



научная школа
ПЛАВУЧИЙ
УНИВЕРСИТЕТ



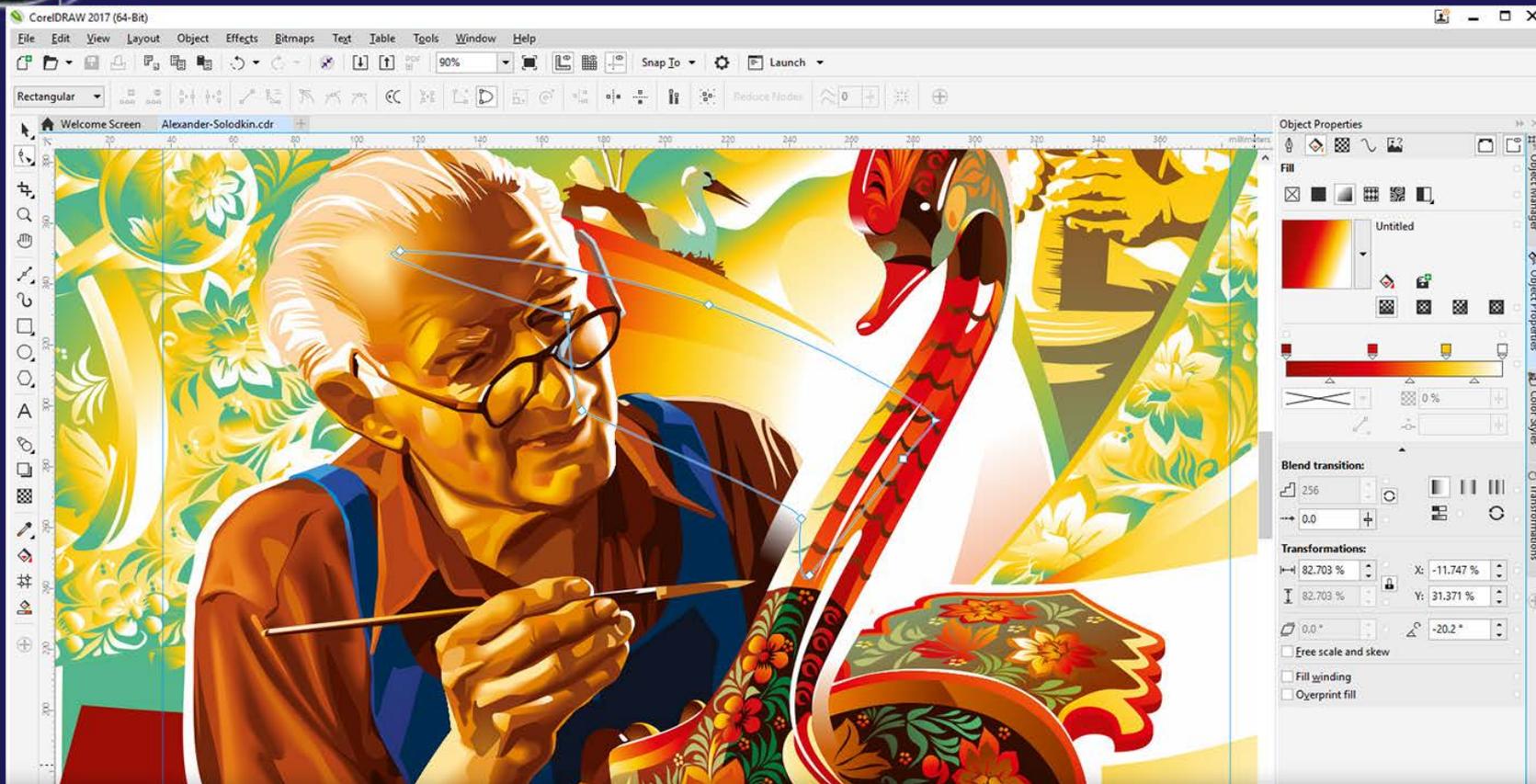
CoreIDRAW в современной океанологии

Игорь Медведев
лаборатория цунами

17.04.2018



CorelDRAW



Программа предназначена для создания и редактирования векторной графики



CorelDRAW

Основной пакет программ CorelDRAW Graphics Suite 2017:

- CorelDRAW 2017;
- Corel® PHOTO-PAINT® 2017;
- Corel Font Manager™ 2017;
- Corel® PowerTRACE™ 2017 (входит в состав CorelDRAW 2017);
- Corel® CAPTURE™ 2017;
- Corel® CONNECT™ 2017;
- Corel® Website Creator™



CorelDRAW

Вспомогательные приложения, входящие в состав CorelDRAW Graphics Suite 2017:

- Microsoft Visual Basic for Applications 7.1 — автоматизация задач;
- Microsoft Visual Studio Tools for Applications 2015 — автоматизация задач и использование прогрессивных макросов;
- BenVISTA PhotoZoom Pro 4 — плагин для увеличения цифровых изображений;
- Barcode Wizard — генератор штриховых кодов в стандартных форматах;
- Duplexing Wizard — мастер двусторонней печати;
- WhatTheFont — онлайн-сервис опознавания шрифтов;
- GPL Ghostscript — улучшенный импорт файлов EPS и PS.



