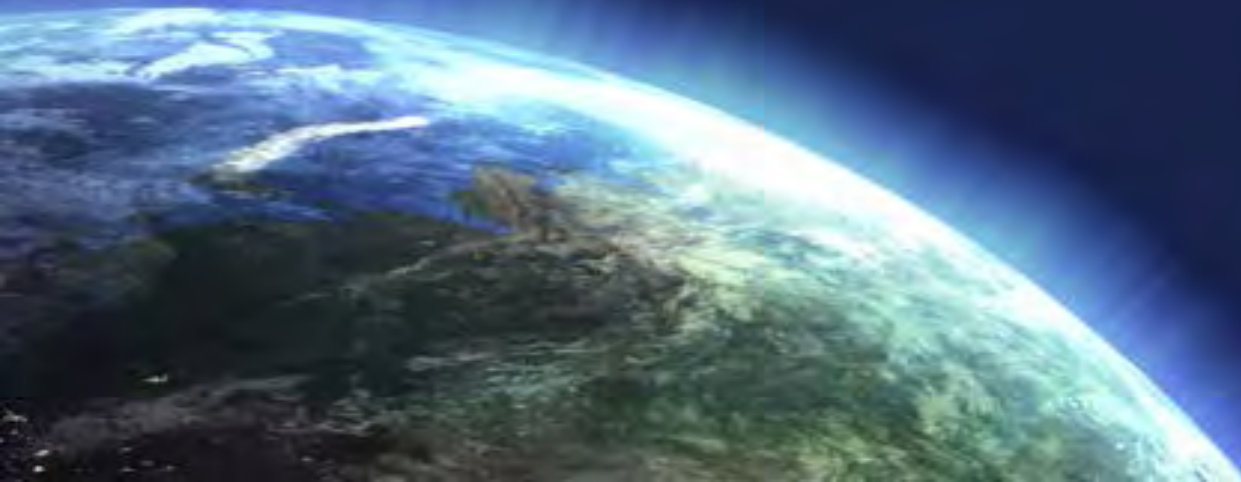
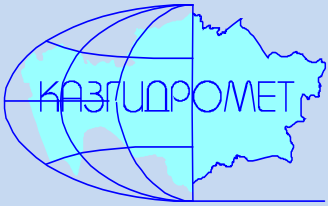


# Flash floods in Kazakhstan

## RSE “Kazhydromet”

2015

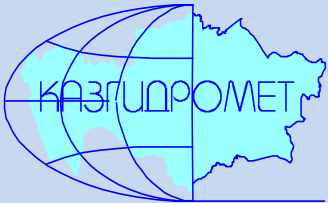




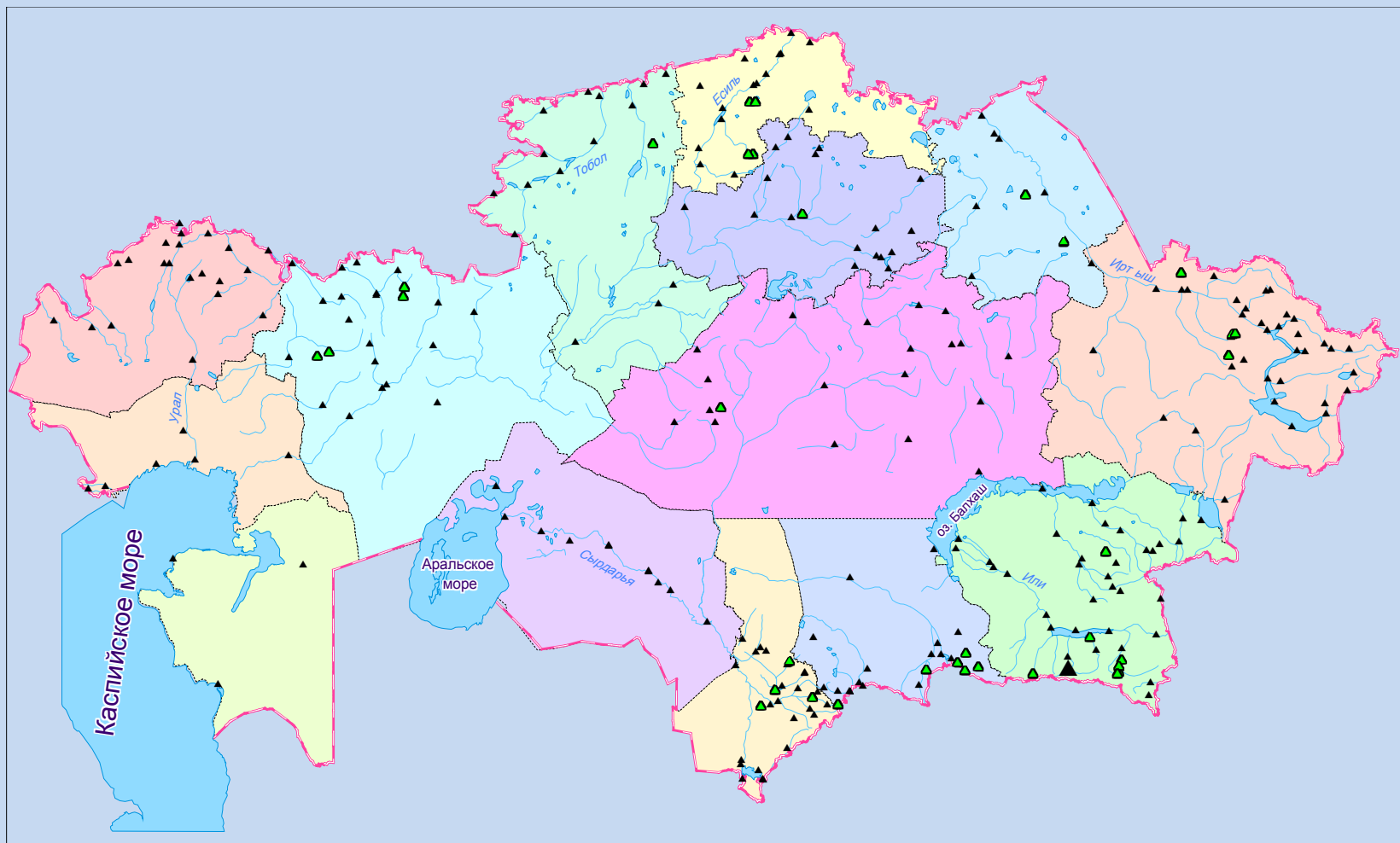
## **Kazakhstan water resources:**

- Approximately 8390 rivers and temporary streams (longer than 10 km)
- About 76 thousand small watercourses
- More than 3000 lakes with an area of more than 1 square km.

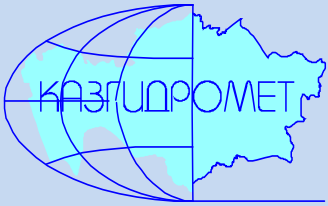
The main type of Republic’s water resource is the river flows.



