

WORLD METEOROLOGICAL ORGANIZATION

WDS-MAP/GDPFS-NWP_Report07, Annex

ANNUAL JOINT WMO TECHNICAL PROGRESS REPORT ON THE GLOBAL DATA PROCESSING AND FORECASTING SYSTEM AND NUMERICAL WEATHER PREDICTION RESEARCH ACTIVITIES FOR 2007

Country: Kazakhstan

Centre: Kazhydromet

1. Summary of highlights

No changes

2. Equipment in use

MTS	- Pentium IV, 3 000 MHz.
UniMAS	- Pentium IV, 2 400 MHz.
AWS-weather	- Pentium III, 800 MHz.
GIS Meteo	- Pentium II, 500 MHz.
E-mail server	- Pentium IV, 1 500 MHz.
Satellites	- Pentium III, 633 MHz.
E-mail	- Pentium IV, 3 000 MHz.
Switch 2512, SAS 2224, DSR 2216, Cisco 2500.	
Server	- Pentium IV, 1 400 MHz.
Server	- Netserver LC 2000U3, 1 400 MHz.
Modems	- M-144, TAINET, Zyxel.
The soft- and hardware for weather maps preparation – Pentium IV, 3 000 MHz, DesignJet – 450C.	

3. Data and Products from GTS in use

- SYNOP
- TEMP
- ECMWF Reading
- WMC Washington

4. Forecasting system

4.1 System run schedule and forecast ranges

4.2 Medium range forecasting system (4-10 days)

4.2.1 Data assimilation, objective analysis and initialization

4.2.1.1 In operation

Conventional methods of weather forecasting are applied in the Hydrometeorological Service of Kazakhstan based on analysis of actual information using baric fields forecast, which is being received from the World Meteorological Centre (Washington), European Centre for Medium Range Weather Forecasts (Reading), and Moscow Centre.

Every day meteorological, sea, hydrological and agrometeorological forecasts are made up. Regularly the week, decade weather forecasts are issued for all the regions of Kazakhstan. One of the main tasks of the Hydrometeorological Service of Kazakhstan is to make forecasts of the dangerous and natural phenomena, reports of the weather changes and distribute to customs and user.

4.2.1.2 Research performed in this field

No

4.2.2 Model

4.2.2.1 In operation

4.2.2.2 Research performed in this field

4.2.3 Operationally available Numerical Weather Prediction Products

Charts from the World Meteorological Centre (Washington), European Centre for Medium Range Weather Forecasts (Reading), and Moscow Centre are used for making up forecasts.

4.2.4 Operational techniques for application of NWP products (*MOS, PPM, KF, Expert Systems, etc.*)

4.2.4.1 In operation

No

4.2.4.2 Research performed in this field

No

4.2.5 Ensemble Prediction System (EPS)

4.2.5.1 In operation

No

4.2.5.2 Research performed in this field

None

4.2.5.3 Operationally available EPS Products

No

4.3 Short-range forecasting system (0-72 hrs)

4.3.1 Data assimilation, objective analysis and initialization

4.3.1.1 In operation

Charts from the World Meteorological Centre (Washington), European Centre for Medium Range Weather Forecasts (Reading), and Moscow Centre are used for making up forecasts.

For drawing of atmospheric fronts are analyzed initial GRID data base, SYNOP, TEMP and results of SYNOP and TEMP objective analysis, and satellite information.

4.3.1.2 Research performed in this field

No

4.3.2 Model

4.3.2.1 In operation

4.3.2.2 Research performed in this field

4.3.3 Operationally available NWP products

4.3.4 Operational techniques for application of NWP products

4.3.4.1 In operation

4.3.4.2 Research performed in this field

4.3.5 Ensemble Prediction System

4.3.5.1 In operation

4.3.5.2 Research performed in this field

4.3.5.3 Operationally available EPS Products

4.4 Nowcasting and Very Short-range Forecasting Systems (0-6 hrs)

4.4.1 Nowcasting system

4.4.1.1 In operation

4.4.1.2 Research performed in this field

4.4.2 Models for Very Short-range Forecasting Systems

4.4.2.1 In operation

4.4.2.2 Research performed in this field

4.5 Specialized numerical predictions

The water level fluctuations at the Caspian Sea northeastern part depend from the following factors: relief, wind regime and background sea level position. During the period especially dangerous wind setup phenomena the sea level over the short period (a few hours) can rise up to 3.0 m at east most gently sloping seaside, therefore the low territories are flooded up to 30 km. The losses from the coastal zone flooding are estimated to millions dollars. Therefore, at designing and protection of hydraulic engineering and civil constructions the water level forecasts on basis of numerical modelling are put forward to one in the central places. The preliminary warning (forecast) of these phenomena allows to considerably reduce the damage.

