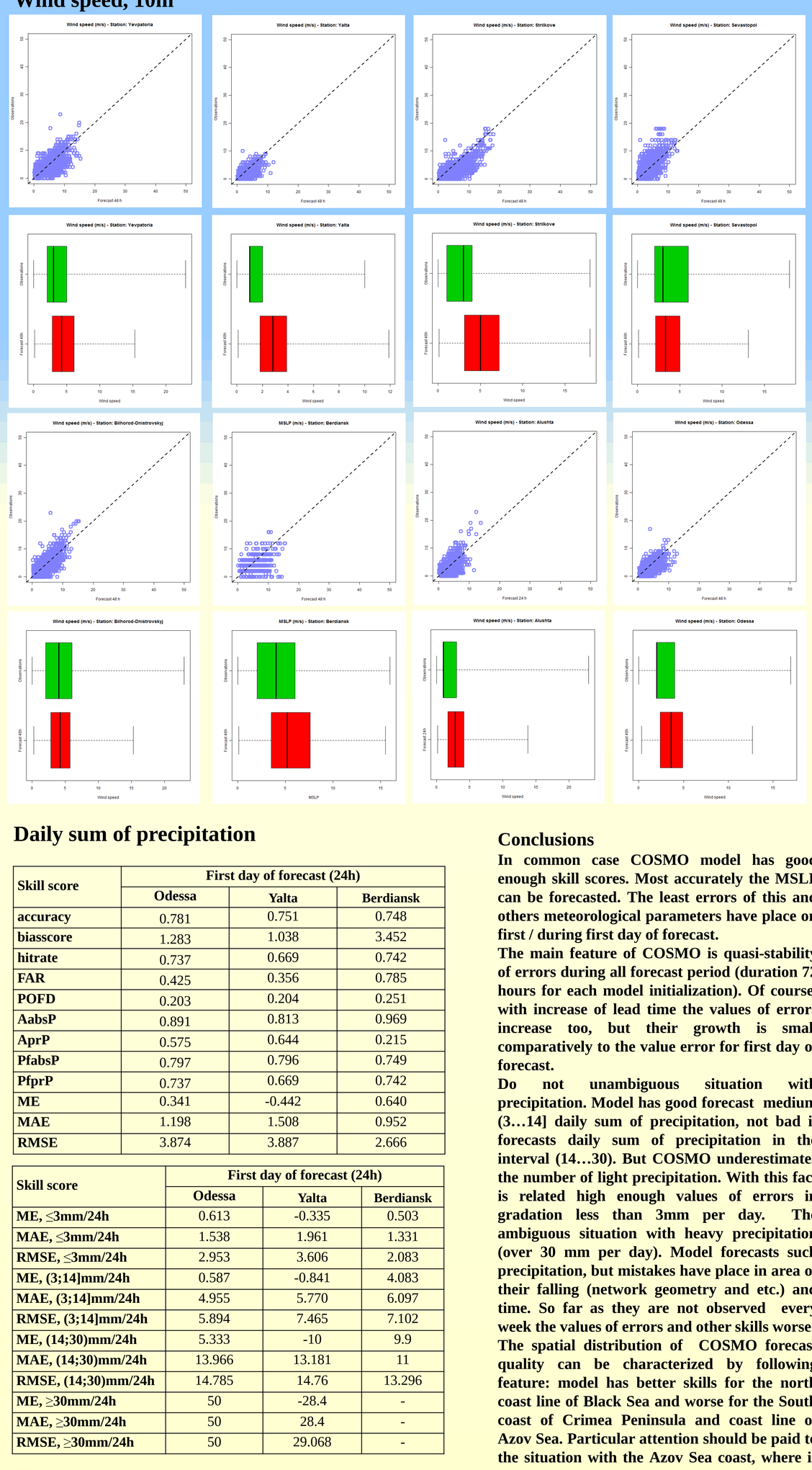


Temperature, 2m





Wind speed, 10m



Daily sum of precipitation

Skill score	First day of forecast (24h)		
	Odessa	Yalta	Berdiansk
accuracy	0.781	0.751	0.748
biasscore	1.283	1.038	3.452
hitrate	0.737	0.669	0.742
FAR	0.425	0.356	0.785
POFD	0.203	0.204	0.251
AabsP	0.891	0.813	0.969
AprP	0.575	0.644	0.215
PfabsP	0.797	0.796	0.749
PfprP	0.737	0.669	0.742
ME	0.341	-0.442	0.640
MAE	1.198	1.508	0.952
RMSE	3.874	3.887	2.666

Skill score	First day of forecast (24h)		
	Odessa	Yalta	Berdiansk
ME, ≤3mm/24h	0.613	-0.335	0.503
MAE, ≤3mm/24h	1.538	1.961	1.331
RMSE, ≤3mm/24h	2.953	3.606	2.083
ME, (3;14]mm/24h	0.587	-0.841	4.083
MAE, (3;14]mm/24h	4.955	5.770	6.097
RMSE, (3;14]mm/24h	5.894	7.465	7.102
ME, (14;30)mm/24h	5.333	-10	9.9
MAE, (14;30)mm/24h	13.966	13.181	11
RMSE, (14;30)mm/24h	14.785	14.76	13.296
ME, ≥30mm/24h	50	-28.4	-
MAE, ≥30mm/24h	50	28.4	-
RMSE, ≥30mm/24h	50	29.068	-

Here

AabsP = (corneg / forno) – forecast accuracy of the absence of precipitation, where corneg - the number of forecasts no rain, which came true, forno - the number of forecasts no rain.

AprP = (hits / foryes) – forecast accuracy of the presence of precipitation.

PfabsP = (cornegr / obsno) – fact-preventable of the absence of precipitation.

PfprP = (hits / obsyes) – fact-preventable of the presence of precipitation.

Conclusions

In common case COSMO model has good enough skill scores. Most accurately the MSLP can be forecasted. The least errors of this and others meteorological parameters have place on first / during first day of forecast.

The main feature of COSMO is quasi-stability of errors during all forecast period (duration 72 hours for each model initialization). Of course, with increase of lead time the values of errors increase too, but their growth is small comparatively to the value error for first day of forecast.

Do not unambiguous situation with precipitation. Model has good forecast medium (3…14] daily sum of precipitation, not bad it forecasts daily sum of precipitation in the interval (14…30). But COSMO underestimates the number of light precipitation. With this fact is related high enough values of errors in gradation less than 3mm per day. The ambiguous situation with heavy precipitation (over 30 mm per day). Model forecasts such precipitation, but mistakes have place in area of their falling (network geometry and etc.) and time. So far as they are not observed every week the values of errors and other skills worse. The spatial distribution of COSMO forecast quality can be characterized by following feature: model has better skills for the north coast line of Black Sea and worse for the South coast of Crimea Peninsula and coast line of Azov Sea. Particular attention should be paid to the situation with the Azov Sea coast, where is unclear reasons, why all the meteorological quantities are predicted worse.