## Hydrological stations



**Under the State Water Resources Management program  
195 hydrological stations are planned to open until 2020**



# RSE “Kazhydromet”

**Hydrological  
data**

**For the 8 main river  
basins since 1891**

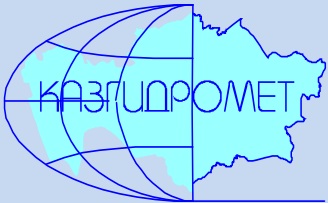
**Hydrological  
calculations**

**Determination the water  
flow supply**

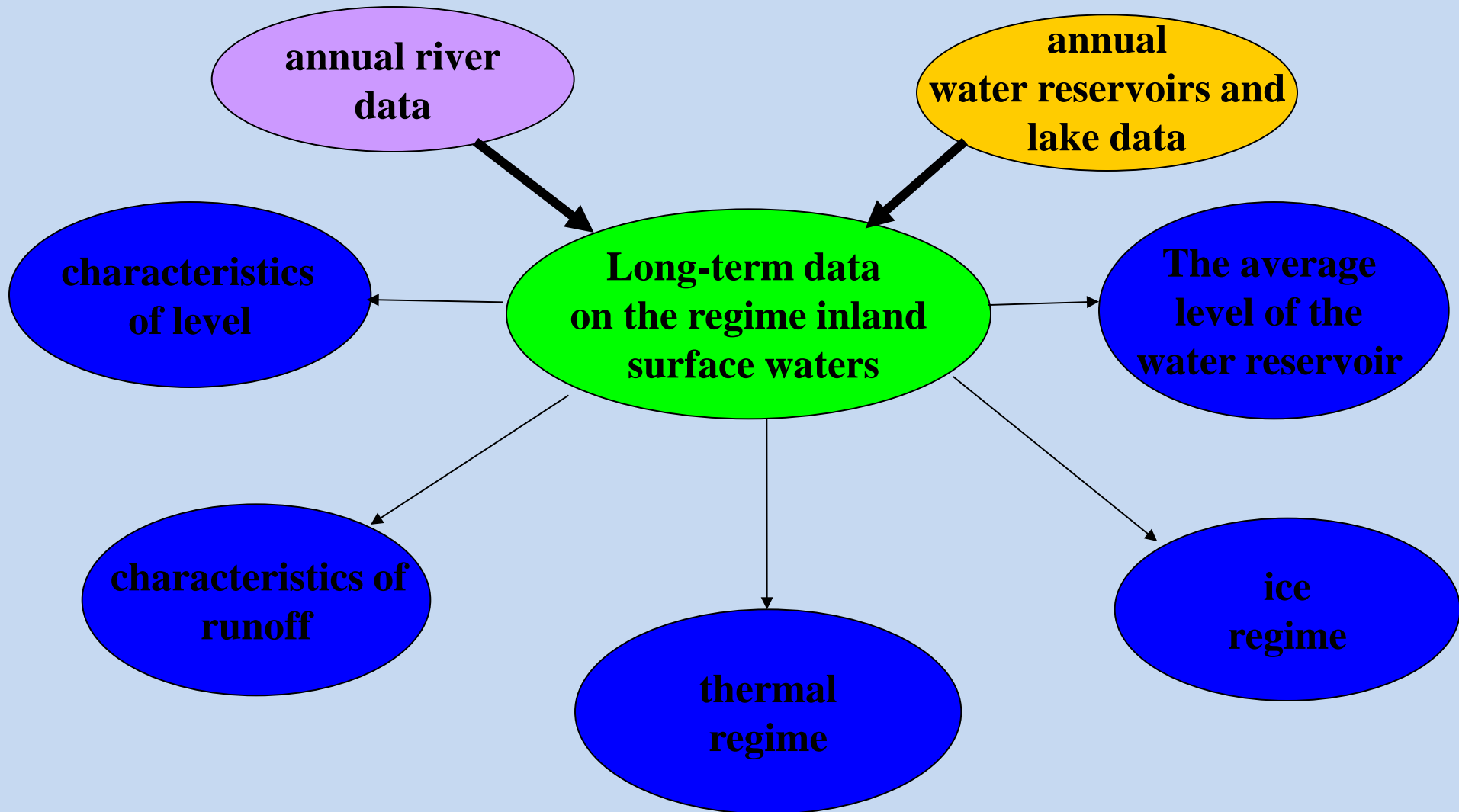
**Preparation for  
release State  
Water Cadaster**

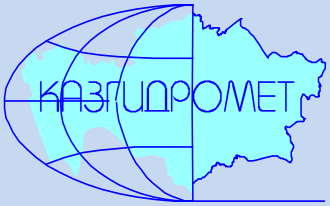
**Reference books:**

- Annual data on the regime inland surface waters;
- Annual data on the regime Caspian Sea;
- Long-term data on the regime inland surface waters



## The control flow of multiyear data





# RSE “Kazhydromet”

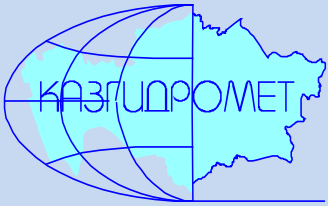
- Flash Flood - a rapid increase in water level as a result of intense rainfall or dam.
- Timely and accurate short-term rainfall forecast is an important component for the flood prediction and warning systems.
- In Kazakhstan, mountainous areas of the south and southeast are the most susceptible to floods.



Floods forecasting stages:

- Heavy rain forecast in 12, 24 and 36 hours advance
- Flood forecast based on the formation of specially developed criteria for air temperature and precipitation.

**Flooding in Karaganda region 14 April 2015**



# RSE “Kazhydromet”

## The conditions under which formed flash floods.

*Conditions developed for the three altitudinal zones:*

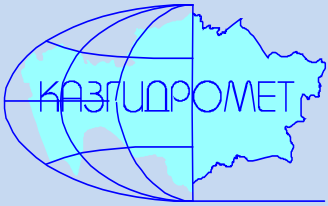
- **Above 2500 m,**
- **2500 - 1500 m**
- **Below 1500 m.**

*For each high-altitude zones are defined critical values of air temperature and precipitation for the next day, for the past 5 days, 10 days.*

*If it is expected 40 mm rainfall or more, a storm warning is announced.*

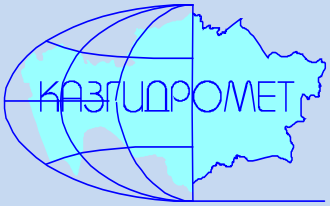
*In March and April during snow melt for zone below 1500 m critical value of precipitation is 20 mm.*





## **Mudflow on the Talgar river, as result of lake outburst**

- July 17<sup>th</sup> 2014, at 12:05 in the basin Talgar river, lake drainage under the glacier formed mudflow
- Flood was stopped by protection dam, there is no destruction in Talgar town.
- To monitor the mountain lakes, dangerous areas are regularly observed by helicopters

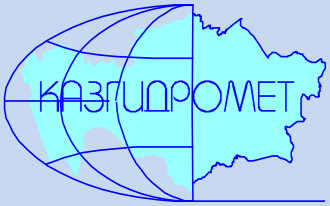


**RSE “Kazhydromet”**

**Mountain lake outburst in Talgar upper river in  
July 2014**



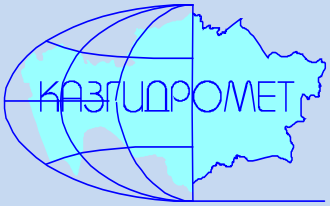




**RSE “Kazhydromet”**

**Mudflow on Talgar river was stopped by protection dam**

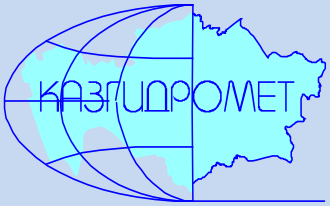




# RSE “Kazhydromet”

## Flooding in the South Kazakhstan region in January 2013

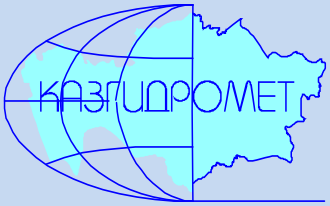




# RSE “Kazhydromet”

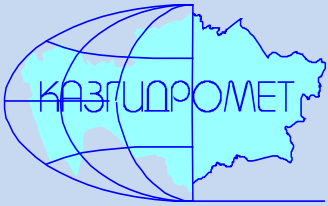
## Flooding in the South Kazakhstan region in January 2013





## Flooding in the South Kazakhstan region in January 2013



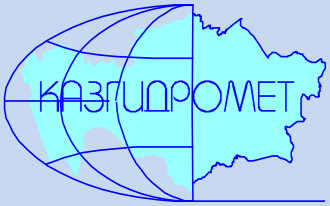


# The current hydrological situation

## Flooding in the East Kazakhstan region

- High temperatures, heavy snowmelt and heavy rains (30 mm) formed floods on 27 - 29 April 2015 on East Kazakhstan region's rivers.
- On the rivers Kurshim, Ulba, Oba, Buktyrma waters level reached 0.8-1.5 m. The water level of river Buktyrma located near village Lesnaya Pristan and river Oba located near Shemonaiha town exceeded the historical maximum.
- In villages of Glubokovski, Zyryanovsky, Katon-Karagai, Urdzharsky districts and in Ust-Kamenogorsk were flooded 356 houses, gardens . The local population were evacuated.



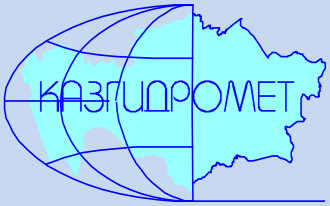


# The current hydrological situation

## Flooding in the East Kazakhstan region



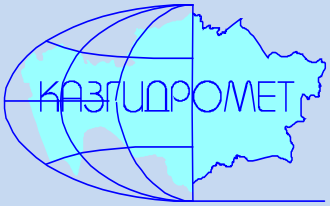




# The current hydrological situation

## Flooding in the East Kazakhstan region

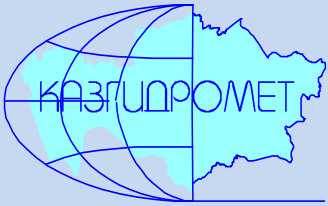




# The current hydrological situation

## Flooding in the East Kazakhstan region



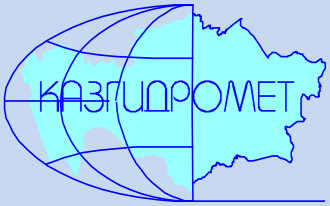


# The current hydrological situation

## Flooding in the Karaganda region

- From 8 April, a sharp increase in air temperature, high snow cover and high fall moisture (2-2.5 above normal) influenced the rivers of the Karaganda region. It caused the rapid development of spring flood. Samarkand and Sherubaynurinskyi water reservoirs, that exceeded their capacity, has impaired the hydrological situation in the region.
- The height of the flood waves at rivers Sarysu, Jaman-Sarysu, Sokur, Karakengir, Tokyrauyn, Zhamankon reached 2-4 m, at river Sherubainura 4.3 - 4.6 m, at river Nur 3 - 6 m.
- In the region settlements, roads, bridges were flooded and houses were destroyed. Also farmers suffered heavy damage.
- Water level in the Karaganda region rivers in 2015 was extremely high.

