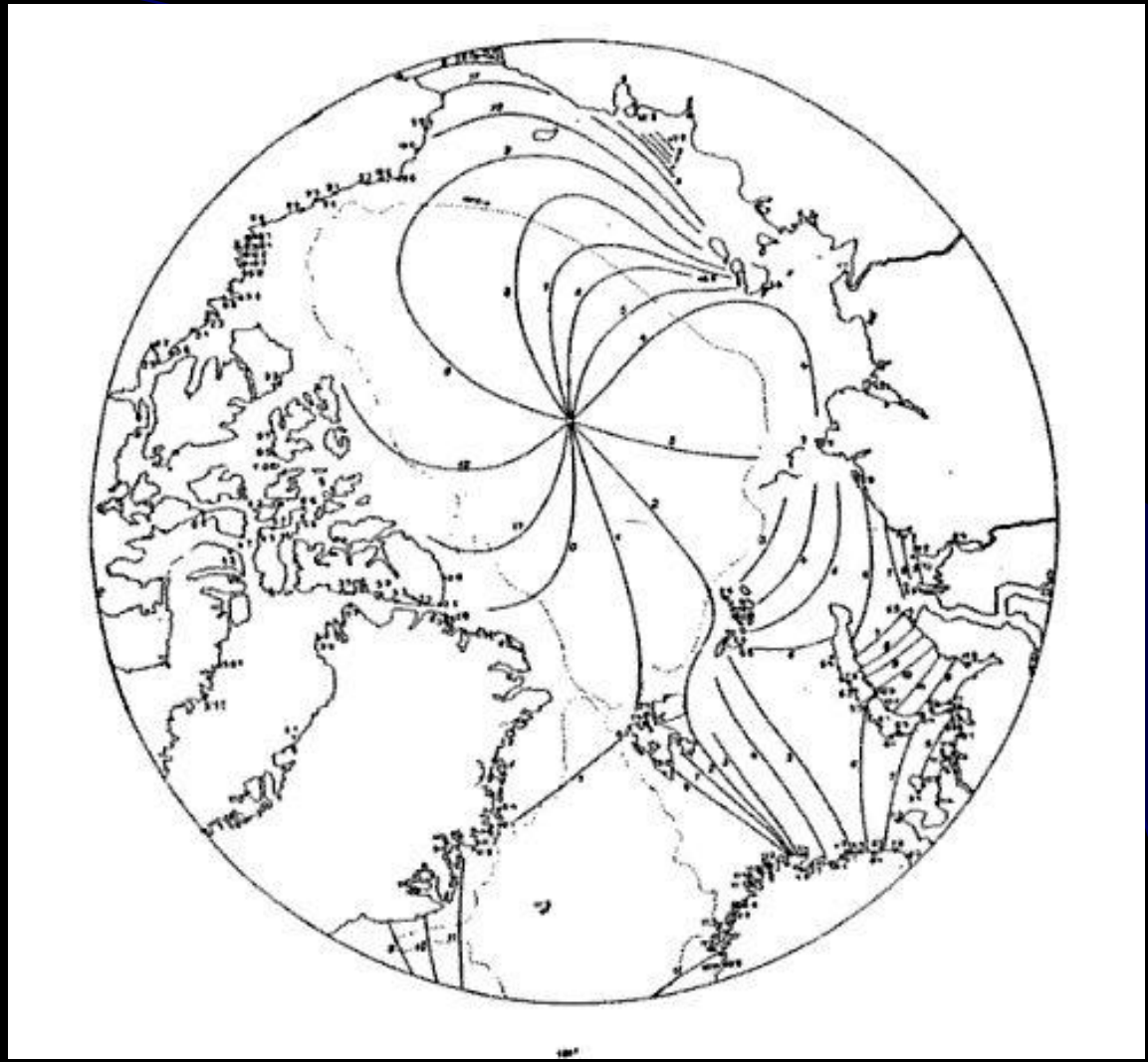
Tides in the Arctic

Ruslan May

Cotidal map by Robert von Sterneck (1928)