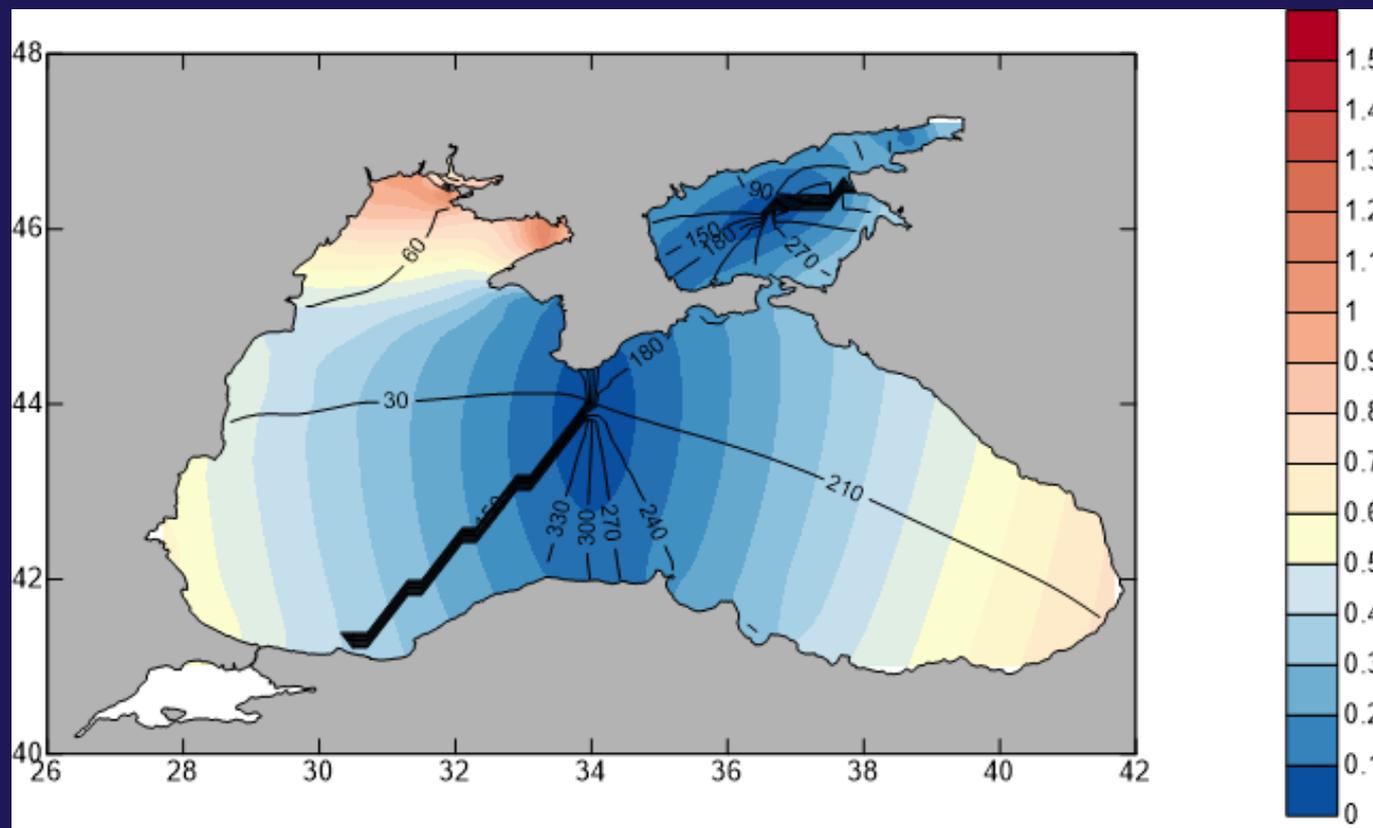
План доклада

- Правка рисунков (карт, графиков)
- Создание сложных рисунков
- Создание новых рисунков, схем и т.п.
- Трассировка и оцифровка изображений
- Импорт и экспорт изображений
- Создание постеров



Правка рисунков

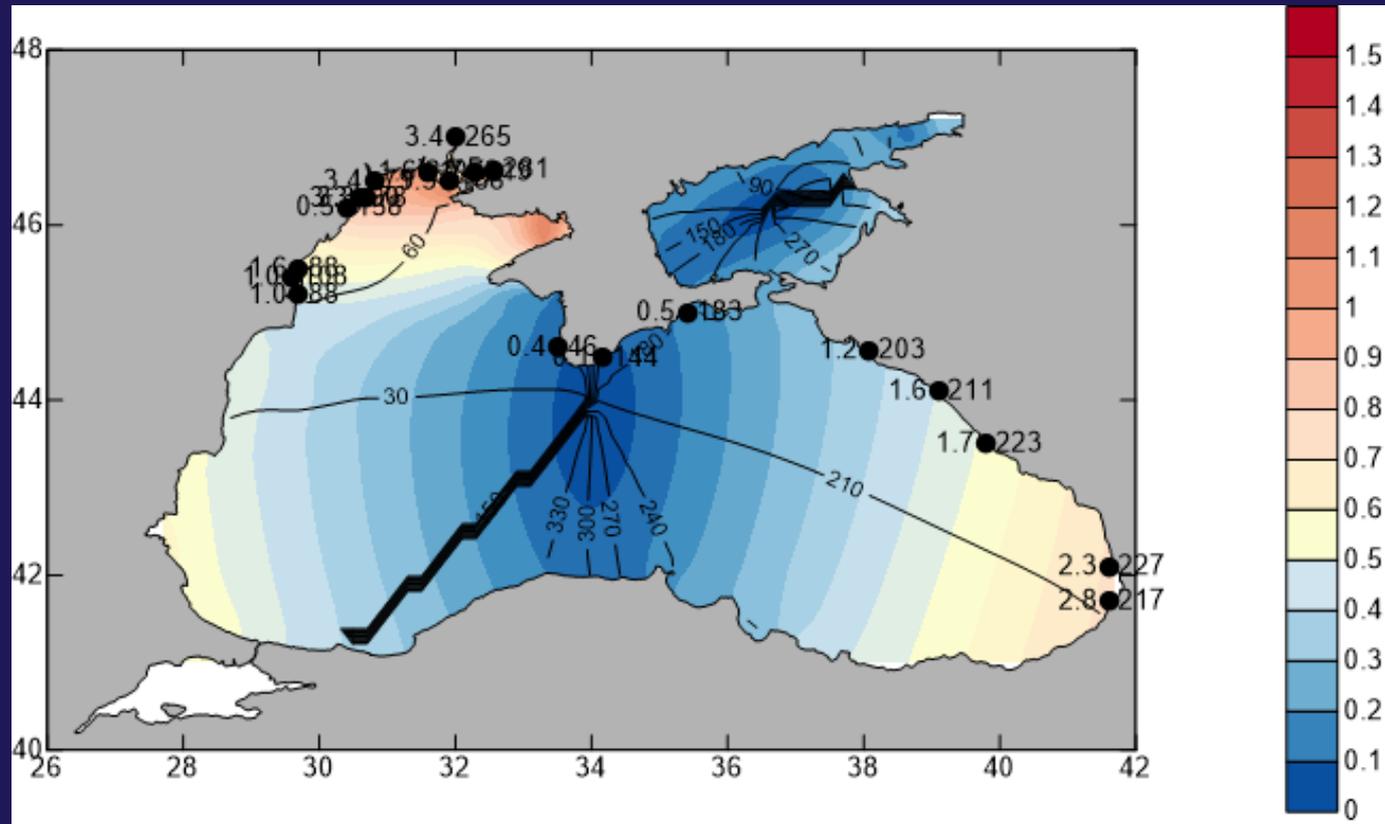
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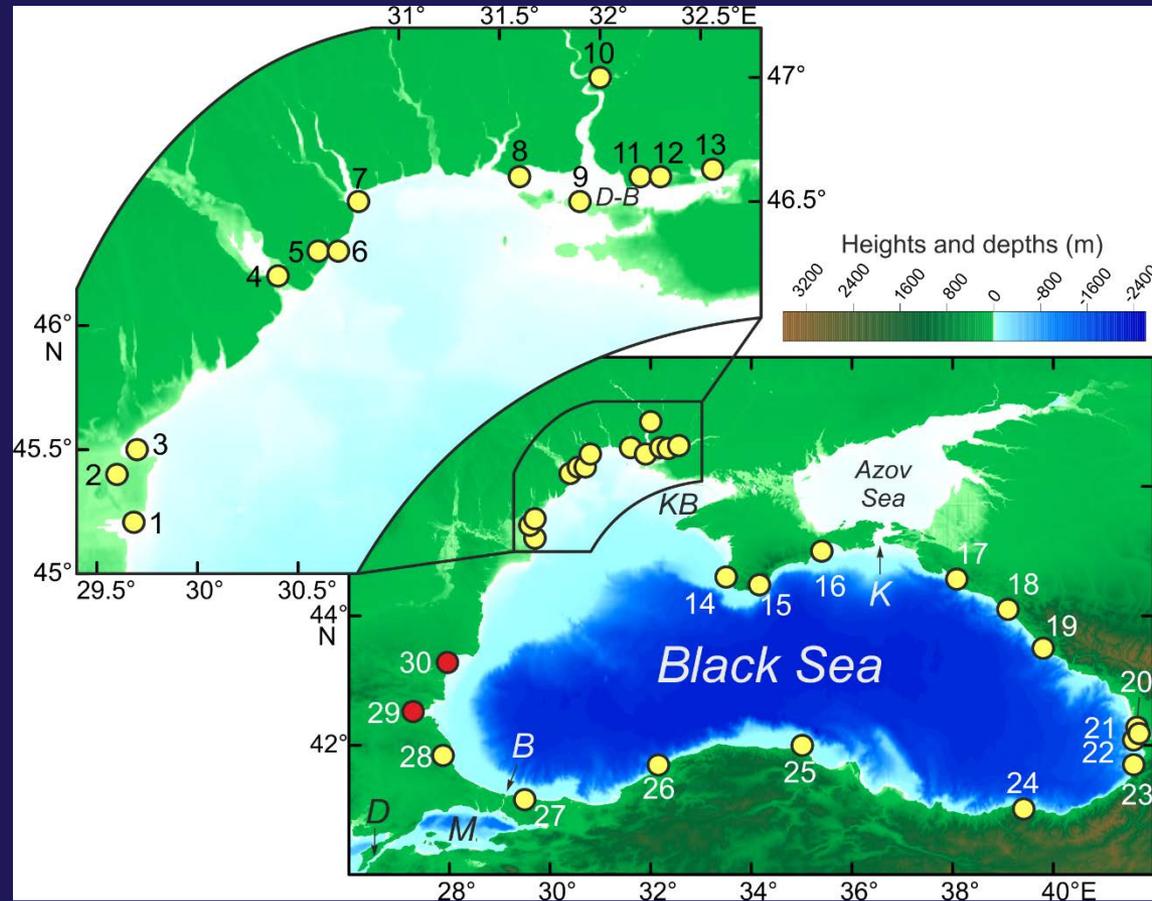
Правка рисунков