4.5.1 Assimilation of specific data, analysis and initialization (where applicable)

4.5.1.1 In operation

An operational storm surge model has been established at the Kazakh Republican State Enterprise "Kazhydromet" The model is based on DHI's 2D hydrodynamic model, MIKE 21 (Denmark, DHI). This model is a structural element of the automatic transfer line of the Caspian Sea operational system level forecasting with lead-time till 120 hours. The system allows to receive the meteorological information from the European Center for Medium-Range Weather Forecasts (ECMWF, UK); hydrological information - from the Kazakhstan's stations on the Caspian Sea via the communicate channels, to process it and to make necessary forecasts in the shortest possible time. On the basis of digital meteorological data received from the ECMWF carry out daily computer simulations of storm surge forecasts for the Kazakh coast of the Caspian Sea. The model is forced with the meteorological forecast wind and air pressure data.

Adaptation of the HD module to the shallow conditions of the Northern Caspy was made by the Kazakh executives over creation the bathymetric models of all sea (grid spacing 10 km) and its northern part (grid spacing 2.0 km), selection of the check-up factors: bed resistance, wind friction and others. System allows expecting hourly water level fluctuations in any point of the Caspian Sea. Initial sea level is defined according to network observation, acting by communicate channels. Adapt the storm surge warning model to take account of seasonal particularities such as ice cover, river inflows, evaporation and precipitation. During the winter period the northern shallowest part of the Caspian Sea is covered by ice. An effect of such ice cover is that the water level fluctuations are dampened. This effect also was implemented in the operational storm surge model.

The water level forecasts are made for the different regions of the Kazakhstan's coast of the Caspian Sea. Representation form of the forecast: text, water level fluctuations' graph, Warnings of the dangerous consequences (flooding, dams' destruction, deterioration of navigation conditions).

4.5.1.2 Research performed in this field

4.5.2 Specific Models

4.5.2.1 In operation

4.5.2.2 Research performed in this field

4.5.3 Specific products operationally available

4.6 Extended range forecasts (ERF) (10 days to 30 days)

4.6.1 Models

4.6.1.1 In operation

Synoptic-statistics method is used for making up forecast for month. There are mean monthly temperature, temperature and precipitation anomaly, plots of the mean daily temperature and weather phenomena.

4.6.1.2 Research performed in this field

4.6.2 Operationally available NWP model and EPS ERF products

4.7 Long range forecasts (LRF) (30 days up to two years)

4.7.1 In operation

- Long-range Weather Forecast Department of Kazhydromet makes up forecast for 6 month two times per year. There are mean monthly temperature and precipitation anomaly.

- An experimental exploitation of Regional Climate Model (RegCM, Version 3, ICTP) is being carried out for seasonal forecasts for the entire territory of Kazakhstan.

4.7.2 Research performed in this field

By using Regional Climate Model meteorological fields on season and month were simulated in hindcast mode for 10 years (1991-2000 years). The NCEP reanalysis and OISST data set are used in RegCM as initial and boundary conditions. Meteorological fields were compared with observed fields (UKMO/CRU data sets). Systematic biases were found. Experiments were carried out with different type of cloud parameterization and different domain size.

4.7.2 Operationally available EPS LRF products

5. Verification of prognostic products

6. Plans for the future (next 4 years)

6.1 Development of the GDPFS

6.1.1 Modernization is planned during 2009-2011 in Kazhydromet.

6.2 Planned research Activities in NWP, Nowcasting and Long-range Forecasting

6.2.1 Planned Research Activities in NWP

6.2.2 Planned Research Activities in Nowcasting

6.2.3 Planned Research Activities in Long-range Forecasting

Applying Regional Climate Models in the real time operation mode for seasonal forecasts.
Applying PRECIS for future climate forecast.

7. References