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БІЛІМ ЖӘНЕ ҒЫЛЫМ МИНИСТРЛІГІ

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ
РЕСПУБЛИКИ КАЗАХСТАН

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AUTOMATIC DATA COLLECTION ON MONITORING THE CLIMATIC AND ECOLOGICAL STATE OF THE REGION

Abstract. This article about automatic data collection on monitoring the climatic and ecological state of the region. To collect and process data from Internet resources, it was necessary to create a tool that collects, systemizes and normalizes heterogeneous information on a schedule.

Keywords: climat, ecology, monitoring, automatization, data.

Parameter P is the integral index of air pollution in the city, which is the frequency response and represents the ratio of the number of significantly increased concentrations of impurities in the air, measured during the day, to the total number of measurements during the same day.

To calculate the "P" parameter and its use as a characteristic of the air pollution level in the city as a whole, it is necessary to observe the following conditions:

- the number of stationary points in the city should be at least three;
- the number of observations of the concentrations of impurities in the air at all posts during the day should be at least 20;

The work is carried out in the following order:

1. Selection of a number of observations, which will be used to obtain predictive schemes.
2. Calculation of average seasonal concentrations for individual impurities for the selected period.
3. Calculation of the parameter "P" separately for each impurity and in the sum for all impurities.

Selection of a series of observations

It must be remembered that the analysis of samples over the selected number of years should be carried out by one method.

Calculation of mean seasonal concentrations

The simplest indicator of air pollution by any impurity is the concentration averaged throughout the city and for all the periods of observation of a given day.

Operating procedure:

Stage 1: calculation of average monthly concentration.

$$\overline{q}_{ср.м} = \frac{1}{n}\sum_{i=1}^{n} q_i \qquad (1.1)$$

where q_i – is the concentration for the *i*-th observation period, n is the number of observations per month.

For operational work using the parameter "P", calculating the average monthly concentration is a mandatory step.

To perform this task, templates were prepared in Excel. If the observation post is sampling three times per day, then the template "Template for calculating q and P for three terms" is used, when four urgent observations use the "Template for calculating q and P for four terms".

In the template, for each month, separate sheets are selected to fill in the impurity data (Fig. 2.)

	Дата	Срок	Взвешенные частицы (пыль)	Диоксид серы	Сульфаты растворимые	Оксид углерода	Диоксид азота	Оксид азота	Озон	Сероводород	Фенол	Фтористый водород	Хлор	Хлористый водород	Аммиак	Серная кислота и сульфаты	Формальдегид	Неорганические соединения мышьяка	Хром шестивалентный	Суммарные углеводороды
8		7																		
9		13																		
0		19																		
1		7																		
2		13																		
3		19																		
4		7																		
5		13																		
6		19																		
7		7																		
8		13																		
9		19																		
0		7																		
1		13																		
2		19																		
3		7																		
4		13																		
5		19																		
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7		13																		
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9		7																		
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9		13																		
0		19																		
1		7																		
2		13																		
3		19																		
4		7																		
5		13																		
6		19																		
7		7																		
8		13																		
9		19																		
0		7																		
1		13																		
2		19																		

январь | февраль | март | апрель | май | июнь | июль | август | сентябрь | октябрь | ноябрь | декабрь | Расчеты | Расчеты параметр "Р" | Сезоны | Сроки

Figure 1. Type of template for filling in data

Sheets "Calculations", "Calculations parameter P", "Seasons", "Timing" - does not apply to operational work, these sheets are intended for analysis and research purposes.

After the data for the last month is filled, the average concentration of pollutants for the month is calculated by the formula (1)

In the template used, the calculation is output at the end of the sheet, after the maximum and minimum values for the period (Fig. 2.).

23		31.1	7	0.3	0.271		1.00	0.000		
24		31.1	13	0.3	0.237		1.00	0.040		
25		31.1	19	0.2	0.270		2.00	0.030		
26	макс			0.4000	0.4170	0.0000	2.0000	0.2600	0.0000	0.0000
27	мин			0.0000	0.0530	0.0000	0.0000	0.0000	0.0000	0.0000
28	ср			0.1293	0.1459		0.5435	0.0523		

Figure 2. Calculated mean monthly concentrations of pollutants

Calculation of the average monthly concentration of pollutants is carried out for all observation post , whose data are used in the operational calculation of the parameter P.