Сделали в Surfer



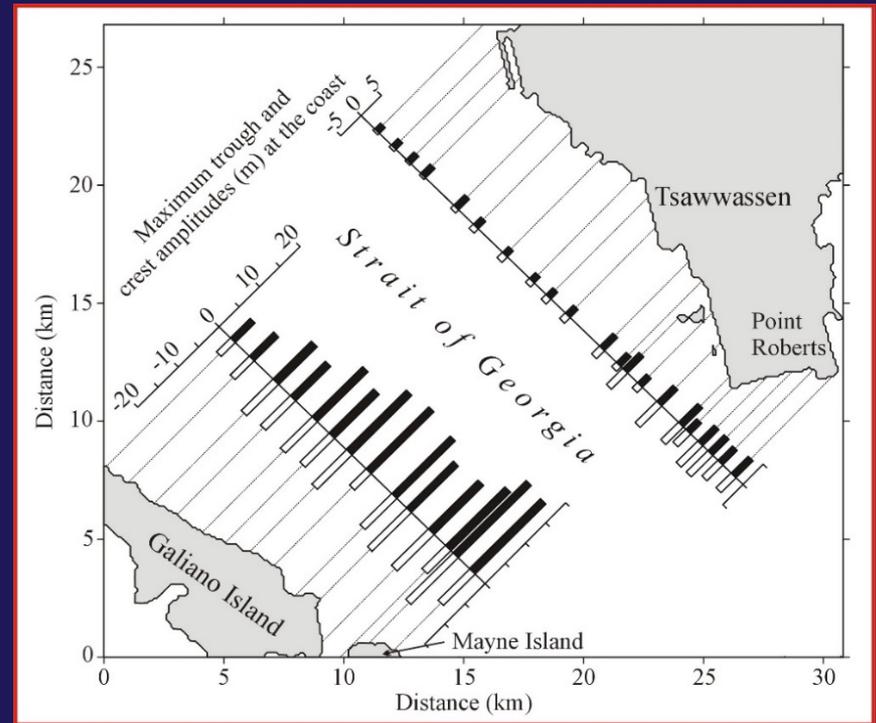
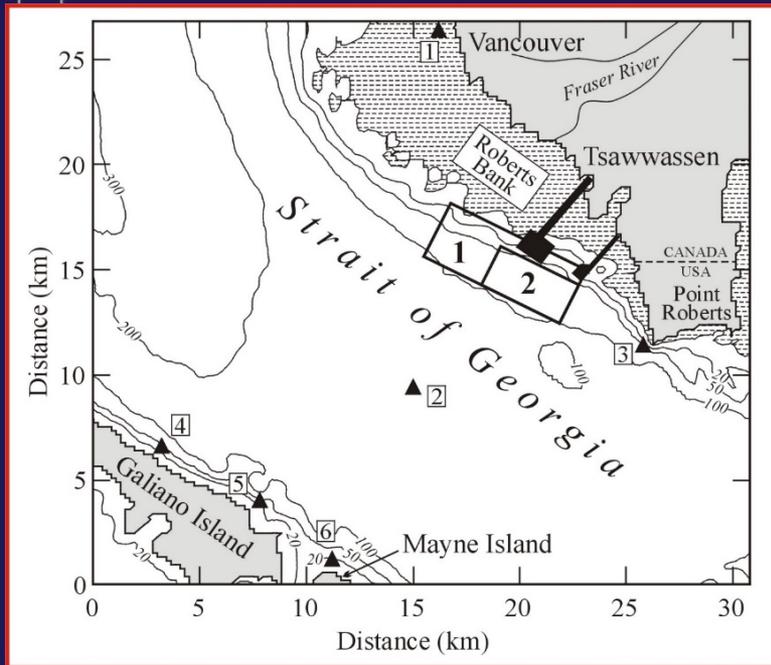