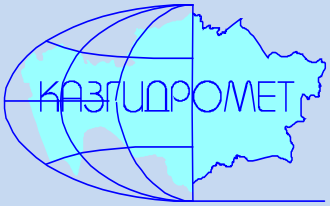




# The current hydrological situation

## Flooding in the Karaganda region

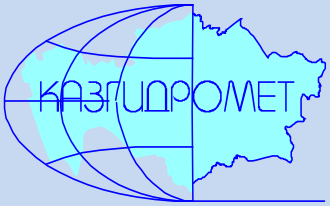




# The current hydrological situation

## Flooding in the Karaganda region

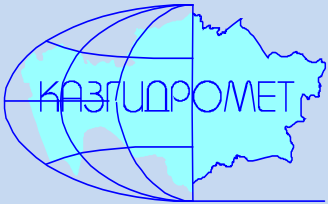




# The current hydrological situation

## Flooding in the Karaganda region

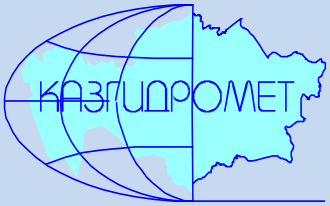




# The current hydrological situation

## Flooding in the Akmola region

- In 11-12 April 2015 Akmola region rivers' (Yesil, Moiylidy, Jabai, Siletty, Kalkutun) water level sharply raised. The water level in rivers reached 2.5 - 5.2 m.
- Exceeding the dangerous marks of water level was mentioned on river Yesil – villages Turgenevka, Kalkutan Jabai and town Atbasar.
- In Atbasar 18 houses, farm building and gardens were flooded.

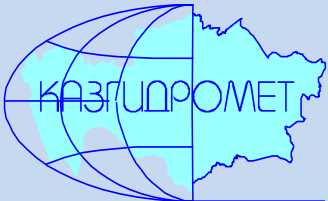


# The current hydrological situation

## Flooding in the Akmola region



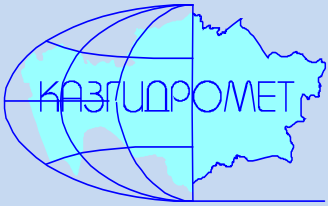




# The current hydrological situation

## Flooding in the Akmola region

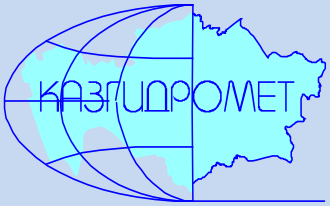




# The current hydrological situation

## Flooding in the Northern Kazakhstan region

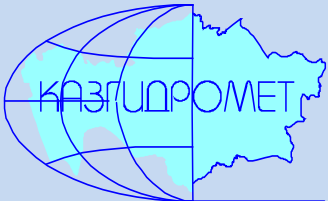
- In the second part of April, on the rivers of Northern Kazakhstan region spring flooding began developed . Esil water level is still rising and reach 4 - 9 m.
- River floodplain expansion is observed in Novonikolsk, Dolmatovo villages and Petropavlovsk city.
- Suburban areas and road of international importance 528 km Chelyabinsk – Novosibirsk were flooded.



# The current hydrological situation

## Flooding in the Northern Kazakhstan region





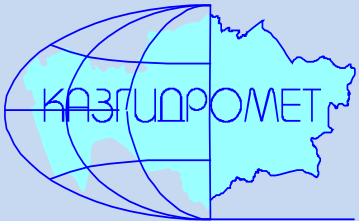
# HYDROLOGICAL SERVICE



**Kazhydromet**  
**Flash flood early warnings**



**The main consumers of water outputs are the state structures, mass media and various sectors of the economy, including transport, energy sector.**



# RSE “Kazhydromet”

At end of 2010 the equipment was purchased to create a computing cluster and engineers and forecasters assigned to the project

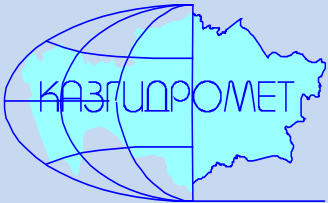


**Room with forecaster workstations and Supervisory Control computing cluster**

**Computing cluster: Intel Xeon processor 5500, the total number of cores 64.**







# RSE “Kazhydromet”

Computing Center web portal : [www.wrf.hydromet.kz](http://www.wrf.hydromet.kz)

Документация: x Приемная комиссия ЕН: x МЕТЕОГРАММАЛАР (АУ: x

Manzura

wrf.hydromet.kz/links2/2015-04-08/kz\_meteograms.html

АУА РАЙЫ ЗЕРТЕУ ЖӘНЕ БОЛЖАУ МОДЕЛІ - Weather Research and Forecasting (WRF) Model

108.04.2015

**ЖАУЫН-ШАШЫН**  
**ҚАР**  
**БҮЛТ**  
**ТЕМПЕРАТУРА**  
**ЖЕЛ**  
**АТМОСФЕРАЛЫҚ ҚЫСЫМЫ**

• **МЕТЕОГРАММАЛАР**

**AZƏRBAYCAN**  
**ҚЫРҒЫЗСТАН**  
**ТОЧИКИСТОН**  
**TÜRKMENISTAN**  
**O'ZBEKISTON**

◦ **ҚАЗАҚСТАН**

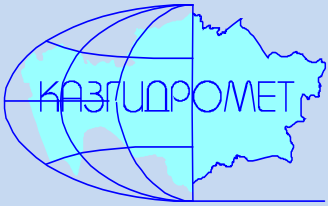
**Ақмола облысы**  
**Ақтөбе облысы**  
**Алматы облысы**  
**Атырау облысы**  
**Батыс-Қазақстан облысы**  
**Жамбыл облысы**  
**Қарағанды облысы**  
**Қостанай облысы**  
**Қызылорда облысы**  
**Манғыстау облысы**  
**Оңтүстік-Қазақстан облысы**  
**Павлодар облысы**  
**Солтүстік-Қазақстан облысы**  
**Шығыс-Қазақстан облысы**

**ҚАЗАҚСТАН ҚАЛАЛАРЫНЫҢ МЕТЕОГРАММАЛАРЫ**

Астана:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Көкшетау:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Ақтөбе:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Алматы:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Талдықорған:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Атырау:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Орал:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Тараз:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Қарағанды:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Қостанай:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Қызылорда:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Ақтау:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Шымкент:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Павлодар:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Петропавл:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>
Өскемен:	<a href="#">36h-18km</a>	<a href="#">36h-02km</a>	<a href="#">36h-02km_h</a>	<a href="#">96h-18km</a>	<a href="#">168h-18km</a>

Microsoft PowerP...

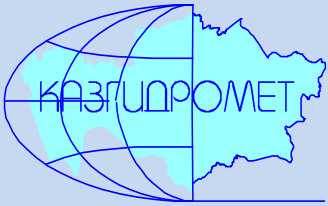
11:50  
08.04.2015



# RSE “Kazhydromet”

## *The model prepares:*

1. 3 different assembly domains for the prediction of air temperature near the ground, at the height of the AT-850 hPa and ground temperature,
2. The general accumulated precipitation and precipitation scheme convective clouds (for the warm half of the year),
3. field level pressure,
4. surface wind field and its impulses,
5. the field surface of AT-500 hPa and cloud cover,
6. the first frost in the air and on the ground (in the autumn),
7. dangerous heat (in the summer) and dangerous cold (in winter),
8. the forecast stream flows on the surface of AT- 500 hPa in Kazakhstan
9. etc