Stage 2: Template calculation of parameter P.

Calculate the average monthly concentrations of pollutants and copy in the template calculation of parameter P, the sheet "Avg. months. *q* from 2012 to 20XX "is inserted in the corresponding month for each observation post . An example of a sheet for filling average monthly values illustrated in (Fig. 3).

ЯНВАРЬ | ФЕВРАЛЬ | МАРТ | АПРЕЛЬ | МАЙ | ИЮНЬ

ИЮЛЬ | АВГУСТ | СЕНТЯБРЬ | ОКТЯБРЬ | НОЯБРЬ | ДЕКАБРЬ

ЯНВАРЬ

ПНЗ № 1	Взвешенные частицы (пыль)	Диоксид серы	Сульфаты растворимые	Оксид углерода	Диоксид азота	Оксид азота	Озон	Сероводород	Фенол	Фтористый водород	Хлор	Хлористый водород	Аммиак	Серная кислота и сульфаты	Формальдегид	Неорганические соединения мышьяк	Хром шестивалентный	Суммарные углеводороды
2012	0	0.01413		0.72527	0.02591													
2013	0	0.01004		0.28125	0.02438													
2014	0	0.00665		0.21875	0.00708													
2015	0.00521	0.00961		0.41667	0.01625													
2016	0.00217	0.00872		0.57609	0.015													
2017	0	0.0089		0.32609	0.01													
2018																		
2019																		
2020																		
2021																		
2022																		
2023																		
2024																		
2025																		
q ср.м	0.00123	0.00968	#ДЕЛ/0!	0.42402	0.01644	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!

ЯНВАРЬ

ПНЗ № 4	Взвешенные частицы (пыль)	Диоксид серы	Сульфаты растворимые	Оксид углерода	Диоксид азота	Оксид азота	Озон	Сероводород	Фенол	Фтористый водород	Хлор	Хлористый водород	Аммиак	Серная кислота и сульфаты	Формальдегид	Неорганические соединения мышьяк	Хром шестивалентный	Суммарные углеводороды
2012	0	0.01533		1.36232	0.03577			0.00235							0.00887			
2013	0.00139	0.01054		0.26389	0.03708			0.00442							0.00722			
2014	0.00139	0.00671		0.5	0.02389										0.00206		0.00014	
2015	0.0125	0.01096		2.75	0.01875										0.00717		0.00057	
2016	0.00145	0.01083		0.4058	0.02478										0.00749		0.00039	
2017	0	0.01016		6.95652	0.01754			0.00349							0.00625		0.00052	
2018																		
2019																		
2020																		
2021																		
2022																		
2023																		
2024																		
2025																		
q ср.м	0.00279	0.01075	#ДЕЛ/0!	2.03975	0.0263	#ДЕЛ/0!	#ДЕЛ/0!	0.00342	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	0.00651	#ДЕЛ/0!	0.0004	#ДЕЛ/0!

Сред. мес. q с 2012 по 20XX | Прогноз qср.сезон | ПРОГНОСТИЧЕСКИЙ "Р" | Фактический "Р" и графики

Figure 3. Example of filling a sheet with average monthly values of pollutants

Daily operational forecast for parameter P

I. With daily operational forecasting, the average level of air pollution taken into account during the corresponding three-month period of the previous year and the previous month of the year. For example, for March 2001:

$$q_{ср.сез.III.2001} = \frac{(\bar{q}_{II} + \bar{q}_{III} + \bar{q}_{IV})_{2000} + \bar{q}_{II\,2001}}{4} \quad (2)$$

These calculations are automated, when filling out the data on the sheet "Avg. months. *q* from 2012 to 20XX ", is calculated and displayed on the" Forecast qsr.season "sheet.

Calculation of the average level of air pollution must be made on the 1-day of each month and used throughout the forecast month. An example of the calculated values of *qsr.season* illustrated in (Fig. 3).