Правка рисунков Подправили в Corel





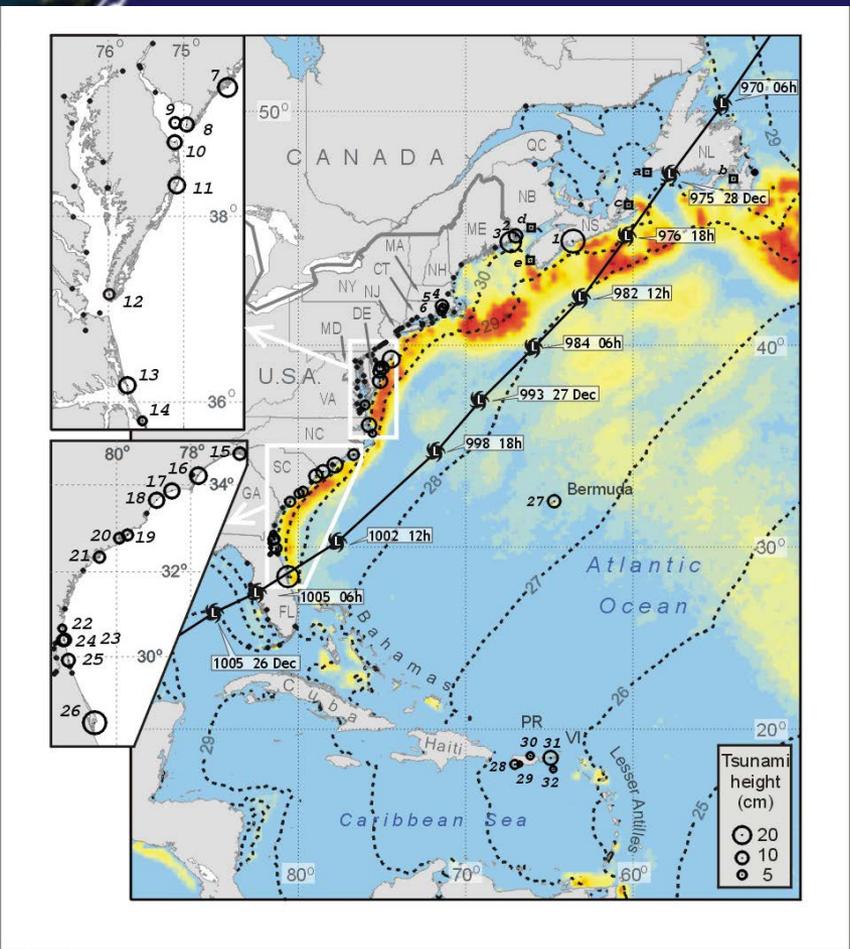
Создание сложных рисунков



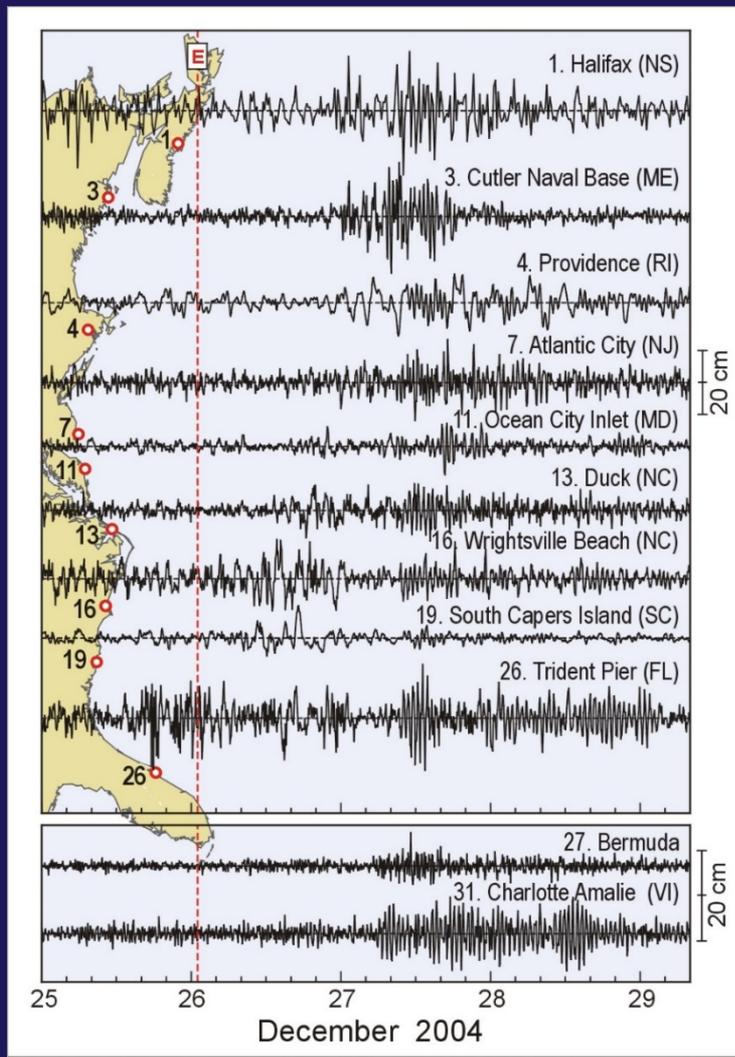
Rabinovich et al., 2004



Создание сложных рисунков

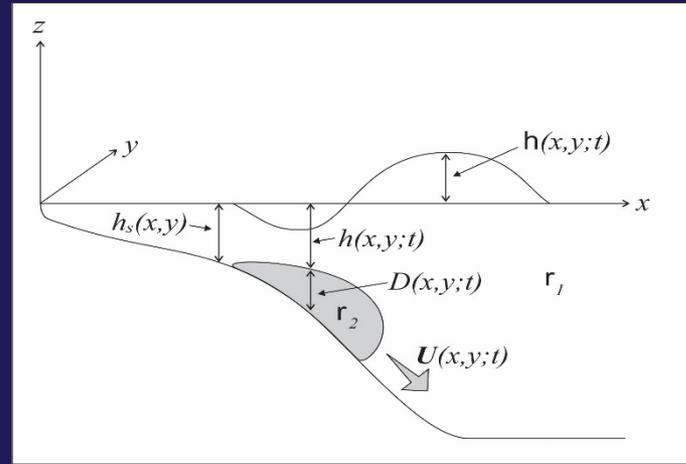
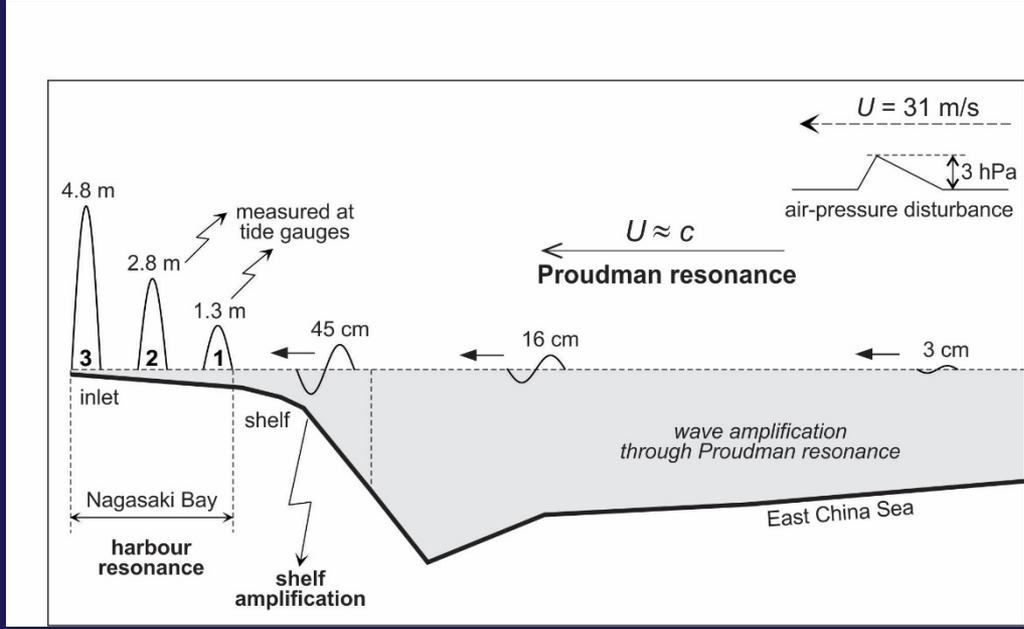