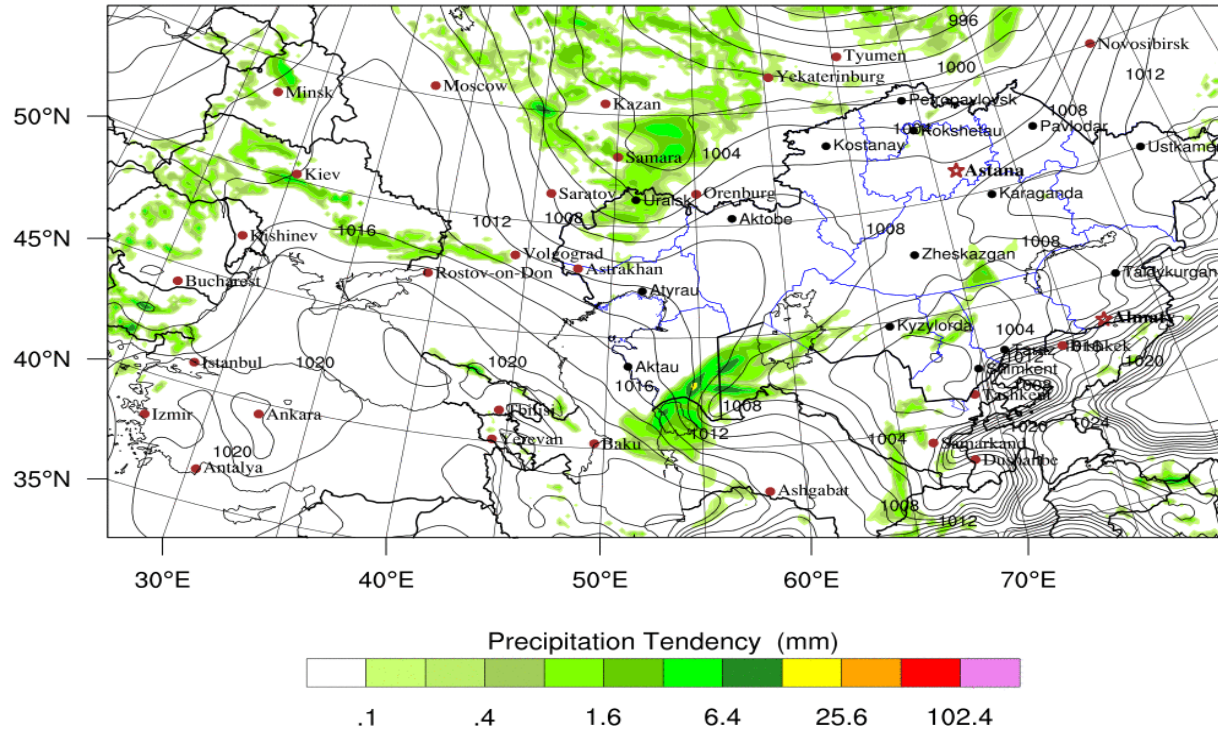


# RSE "Kazhydromet"

## KAZHYDROMET REAL-TIME WRF

Init: 2015-04-25\_12:00:00  
Valid: 2015-04-25\_15:00:00

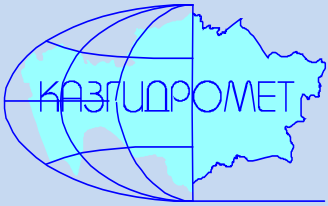
Precipitation Tendency from 2015-04-25\_12:00:00 to 2015-04-25\_15:00:00 (mm)  
Sea Level Pressure (hPa)



OUTPUT FROM WRF V3.5.1 MODEL  
WE = 270 ; SN = 150 ; Levels = 30 ; Dis = 18km ; Phys Opt = 4 ; PBL Opt = 1 ; Cu Opt = 1

**Forecast of MSL Pressure and Precipitation, issued on 25 April 2015 (18km)**



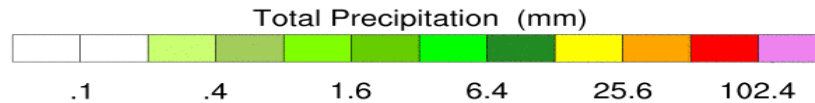
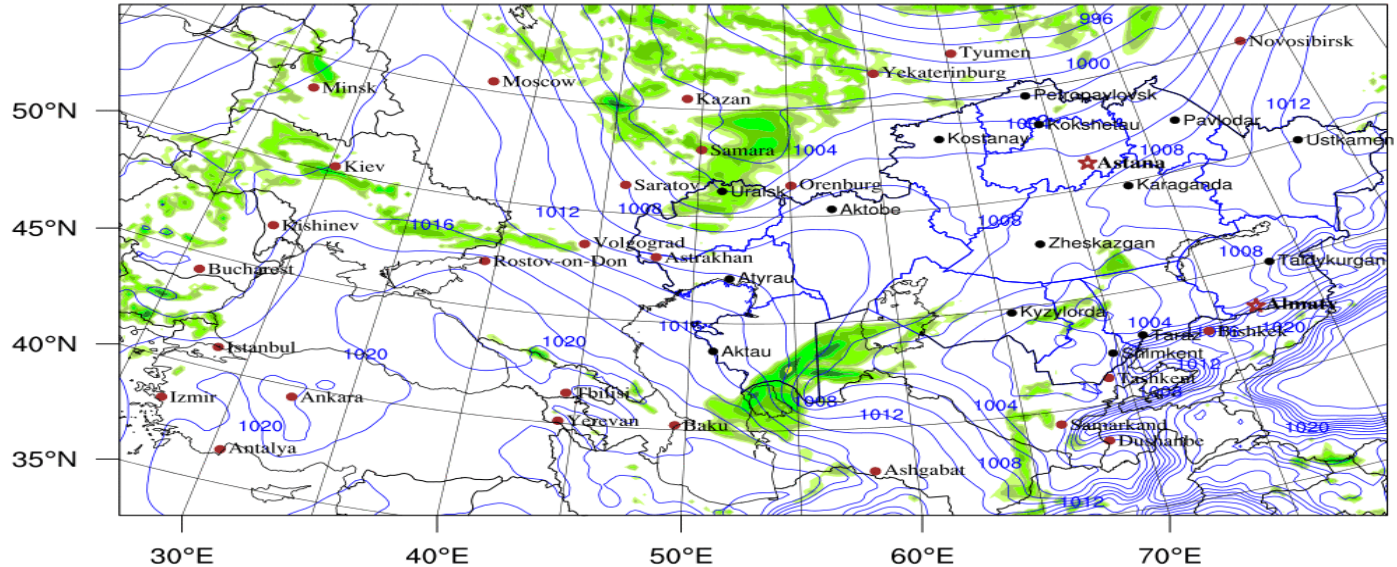


# RSE "Kazhydromet"

## KAZHYDROMET REAL-TIME WRF

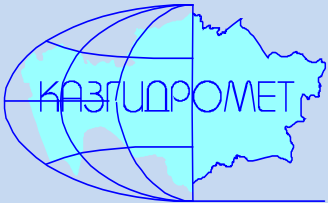
Init: 2015-04-25\_12:00:00  
Valid: 2015-04-25\_15:00:00

Total Precipitation (mm)  
Sea Level Pressure (hPa)



OUTPUT FROM WRF V3.5.1 MODEL  
WE = 270 ; SN = 150 ; Levels = 30 ; Dis = 18km ; Phys Opt = 4 ; PBL Opt = 1 ; Cu Opt = 1

Forecast of MSL Pressure and accumulated precipitation, issued on 25 April 2015 (18km)

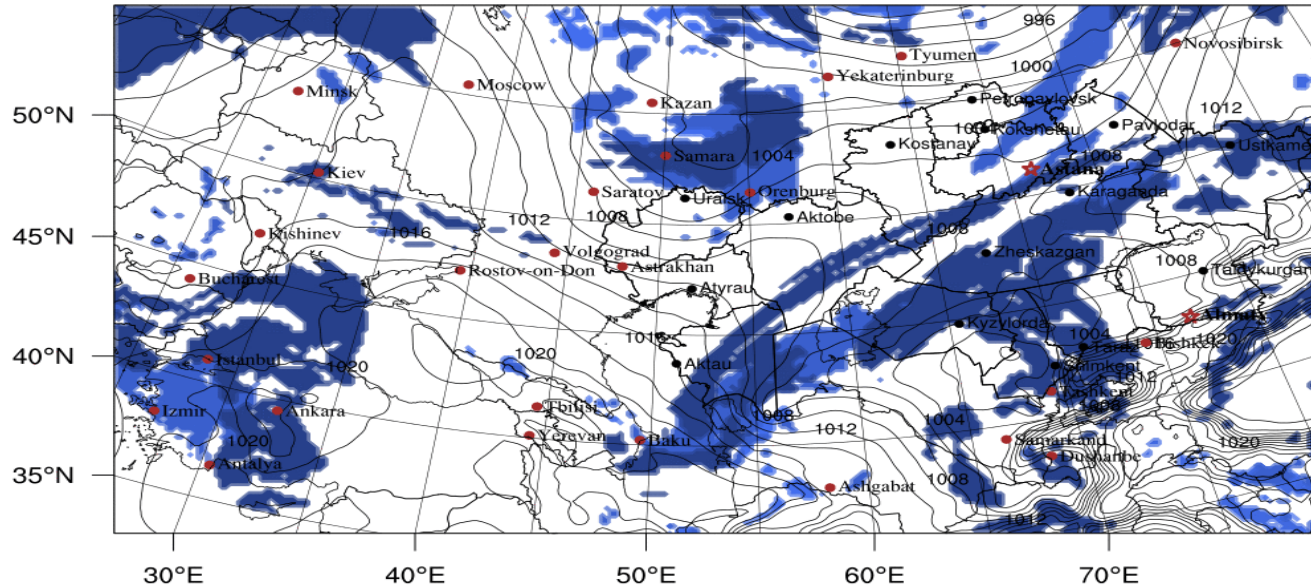


# RSE "Kazhydromet"

## KAZHYDROMET REAL-TIME WRF

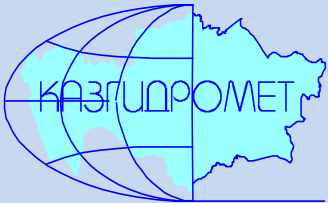
Init: 2015-04-25\_12:00:00  
Valid: 2015-04-25\_15:00:00