	Взвешенные частицы (пыль)	Диоксид серы	Сульфаты растворимые	Оксид углерода	Диоксид азота	Оксид азота	Озон	Сероводород	Фенол	Фтористый водород	Хл
										НОЯБРЬ	
октябрь2016	0.041132	0.014154	#ДЕЛ/0!	2.884615	0.022372	0.028462	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕ
ноябрь2016	0.000321	0.013999	#ДЕЛ/0!	3.180411	0.018397	0.022881	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕ
декабрь2016	0	0.009726	#ДЕЛ/0!	3.0625	0.013634	0.0175	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕ
октябрь2017	0.029915	0.004546	0.001526	2.338675	0.027404	0.034744	#ДЕЛ/0!	0.001064	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕ
Ноябрь2017	0.018	0.011	#ДЕЛ/0!	2.867	0.020	0.026	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕ

	Взвешенные частицы (пыль)	Диоксид серы	Сульфаты растворимые	Оксид углерода	Диоксид азота	Оксид азота	Озон	Сероводород	Фенол	Фтористый водород	Хл
										ДЕКАБРЬ	
ноябрь2016	0.000321	0.013999	#ДЕЛ/0!	3.180411	0.018397	0.022881	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕ
декабрь2016	0	0.009726	#ДЕЛ/0!	3.0625	0.013634	0.0175	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕ
январь2017	0	0.009531	0.002841	2.978261	0.015604	0.017101	#ДЕЛ/0!	0.003493	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕ
ноябрь2017	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕ
Декабрь2017	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕ

Figure 3. Example sheet for calculating the average level of air pollution

Example: On November 1, a forecast is prepared for the next day. Data for October are already available. In the "Forecast qr.season" sheet, according to the pre-determined formula -2, average monthly concentrations of pollutants are taken for October, November, December 2016 and the previous month in which the forecast is made, that is, October 2017. All data are averaged according to formula (2). The received Values are used in the forecast month (November 2017).

Note. The "Forecast qsr.season" sheet does not require additional operations. In this sheet, only the background pollution values copied.

II. To characterize air pollution in the city as a whole, on the recommendation of the “Main geophysical observatory after A.I.Voeikov” the parameter "P" is used as a characteristic of the background air pollution:

$$P = \frac{m}{n} \quad (3)$$

where n is the total number of observations of the concentration of impurities in the city for one day at all stationary points, m is the number of observations during the same day with concentrations q exceeding the mean seasonal value $qsr.sec$ more than 1.5 times (q> 1.5 $qsr.sez$).

The parameter "P" can vary from 1 (when all measured concentrations exceed 1.5 $qsr.sez$) to 0 (none of the concentrations exceeds 1.5 $qsr.sec$).

For operational forecasting, the "PROGNOSTIC" P "sheet is used. In this sheet the Calculation matrix for the parameter "P" is given (Fig. 4.).

Расчетная матрица для"P"

	Срок	Взвешенные частицы (пыль)	Диоксид серы	Сульфаты растворимые	Оксид углерода	Диоксид азота	Оксид азота	Озон	Сероводород	Фенол	Фтористый водород	Хлор	Хлористый водород	Аммиак	Серная кислота и сульфаты	Формальдегид	Неорганические соединения мышьяка	Хром шестивалентный	Суммарные углеводороды	
										МЕСЯЦ										
ПНЗ	13																			
	19																			
	1																			
	7																			
ПНЗ	13																			
	19																			
	7																			
ПНЗ	13																			
	19																			
	7																			
ПНЗ	13																			
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ПНЗ	13																			
	19																			
	7																			
ПНЗ	13																			
	19																			
	7																			
ПНЗ	13																			
	19																			
	7																			
	макс	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
	мин	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
	ср	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	P
	1.5q ср.сезон	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	#ДЕЛ/0!
	q ср.сезон																			
n	m									число превышений 1,5 q										
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ПДК		0.5000	0.5000		5.0000	0.2000	0.4000	0.1600	0.0080	0.0100	0.0200	0.1000	0.2000	0.2000	0.3000	0.0500				

Figure 4. Calculation matrix for parameter "P"

Before starting the day-to-day operational work, from the "Forecast qsr.season" sheet, the background air pollution values for the forecast month are copied to the "PROGNOSTIC" P "line, in the line qsr.season. in (Fig. 5) is highlighted in red

	макс	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.(
	мин	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.(
	ср	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#ДЕЛ/0!	#Д
	1.5q ср.сезон	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	(
	q ср.сезон										
n	m										число превышен
0	0	0	0	0	0	0	0	0	0	0	

Figure 5. Cells for *q.s.* seasons

The calculated matrix for operational work is ready. The calculated matrix is copied together with the calculated matrix for MPC, and inserted on a new sheet. We write the date for which the forecast is being prepared. In the future, we record the observation data for 13, 19 hours of the past day and 01, 07 hours of the current day.