Thomson et al., 2007





Создание рисунков и схем

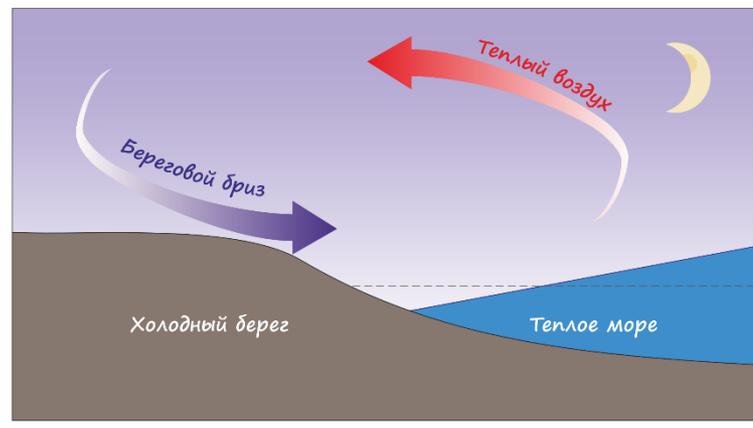
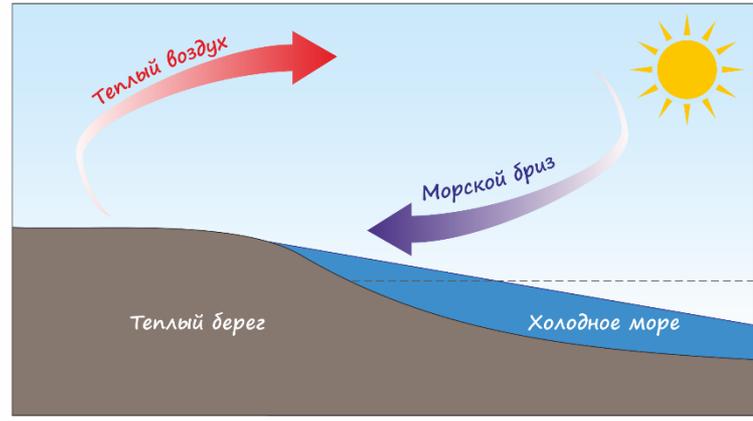