Cloud fraction



OUTPUT FROM WRF V3.5.1 MODEL  
WE = 270 ; SN = 150 ; Levels = 30 ; Dis = 18km ; Phys Opt = 4 ; PBL Opt = 1 ; Cu Opt = 1

The air pressure at the surface and cloud cover, issued from 25 April 2015 (18km)



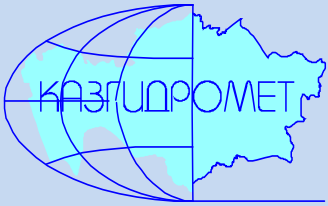
# RSE “Kazhydromet”

*Heavy rain was observed in Almaty 26 April 2015 during the day.*

Heavy rain is the cause of a traffic jam, a flooded intersection and a flooded private sector in the lower parts of the city.

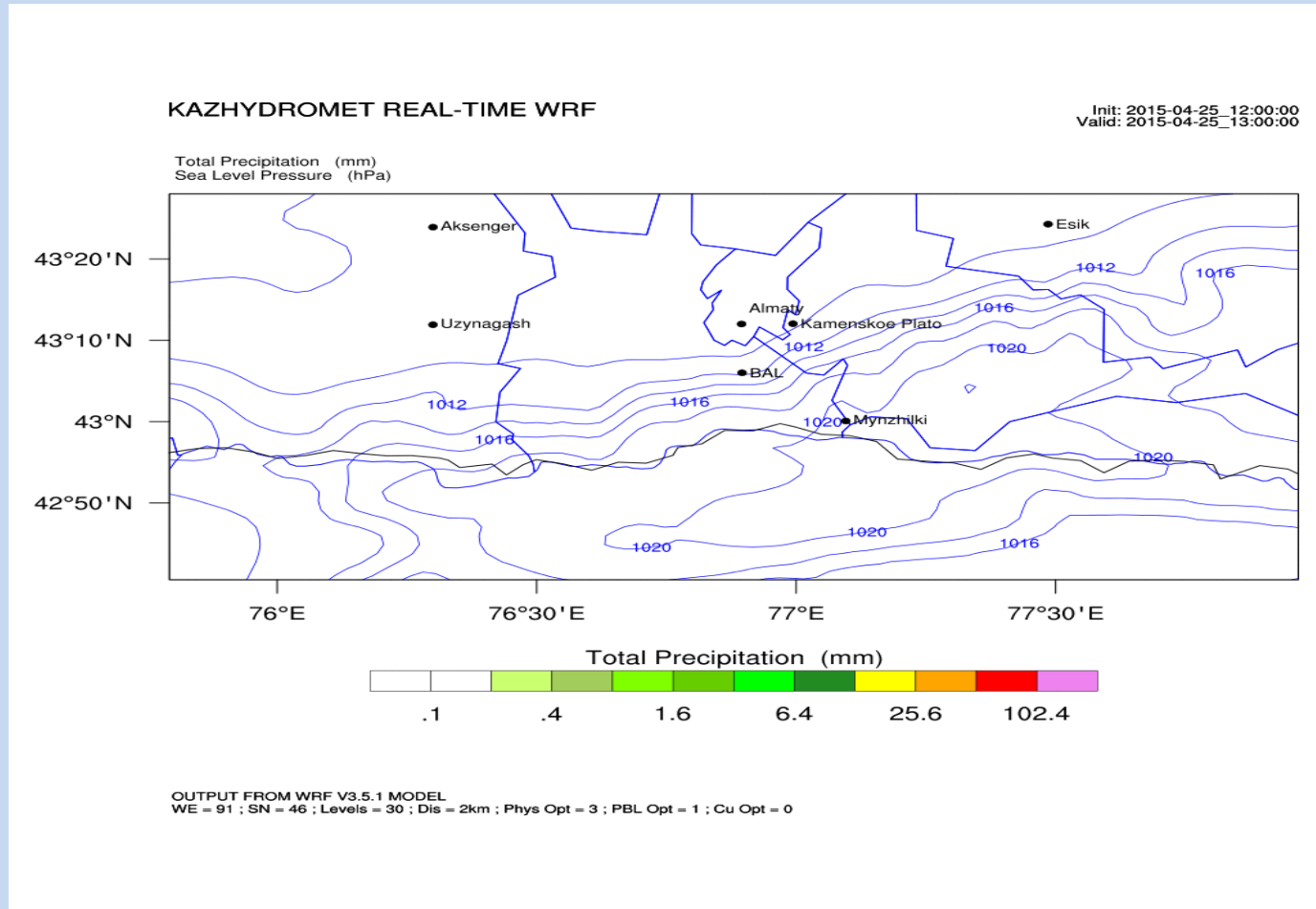


**Heavy rain in Almaty on 26 April 2015**



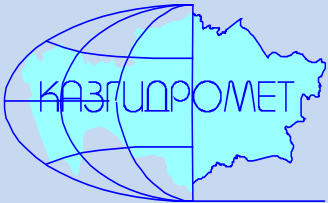
# RSE “Kazhydromet”

**Forecasting meteorology: air temperature, precipitation, wind in mountain and foothill areas of the Almaty region, with a resolution of 2 km.**



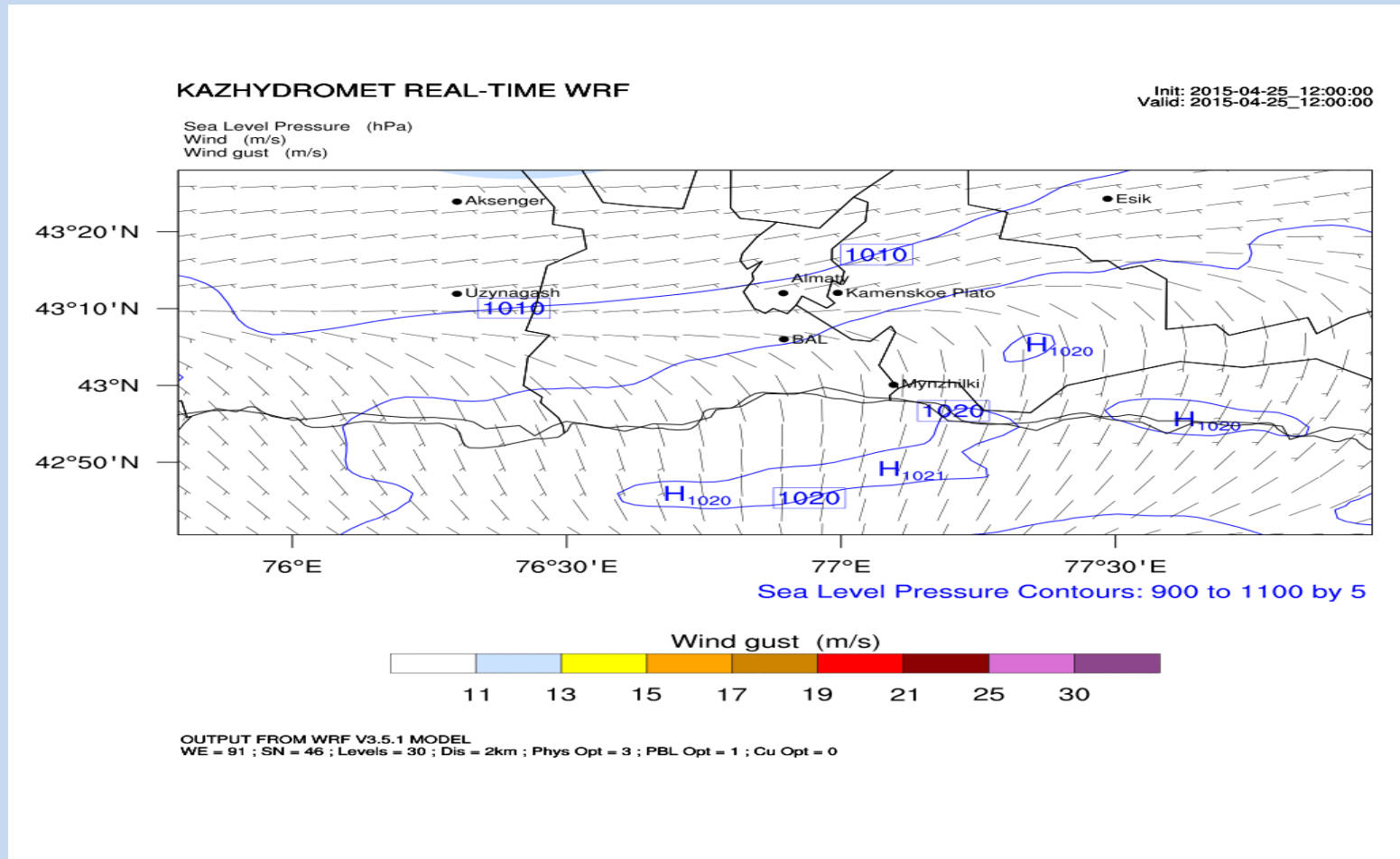
**Rainfall forecast for 36 hours on Zailiysky mountains, with a resolution of 2 km.**