In this template, we calculate: *n* is the total number of observations of the impurity concentration in the city for one day at all stationary points, m is the number of observations during the same day with concentrations *q* exceeding the mean seasonal value *qsr.sec*. more than 1.5 times (q> 1.5 *qsr.sez*). According to the formula for calculating the parameter "P" (formula 1.3), the prognostic value of the parameter "P" and the Standard Index (SI) calculated.

Note. The prognostic parameter "P" is considered, since this parameter is calculated with the largest close time interval to the forecast preparation time, that is, the observation data for 13, 19 hours past day and 01, 07 hours of the current day.

The actual parameter "P" is calculated according to all the dates of the current day (01, 07, 13, 19 deadlines).

III. To carry out the analysis (estimate the forecast) and compile a daily bulletin, it is necessary to calculate the actual value of the parameter "P" for the previous day.

To perform this task, the sheet "Actual" P "and graphics" is used. The operations performed in this sheet are analogous to the calculation of the prognostic "P":

- The background air pollution values for the forecast month are filled;
- Observation data are filled in according to all terms;

In this template, the actual value of the parameter "P" and the Standard Index (SI) is calculated. Graphs of the concentration of pollutants are constructed.

Note. For questions regarding templates, the office of RSE "KazHydroMet" can be contacted. The formula cannot be changed independently. All formulas on different sheets are interrelated.

Information page of city or region contain:

- name of city or region;
- table with files;
- date;
- sorting by year, month and by date range.

Each file, date and name of city get dynamically from database. We can download these files on one click from web site.

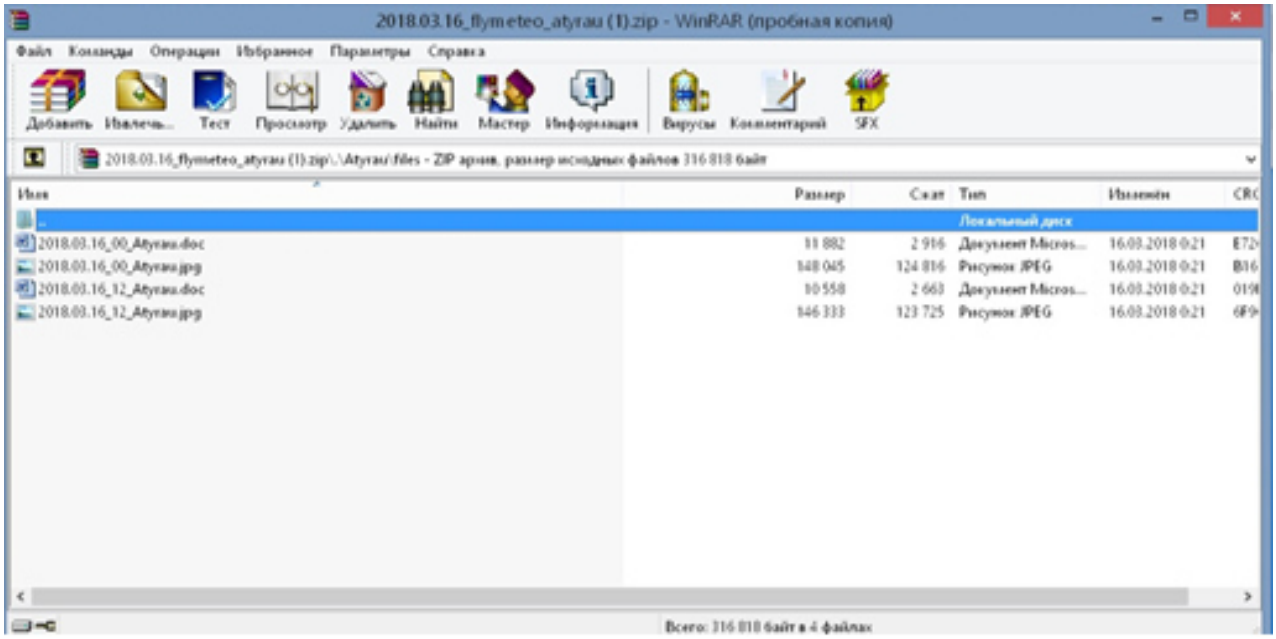

Figure 6. Representing results in archive file

There are you can see the downloaded files, in archive format. All files named by date and city name. There are several files inside the archive file, like picture from **Flymeteo.org** word format files with tables and different data's.