Monserrat et al., 2006



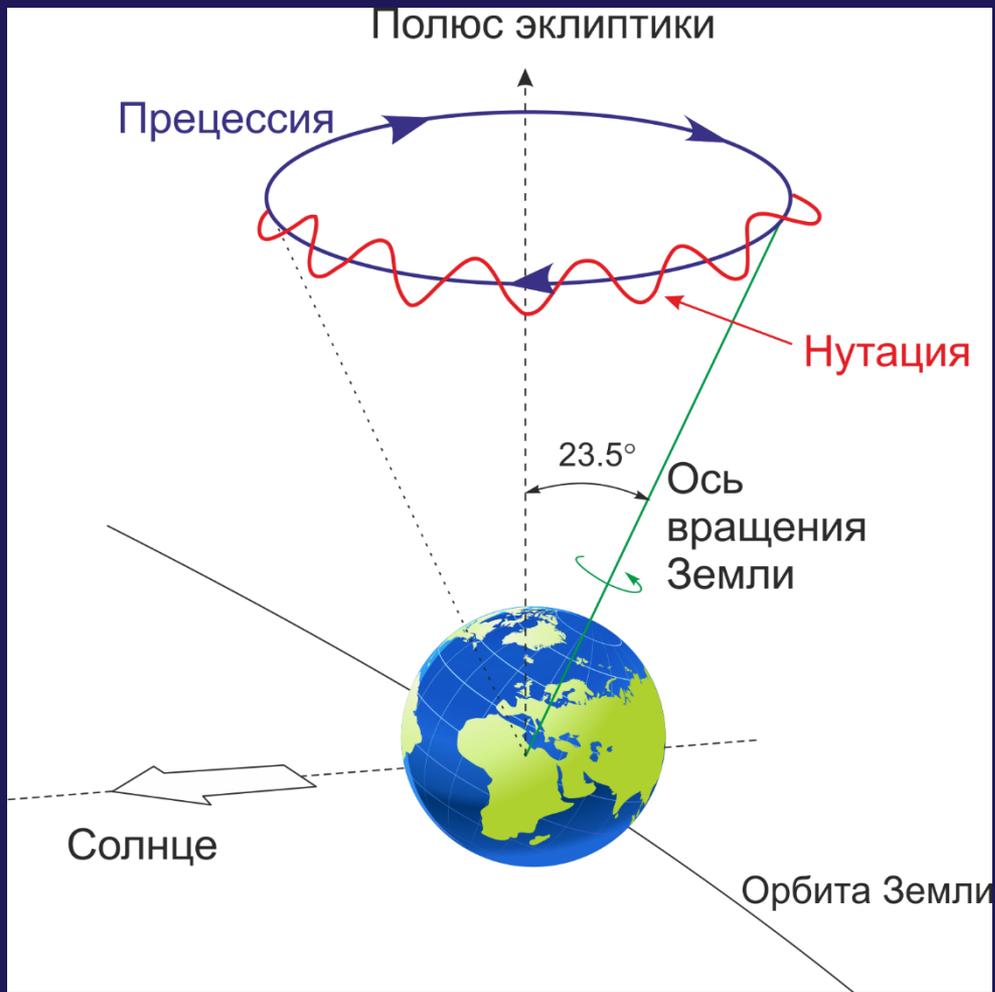
Создание рисунков и схем

Формирование бризовых колебаний уровня моря



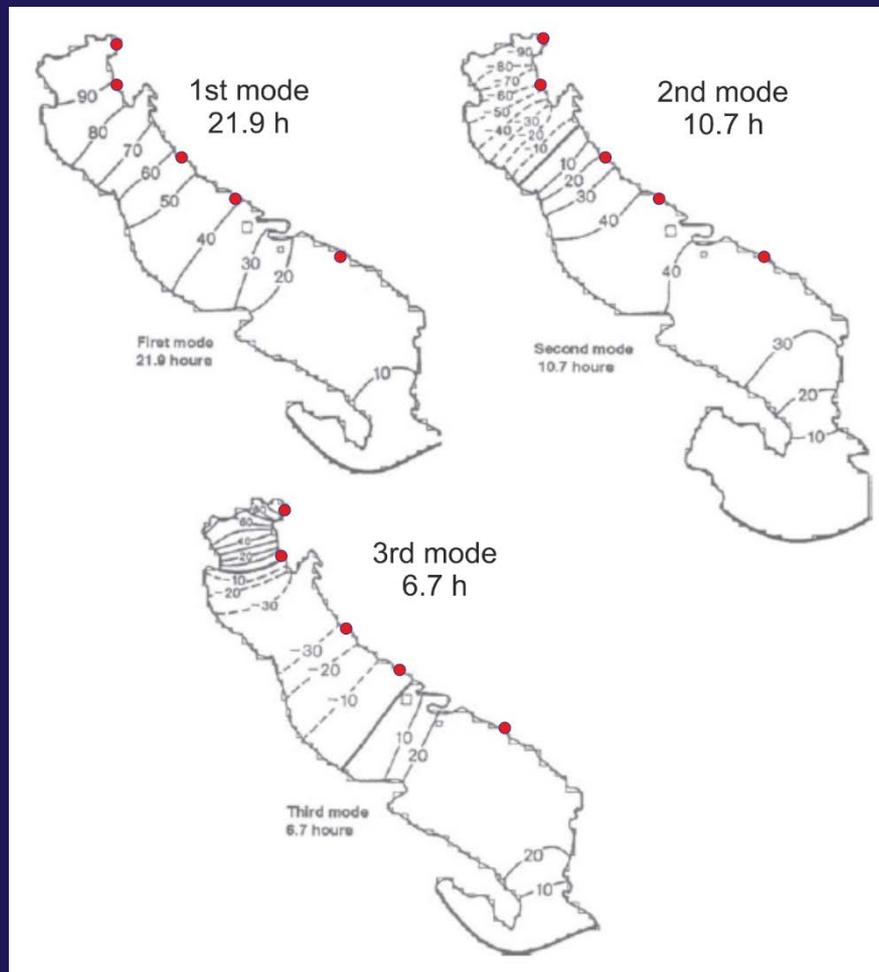


Создание рисунков и схем





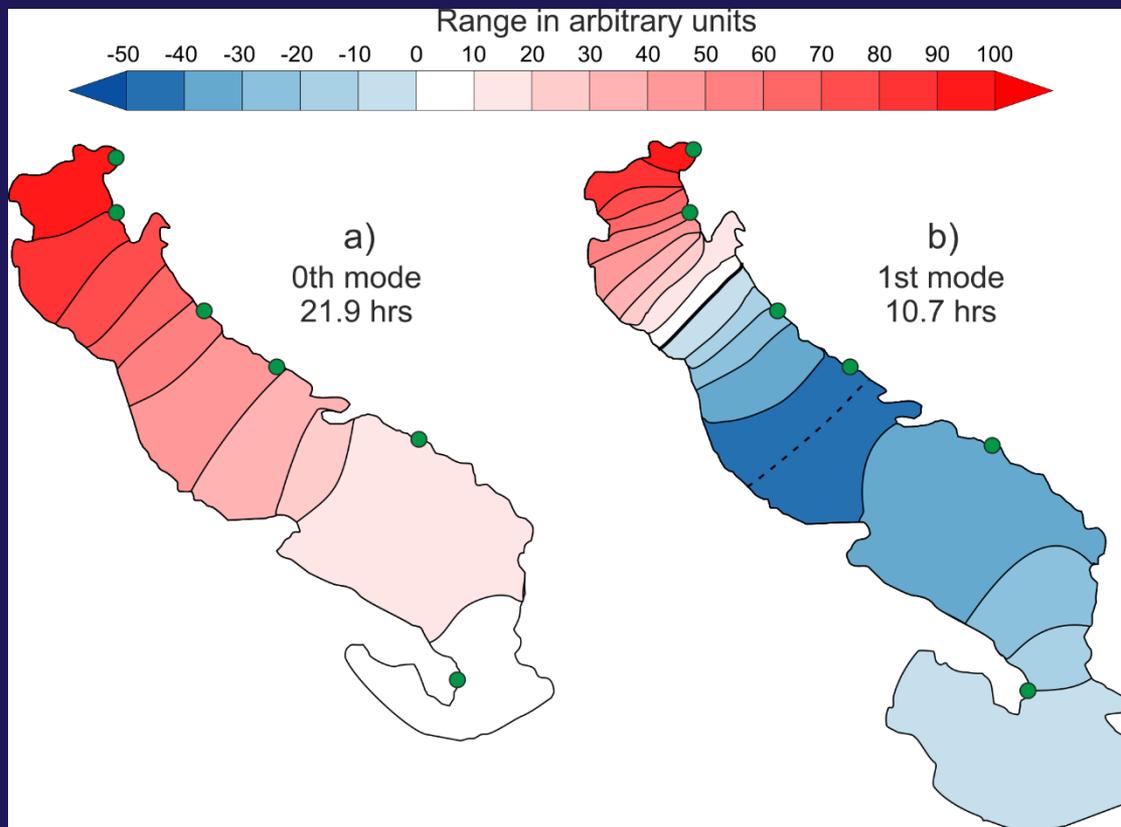
Трассировка изображений



Cushman-Roisin et al., 2001



Трассировка изображений

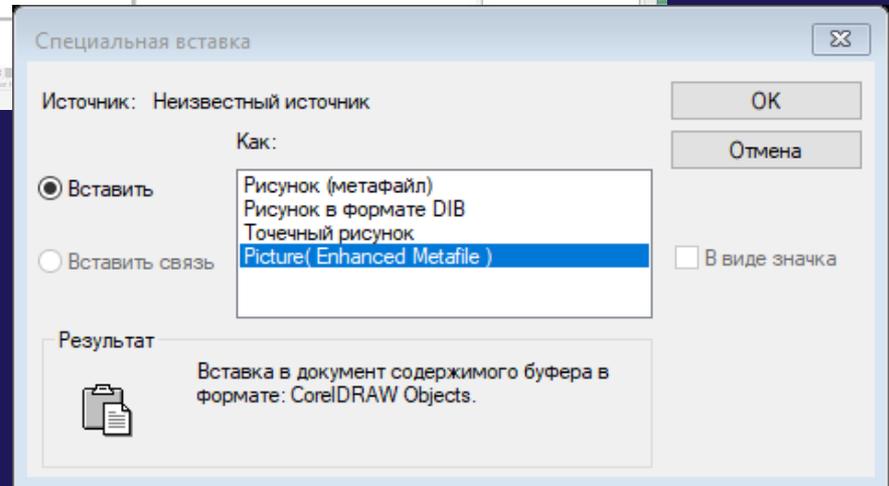
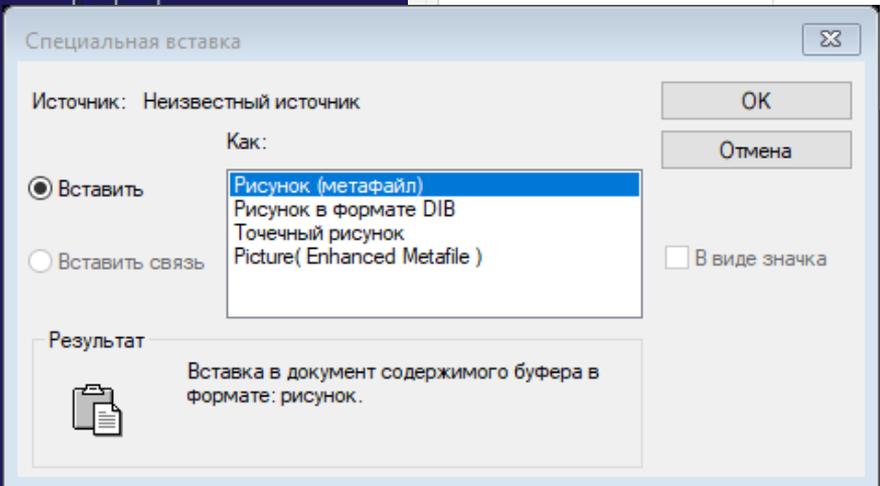
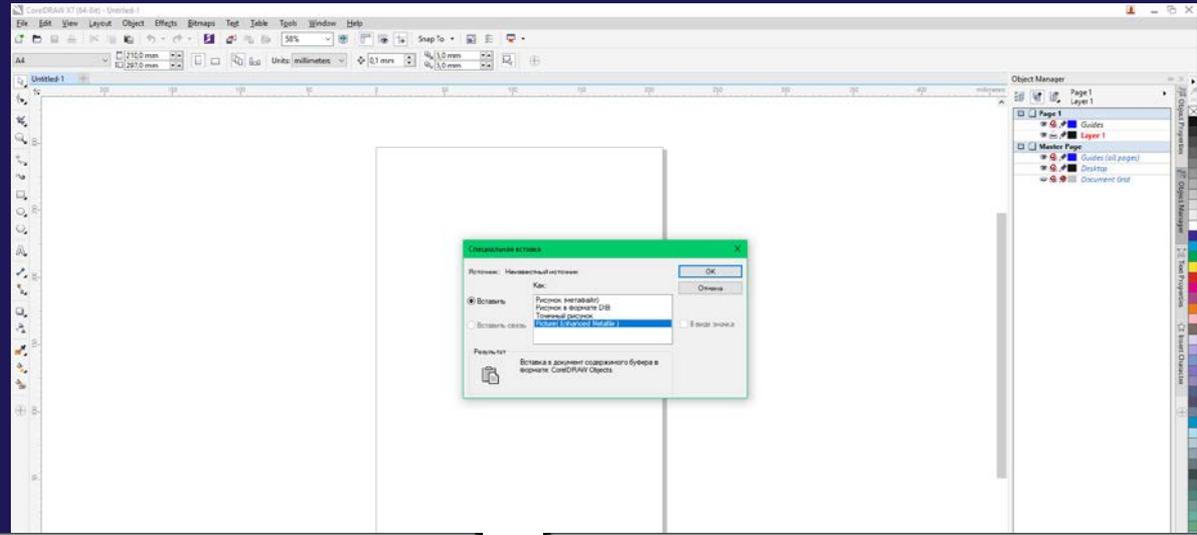


Medvedev et al., 2018



Импорт и экспорт

Импорт через Paste Special





Импорт и экспорт

Экспорт:

Растровые изображения:

- jpg, png, tiff

Векторные изображения

- pdf
- eps (Encapsulated PostScript)



Создание постеров

Extreme statistics of the sea level oscillations on the Russian coast of the Baltic Sea

Igor P. Medvedev and Evgueni A. Kulikov
 patamates@gmail.com

DATA

Site	Start	End
Kronotsk	1806	2016
Vyborg	1869	2016
Golendin	1819	1995
Dagöedden	1869	2016
Zelenogorsk	1957	1993
Lina Ne	1919	1993
Lomonosov	1920	2016
Mosbry	1947	1993
Wladivostok	1926	2016
Orsk	1954	2016
Promslav	1921	1987
Starost	1924	1988
Lap-Luga	1925	1985
Orskirsk	1977	2016
Belofsk	1977	2016
Krasnoflatsk	1977	2016
Kaliningrad	1979	2007
Pionovsk	1977	2016
Komarovsk	1977	1988
Golobok	1977	1988

Introduction

The longest monthly maximal and minimal sea level data from 20 tide gauges on the Russian coast of the Baltic Sea were used to examine the statistical properties of extreme sea levels. The duration of observations varied from 9 to 192 years. It is shown that the extreme sea level value distributions of return period for short tide gauge records are well approximated by the Gumbel distribution.

The longest data series (Kronotsk, St. Petersburg and Vyborg) have shown a significant deviation from the Gumbel distribution for the rarest events. The maximum values of extreme rises/ebbs of 100-year recurrence were observed in the Gulf of Finland.