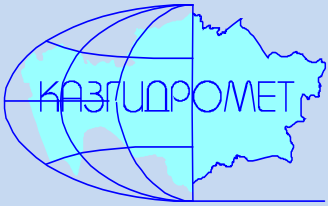


# RSE “Kazhydromet”

Forecasting meteorology: air temperature, precipitation, wind, mountain and foothill areas of the Almaty region, with a resolution of 2 km.

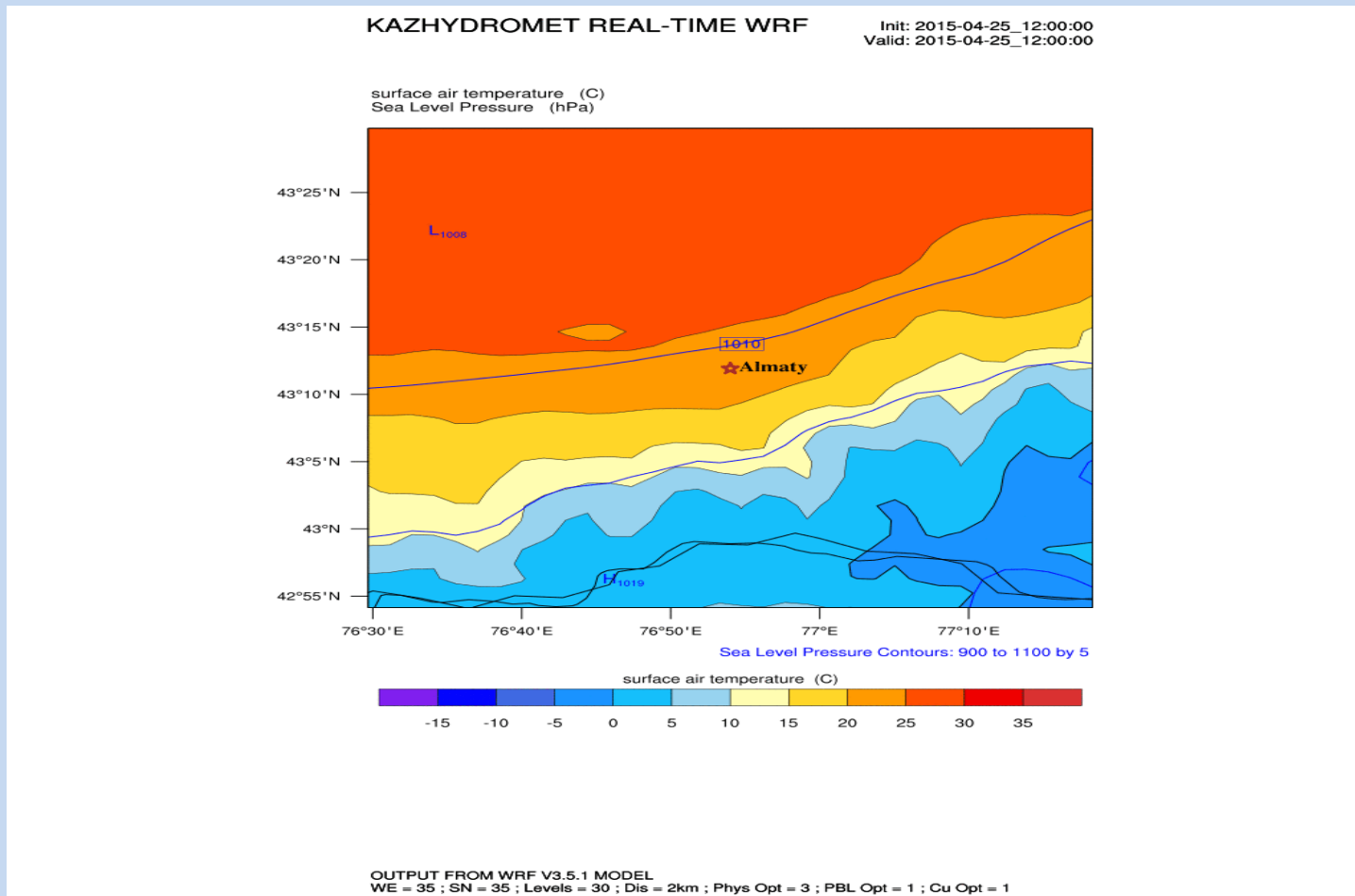


Forecast of wind speed, issued from 25 April 2015 (2 km)

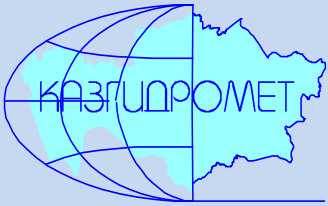


# RSE “Kazhydromet”

The calculation is made detailed on the Kazakhstan (2 km resolution) with the following meteorological parameters: air temperature, precipitation, wind and meteograms for 19 cites.