Scribing data from Foreca.ru

In this section there is a web interface and a database exactly like in **Flymeteo.org**

The difference is that, script collect data on the forecast for 15 days cities as:

- Almaty;
- Ashy-say;

- Aul-Turar-Ruskylova;
- Kazygurt;
- Kegen;
- Kokpekti;
- Leninogorsk;
- Lepsi;
- Sarkand;
- Shemonaiha;
- Urzhar;
- Ust-Kamenogorsk.

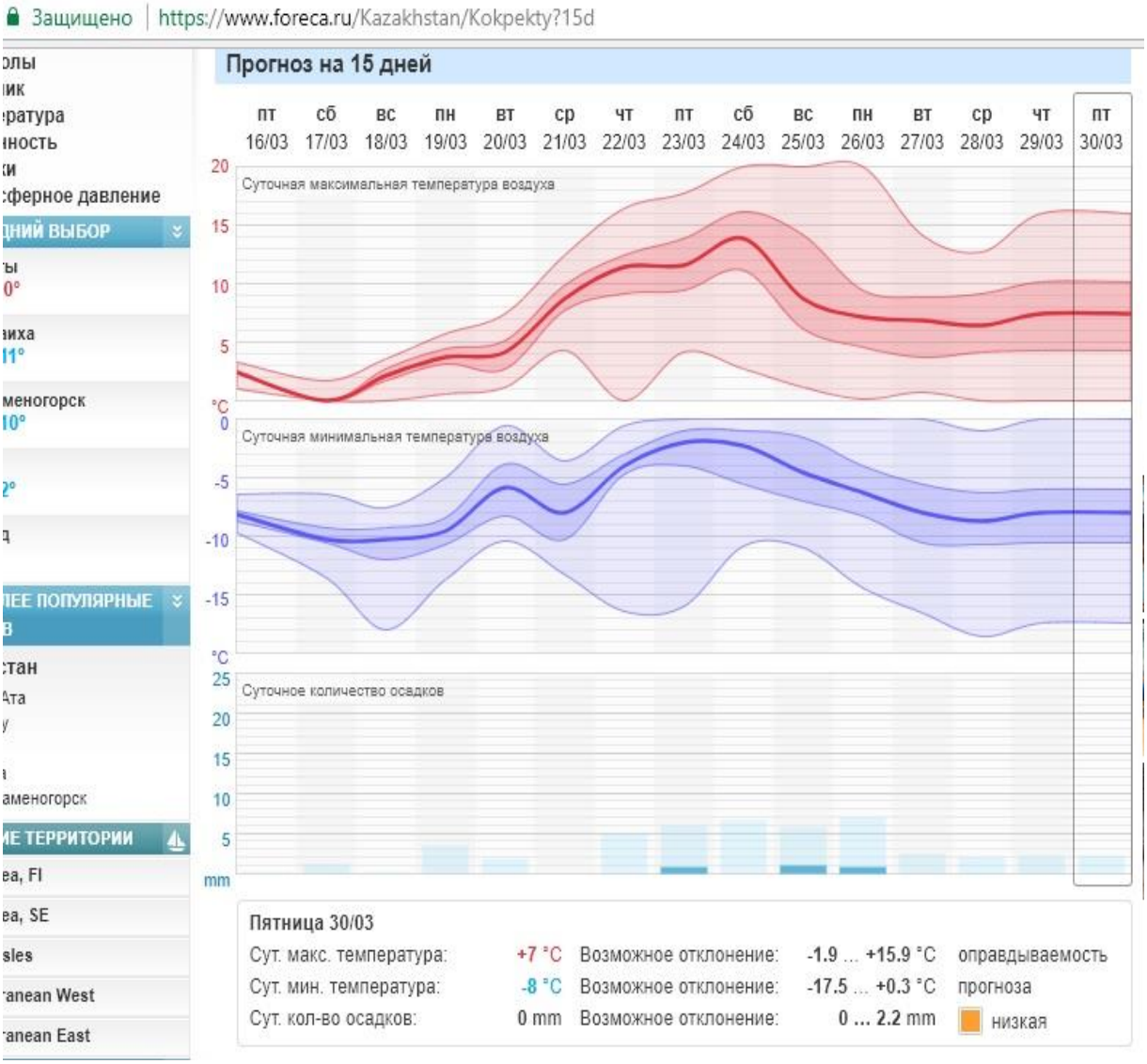

Figure 7. Forecasting 15 days forward

Here our script collects data and so archives and displays on the page, every day at the same