Statistical analysis of the sea level data series reveals that positive surges (floods) occurred more probable than negative surges (ebbs). The maps of distribution of the extreme sea level values for Russian coast of the Baltic Sea with different returned period (10, 20, 50, 100 years) were created, they based on the results of this statistical analysis.

Extreme statistic

A positive asymmetry coefficient is observed at most stations on the Russian coast of the Baltic Sea: sea level rises are more likely than decreases at the head of the Gulf of Finland. The maximum positive asymmetry coefficient is observed at the head of the Gulf of Finland. This asymmetry of the positive and negative storm surges can be explained by the asymmetry of the wind over the Baltic Sea. Western winds dominate considerably, and they cause the most powerful storm surges in the west part of the Baltic Sea.

The extreme sea level value distributions of return period for short tide gauge records are well approximated by the Gumbel distribution. For the longest data series the extreme values of sea level for return periods $T=20$ years fit well on the straight line of the approximation of the Gumbel distribution. However, events with return period $T=20$ deviate from the Gumbel distribution significantly. The residual distribution is the more suitable asymptotic for the events with rare return period.

Single extreme events sometimes do not completely correspond to the distribution. On January 9, 2005, a storm surge took place in the Gulf of Finland. The return period of this storm surge, which is estimated by the extrapolating the empirical Gumbel distribution function is 500 years.