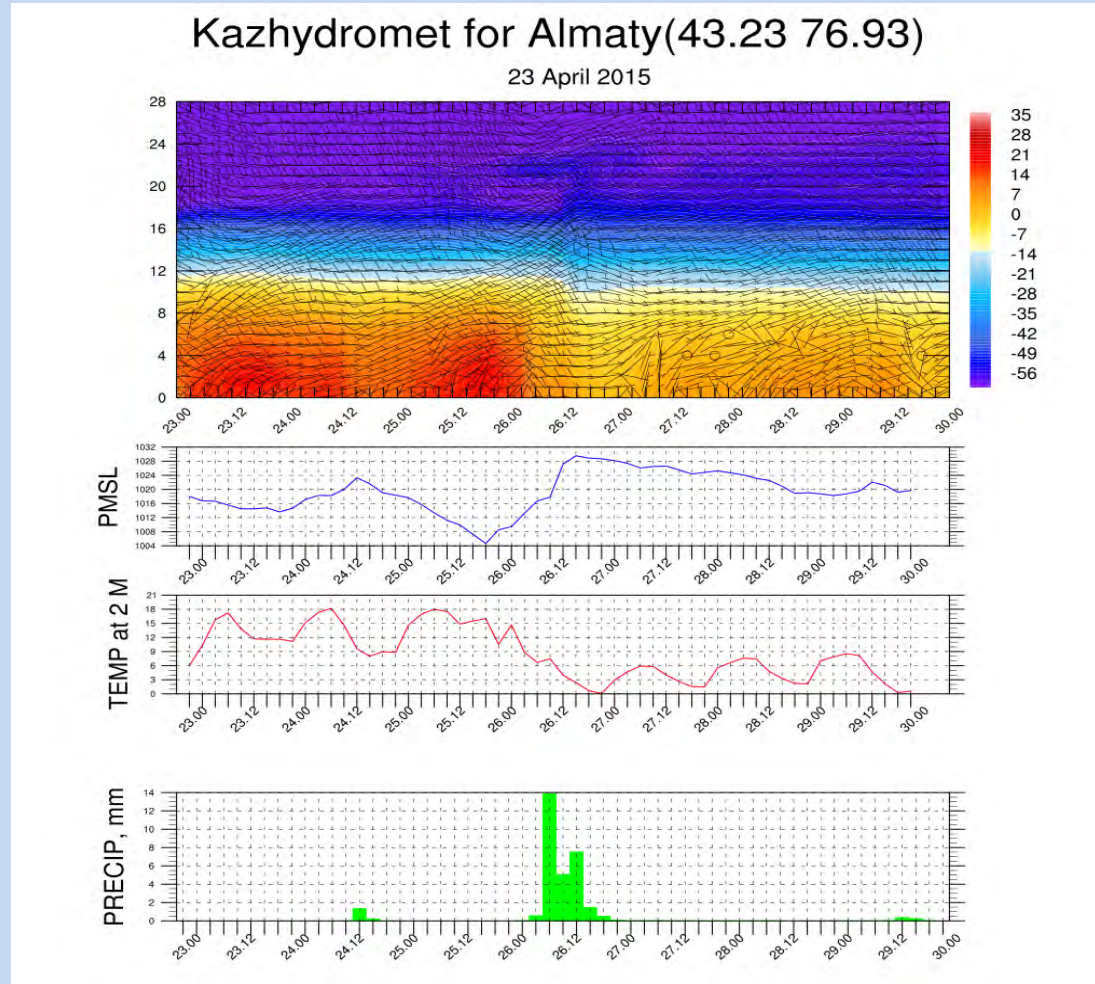


**Forecast fields of air temperature at 2 m, issued from 13 April 2015**

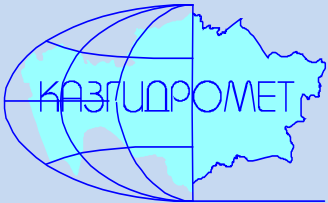


# RSE “Kazhydromet”

The calculation is performed by meteograms for 84 cities in Central Asia with a forecast 168 hours

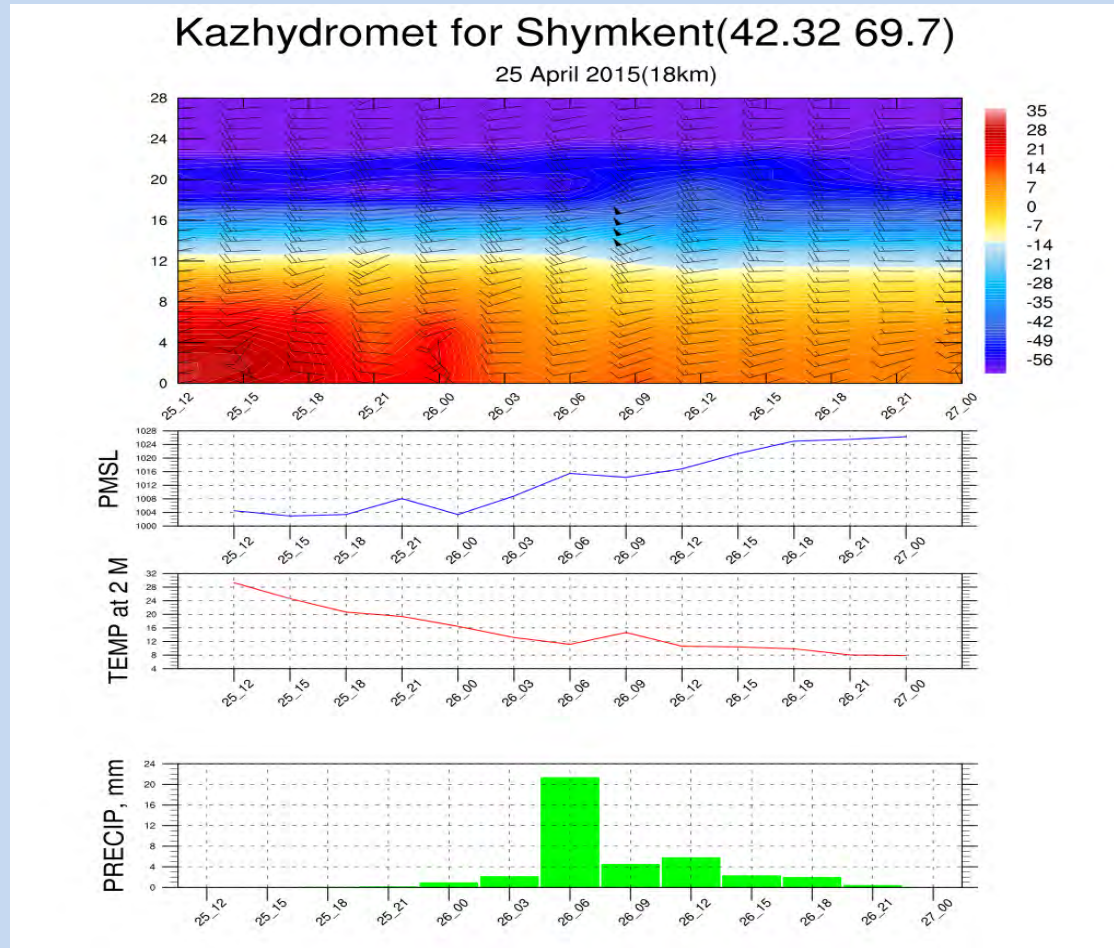


168 hours forecast for Almaty, with a resolution of 18 km.



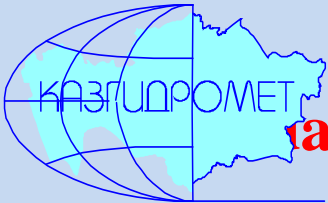
# RSE “Kazhydromet”

The calculation is performed by meteograms for 318 cities in Central Asia with a forecast 36 hours



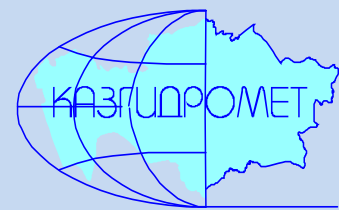
36 hours forecast for Shymkent, with a resolution of 18 km.





## **Summary: heavy rain was observed in the southern regions of Kazakhstan on 26<sup>th</sup> April**

meteorological station	rain (mm)		meteorological station	rain (mm)	
	night	day		night	day
<b>Almaty</b>		<b>30</b>	<b>Zhanatas</b>	<b>4</b>	<b>18</b>
<b>Medeo</b>		<b>42</b>	<b>Tasaryk</b>	<b>9</b>	<b>23</b>
<b>Kamenskoe Plato</b>		<b>38</b>	<b>Shymkent</b>	<b>20</b>	<b>24</b>
<b>T.Ryskulova</b>	<b>21</b>	<b>29</b>	<b>Karak</b>	<b>22</b>	<b>4</b>
<b>Chuuldak</b>	<b>5</b>	<b>25</b>	<b>Esik</b>		<b>20</b>
<b>Kyzylgurt</b>	<b>11</b>	<b>23</b>	<b>Chayan</b>	<b>18</b>	<b>11</b>



# RSE “Kazhydromet”

The CGIAR-CSI Geo Portal is able to provide SRTM 90m Digital Elevation Data for the entire world.

The CGIAR Consortium for Spatial Information (CGIAR-CSI)

Applying GeoSpatial Science for a Sustainable Future...

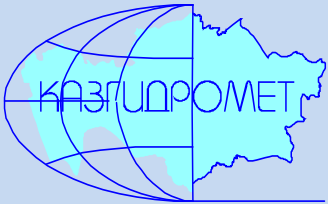
CGIAR-CSI logo and navigation: << BACK TO SEARCH | CSI HOME | SRTM MAIN | HELP

2 Items have been Found.

Description	Location	Image
<p>Product : SRTM 90m DEM version 4</p> <p>Data File Name : srtm_50_02.zip</p> <p>Mask File Name : srtm_mk_50_02.zip</p> <p>Latitude min: 50 N max: 55 N</p> <p>Longitude min: 65 E max: 70 E</p> <p>Center point : Latitude 52.50 N Longitude 67.50 E</p> <p>CSI Server : <a href="#">Data Download (FTP)</a> <a href="#">Data Download (HTTP)</a> <a href="#">Data Mask Download (FTP)</a> <a href="#">Data Mask Download (HTTP)</a> <a href="#">^TOP^</a></p>		
<p>Product : SRTM 90m DEM version 4</p> <p>Data File Name : srtm_51_02.zip</p> <p>Mask File Name : srtm_mk_51_02.zip</p> <p>Latitude min: 50 N max: 55 N</p> <p>Longitude min: 70 E max: 75 E</p> <p>Center point : Latitude 52.50 N Longitude 72.50 E</p> <p>CSI Server : <a href="#">Data Download (FTP)</a> <a href="#">Data Download (HTTP)</a> <a href="#">Data Mask Download (FTP)</a> <a href="#">Data Mask Download (HTTP)</a> <a href="#">^TOP^</a></p>		