time. The script is also started by the **Cron** system. The difference is that the script automatically sends data every day by mail, because some employees of KazHydroMet do not have access to the developed website

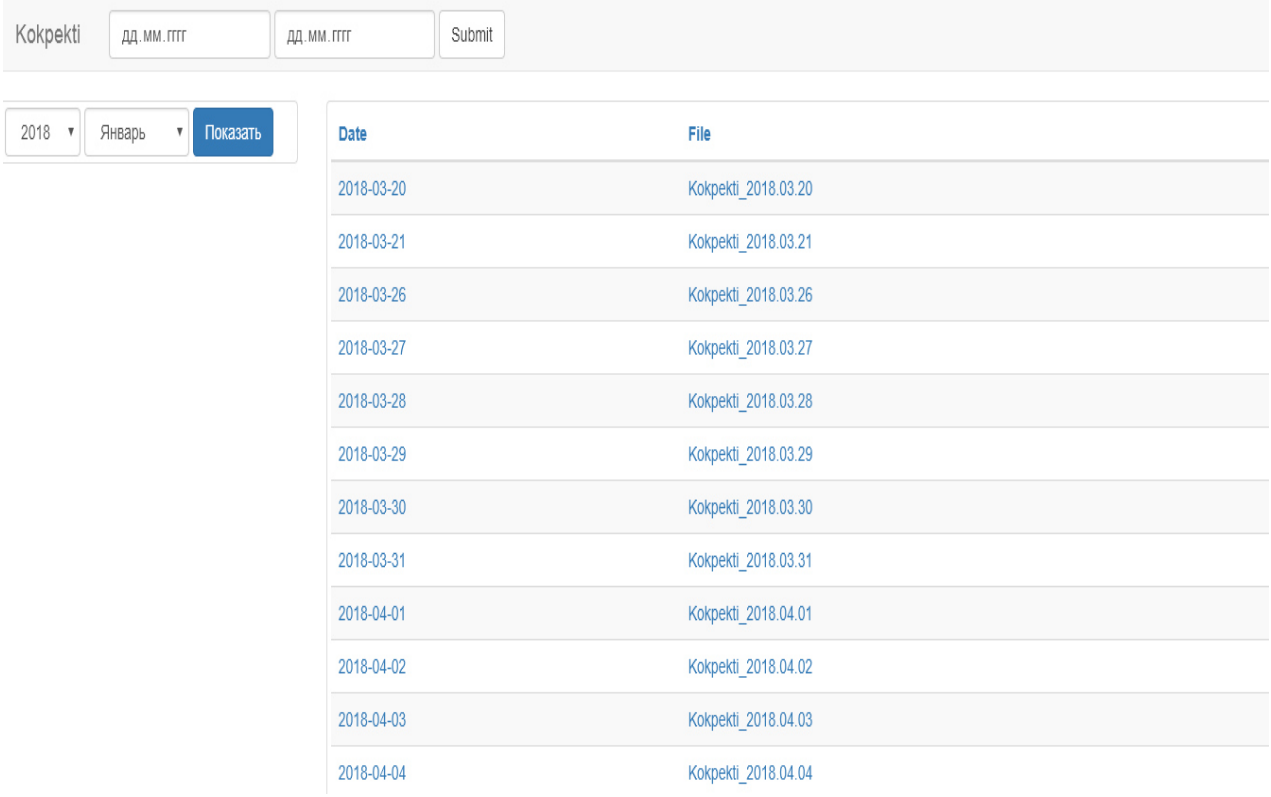

Figure 8. View of files from database

There are files stored in database, which scribed from **Foreca.ru.** All system works as scribing from **Flymeteo.org.** All data is saved from website goes to the store, and then the employee of KazHydroMet can simply download it.