In the range of return periods from 1 to 80 years, extreme values of the sea level are well approximated by the distribution of Gumbel, however, for $T=100$ years this approximation "breaks". These catastrophic floods with sea level rise of 300 cm have different mechanism of formation.

10-year return period **50-year return period** **Data sea level extremes**

20-year return period **100-year return period** **Historical sea level extremes**

Maximum range of the seasonal sea level oscillations (cm) **Maximum range of tides (cm)**

CONCLUSIONS

- Sea level records with a period less than 30-40 years do not allow to calculate extreme values of sea level with a period of recurrence of 100 years.
- The positive surges essentially prevail over the negative surges in the Gulf of Finland.
- Regular periodic sea level oscillations reach significant amplitudes in the Gulf of Finland.

SEA LEVEL OSCILLATIONS IN THE BALTIC SEA: FROM MINUTES TO CENTURIES

Igor P. Medvedev, Alexander B. Rabinovich and Evgueni A. Kulikov
 medvedev@ocean.ru

INTRODUCTION

Various types of storm processes determine the sea level rise in the Baltic Sea. In recent years, multiple climate variability modes like several multidecadal, high-frequency modes and others that cover a wide range of periods from minutes to centuries. We examine the historical sea level and precipitation data to study these oscillations. The Baltic Sea is connected to the North Sea and Atlantic Ocean through the Danish Straits, which act as a low-pass filter strongly attenuating high-frequency processes but allowing the low-frequency processes to penetrate here through. As a result, relatively short-period oscillations (1-2 years) are observed directly within the sea, while long-period oscillations (10-100 years) are observed in the North Sea and Atlantic Ocean. In the case of the Baltic Sea, they are forced in the North Sea as a result of the long-period oscillations of the sea level in the North Sea and Atlantic Ocean. The sea level rise in the Baltic Sea is determined by the combination of the local and remote forcing. The local forcing is determined by the atmospheric pressure and wind stress, while the remote forcing is determined by the atmospheric pressure and wind stress in the North Sea and Atlantic Ocean. The sea level rise in the Baltic Sea is determined by the combination of the local and remote forcing. The local forcing is determined by the atmospheric pressure and wind stress, while the remote forcing is determined by the atmospheric pressure and wind stress in the North Sea and Atlantic Ocean.

EXTERNAL OSCILLATIONS

are generated by the sea level variability beyond the Baltic Sea (in Kattegat and the North Sea) and by fresh water supply.

GENERAL SPECTRUM

INTERNAL OSCILLATIONS

are caused by atmospheric processes (air pressure and wind), water density changes in the Baltic Sea and anthropogenic factors.

DATA

SYNOPTIC AND MESOSCALE SEA LEVEL: EIGEN MODES, STORM SURGES, AND SEICHES

Gulf of Bothnia **Gulf of Finland** **Gulf of Riga**

SEASONAL SEA LEVEL OSCILLATIONS AND POLE TIDE

The Baltic sea level records demonstrate significant positive seasonal trend, which is caused by the post-glacial rise. The largest part of vertical shift is observed in the northern part of the Gulf of Bothnia.

The strongest variations of the pole tide amplitudes are significant (10%) and are strongly correlated with the multidecadal polar vector. Characteristically, particular multidecadal cycles of the pole tide are observed in the Baltic Sea. The correlation of the pole tide with the sea level rise is observed in some decades in the Baltic Sea.

The strongest variations of the pole tide amplitudes are significant (10%) and are strongly correlated with the multidecadal polar vector. Characteristically, particular multidecadal cycles of the pole tide are observed in the Baltic Sea. The correlation of the pole tide with the sea level rise is observed in some decades in the Baltic Sea.

The significant increase in the range of combinations in the Baltic Sea and seasonal tide signal outside of the sea. The increase of spectral density in the frequency range 0.02-0.04 cycles per year is observed in the frequency range 0.02-0.04 cycles per year. The increase of spectral density in the frequency range 0.02-0.04 cycles per year is observed in the frequency range 0.02-0.04 cycles per year. The increase of spectral density in the frequency range 0.02-0.04 cycles per year is observed in the frequency range 0.02-0.04 cycles per year.

TIDES AND KINDRED PHENOMENA

Astronomical tides **Relational tides**

The pole tide

The Chandler wobble (the variation of the Earth's axis) is the most significant natural oscillation of the Earth's axis. The pole tide is the sea level rise caused by the Earth's axis wobble. The pole tide is the sea level rise caused by the Earth's axis wobble. The pole tide is the sea level rise caused by the Earth's axis wobble.

Influence of the zonal wind on Baltic sea-level

The zonal wind spectrum has a similar character as the sea level spectrum in the Baltic Sea. The correlation between sea level and zonal wind variability, every high tide cycle in the noise frequency range of 0.02 cycles per year, and annual period of the oscillation is about 0.4. The phase is about 90°.

The spatial distribution of the amplitudes

TIDES AND KINDRED PHENOMENA

Astronomical tides

An elliptical orbit and oblique Earth frequency multidecadal tide peaks with periods ranging from 10 to 100 years. In a pole tide are observed in general, multidecadal tide peaks are observed in the combined effect of various processes, comprising the major tide components (the M_2 , M_4 , and M_6). In contrast, the main tide peak is observed in the case of the Chandler wobble. The pole tide is the sea level rise caused by the Earth's axis wobble. The pole tide is the sea level rise caused by the Earth's axis wobble.

Relational tides

The sea level rise is caused by the Earth's axis wobble. The pole tide is the sea level rise caused by the Earth's axis wobble. The pole tide is the sea level rise caused by the Earth's axis wobble.

The Curonian Lagoon: absence of classical tides

The long-term hydrological data were analyzed to assess the tidal propagation in detail and to identify some important effects in the environment of the Baltic Sea. The Curonian Lagoon is a shallow body of water, which is connected to the Baltic Sea by the Curonian Spit. The Curonian Lagoon is a shallow body of water, which is connected to the Baltic Sea by the Curonian Spit. The Curonian Lagoon is a shallow body of water, which is connected to the Baltic Sea by the Curonian Spit.

The study is based on the following publications:

Medvedev I.P. and Rabinovich A.B. (2015) Oscillations of the Baltic Sea Level and Fresh in the Gulf of Finland. *Oceanology*, 55(1).
 Medvedev I.P. and Rabinovich A.B. (2016) Sea Level Oscillations in the Baltic Sea. *Oceanology*, 56(1).
 Medvedev I.P. and Rabinovich A.B. (2017) Sea Level Oscillations in the Baltic Sea. *Oceanology*, 57(1).
 Medvedev I.P. and Rabinovich A.B. (2018) Sea Level Oscillations in the Baltic Sea. *Oceanology*, 58(1).
 Medvedev I.P. and Rabinovich A.B. (2019) Sea Level Oscillations in the Baltic Sea. *Oceanology*, 59(1).



*к.ф.-м.н. Игорь Медведев
с.н.с. лаборатории цунами ИОРАН
medvedev@ocean.ru*