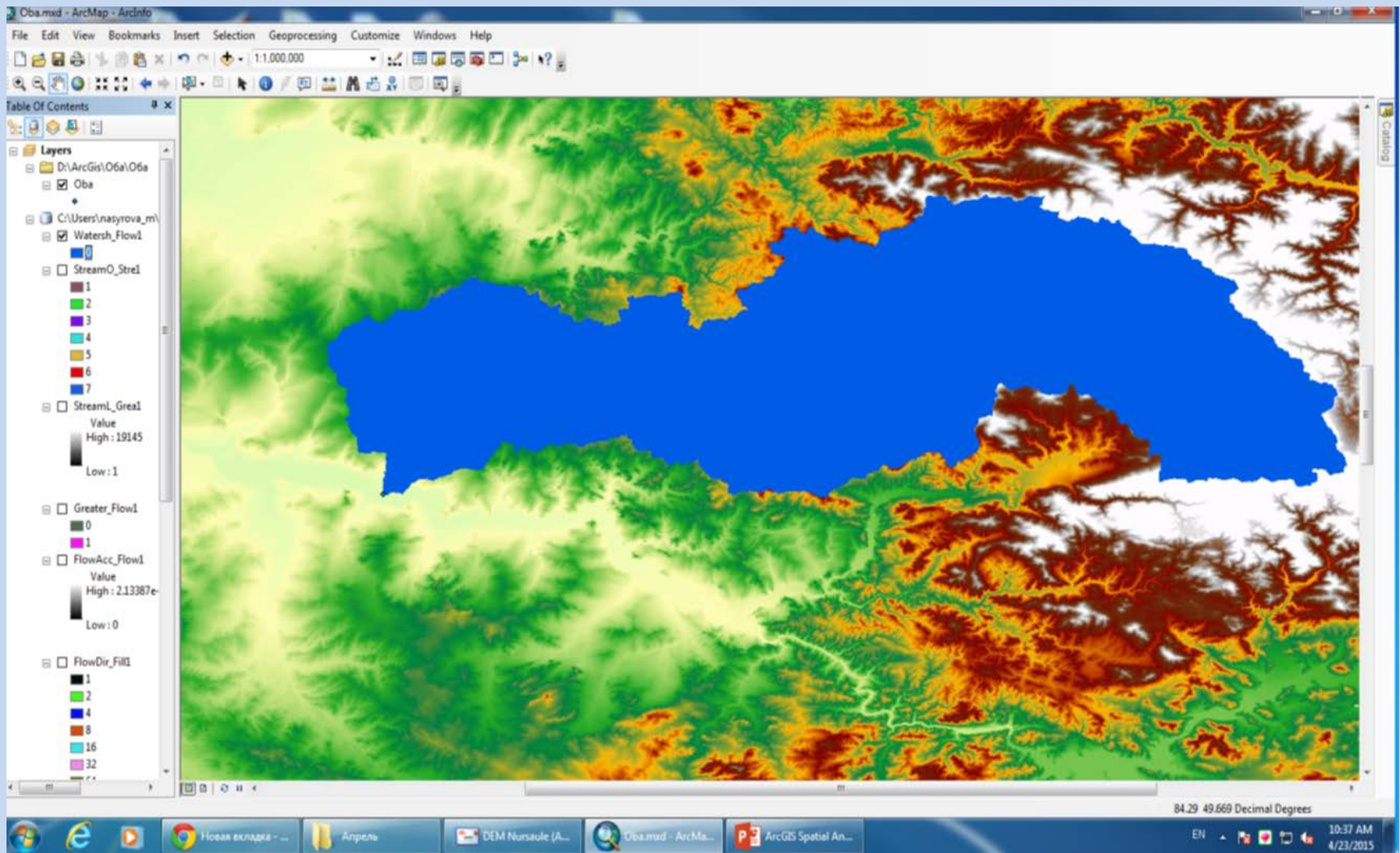
[rtnm.csi.cgiar.org/SRT-ZIP/SRTM\\_V41/SRTM\\_Data\\_GeoTiff/srtm\\_50\\_02.zip](http://rtnm.csi.cgiar.org/SRT-ZIP/SRTM_V41/SRTM_Data_GeoTiff/srtm_50_02.zip)

<http://srtm.csi.cgiar.org/>



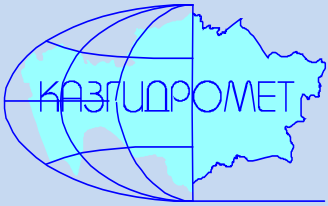
# RSE “Kazhydromet”

## Using ArcGIS Spatial Analyst Tools for calculation watershed of river



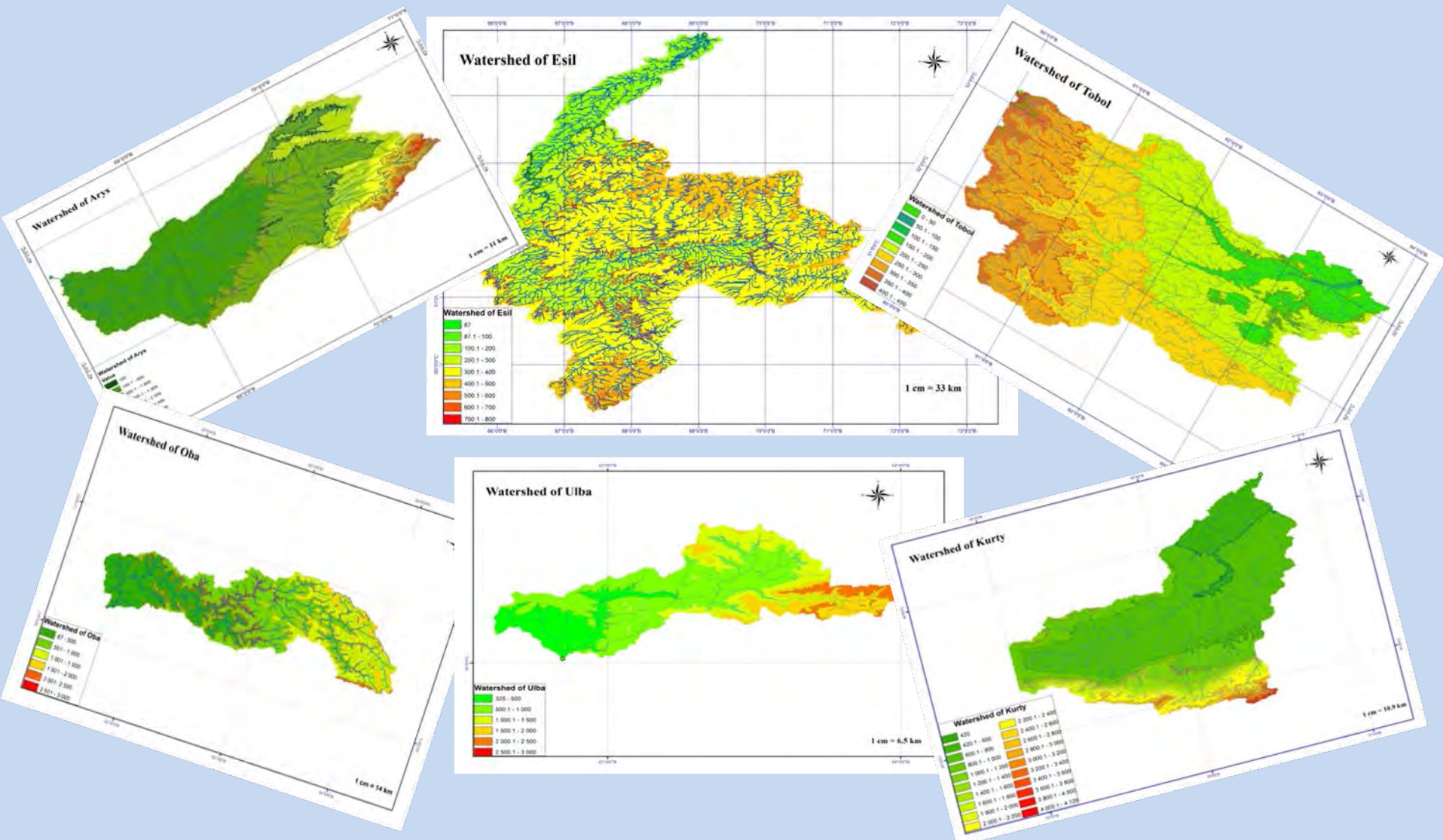
Digital elevation watershed model of the river Oba



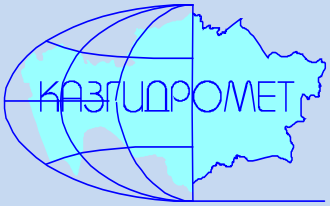


# RSE “Kazhydromet”

## Hydrological modeling



**Digital elevation watershed of the rivers: Oba, Esil, Tobol, Arys, Kurty, Ulba**



**Thank you for attention**