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Дуйсебекова К.С., Дузбаев Н.Т., Аманжолова С.Т.

Облыстың климаттық және экологиялық жағдайына мониторинг жүргізу бойынша деректерді автоматты жинау

Түйіндеме: Бұл статьяда аймақтың климаттық және экологиялық жағдайын бақылау туралы деректерді автоматты жинау туралы. Интернет ресурстарынан деректерді жинау және өңдеу үшін кесте бойынша әр түрлі

ақпаратты жинайтын, ұйымдастыратын және қалыпқа келтіретін құрал жасау қажет болды.

Түйінді сөздер: климат, экология, мониторинг, автоматтандыру, деректер.

Дуйсебекова К.С., Дузбаев Н.Т., Аманжолова С.Т.

Автоматический сбор данных по мониторингу климатического и экологического состояния региона

Резюме. Эта статья об автоматическом сборе данных о мониторинге климатического и экологического состояния региона. Для сбора и обработки данных из интернет-ресурсов необходимо было создать инструмент, который собирает, систематизирует и нормализует разнородную информацию по расписанию.

Ключевые слова: климат, экология, мониторинг, автоматизация, данные.

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LABORATORY STUDIES OF OIL DISPLACEMENT BY NITROGEN IN THE RESERVOIR TO IMPROVE OIL RECOVERY

Abstract. The article describes the mechanism of nitrogen application for enhanced oil recovery and for displacement of residual oil in the pore space of the oil reservoir. The experiments' results which conducted in the laboratory were analyzed.

Keywords. enhanced oil recovery, nitrogen displacement, porous space, core saturation with oil, vacuum.

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МҰНАЙБЕРГІШТІГІН АРТТЫРУ МАҚСАТЫНДА ҚАБАТТАҒЫ МҰНАЙДЫ АЗОТПЕН ИТЕРУДІ ЛАБОРАТОРИЯЛЫҚ ЗЕРТТЕУ

Түйіндеме. Мақалада қабаттың мұнай бергіштігін арттыру және мұнайлы қабаттың кеуекті қуыстарындағы қалдық мұнайды итеру мақсатында айдау агенті ретінде азотты қолданудың механизмін анықтау қарастырылды. Лабораториялық жағдайда жасалынған сынақтардың нәтижелері талданды.

Түйін сөздер: қабаттың мұнайбергіштігін арттыру, азот айдау, кеуекті қуыстар, керннің мұнаймен қанығуы, вакуум.

Кіріспе. Бүкіл дүние жүзіндегі және Еліміздегі мұнай-газды кенорындарының басым көпшілігі игерудің соңғы кезеңінде тұрғандықтан, мұнайбергіштігін арттырудың заманауи әдістерін қолдануға және оны зерттеуге жаппай назар аударып отыр. Қазіргі кездегі мұнайбергіштігін арттыру бойынша жүргізіліп жатқан технологиялардың шамасы кенорнындағы мұнайдың жалпы геологиялық қорының тең жартысын немесе оғанда жетпейтін бөлігін алуға ғана жететін болып отыр. Мұнайбергіштігін арттыру немесе қабат қысымын арттыру мақсатында қабатқа айдалатын агенттерді таңдағанда, алынатын мұнайдың өзіндік құны мен оны қолдануға кететін шығынның мөлшеріне баса мән беріледі.

Өндіру ұңғымаларынан мұнай алу процесінде мұнай ағыны терригенді жыныстардың қуыстары арқылы ұңғыма түбіне келетіндігі анық. Алайда, осы қуыстардағы капиллиярлық қысым мен беттік кернеудің әсерінен, әдеттегі жағдайда мұнайдың белгілі көлемі осы қуыстарда қалып қояды.

Математикалық құрылғының көмегімен жыныстардағы қуыстар мен капиллиярлық матрицадан мұнайды азотпен ығыстыру процесін сипаттауға болады [1,4]. Бұл кезде кішкентай қуыстардағы және

СОДЕРЖАНИЕ

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