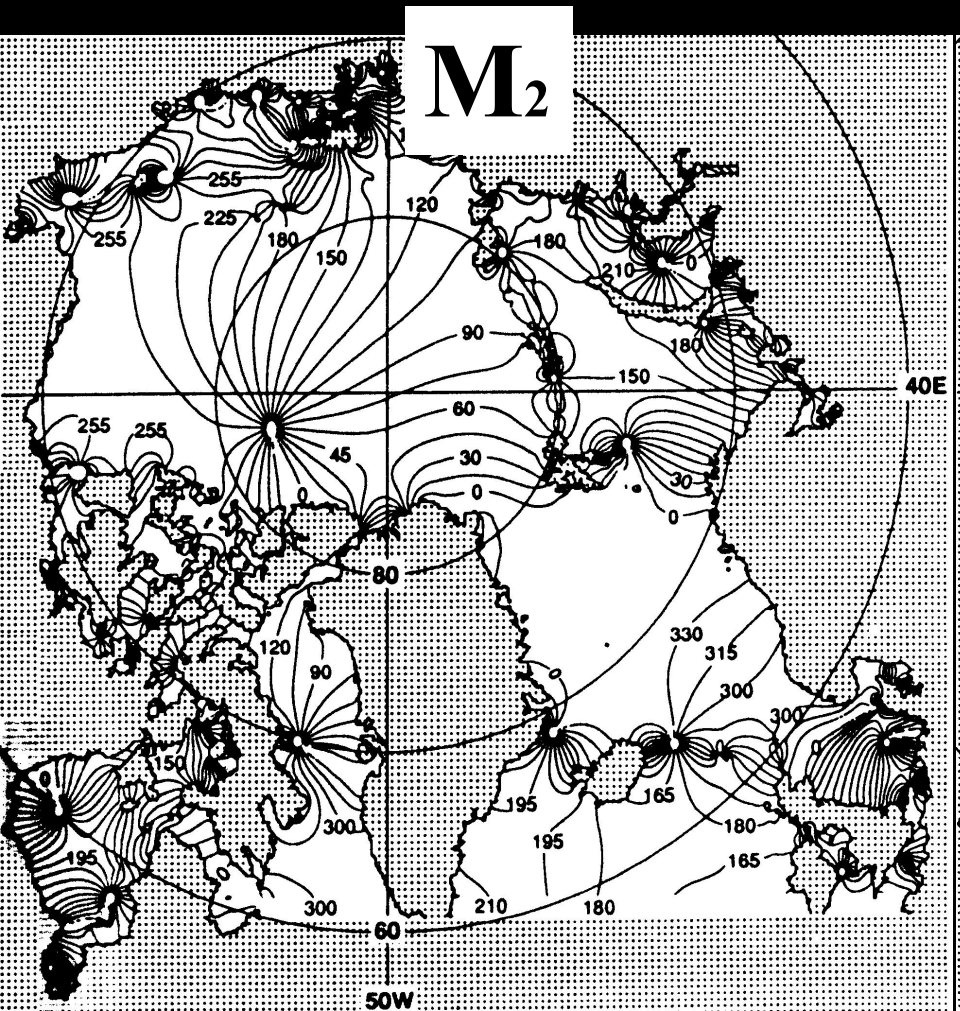


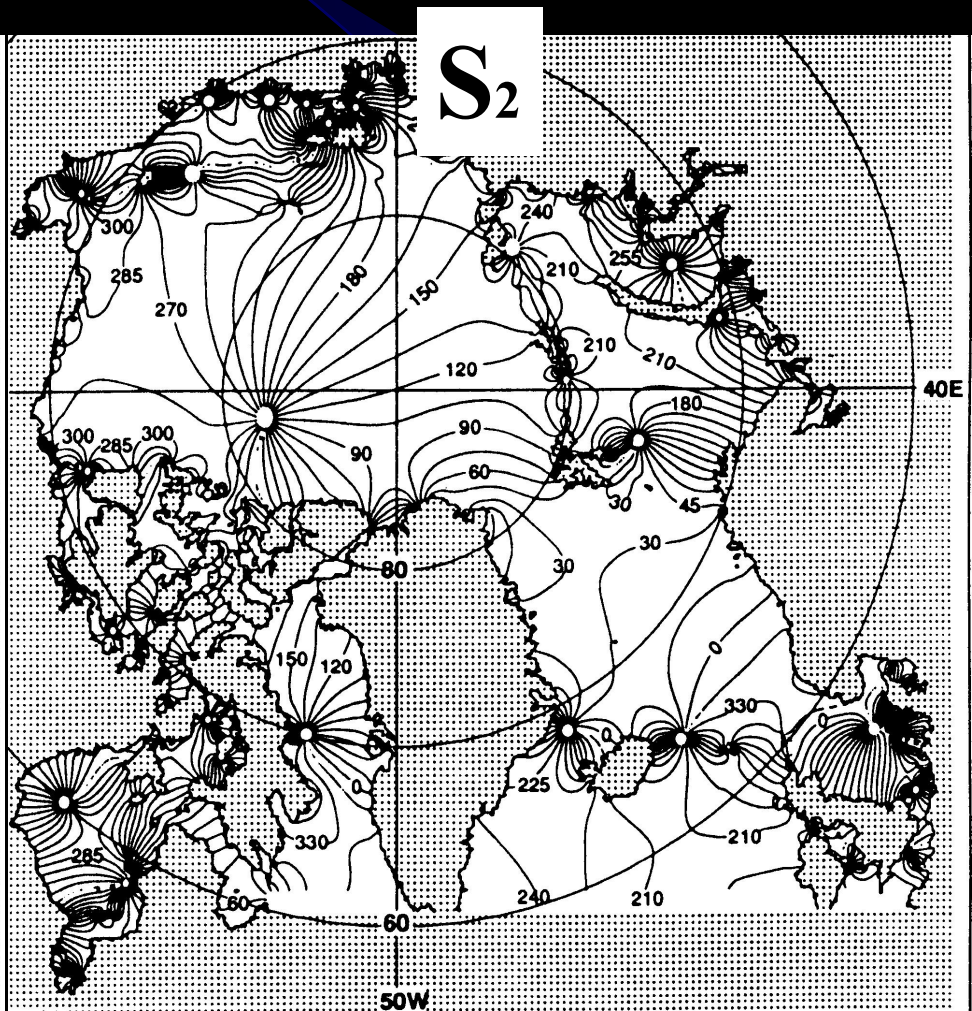
Gjevik B., Straume T. Model simulations of the M2 and K1 tide in the Nordic Seas and Arctic Ocean // Tellus. 1989. Vol. 41A, N1. p 73-96

Kowalik, Z., Proshutinsky, A.Y. The Arctic Ocean Tides // The Polar Oceans and their role in shaping the global environment. Geophysical Monograph 85, edited by O. M. Johannessen, R. D. Muench, and J. E. Overland, AGU, Washington, D. C., pp. 137-158, 1994. http://www.ims.uaf.edu/tide/

Cotidal maps of semidiurnal tidal waves (Kowalik, Proshutinsky; 1994)

http://www.ims.uaf.edu/tide/





Cotidal maps of diurnal tidal waves (Kowalik, Proshutinsky; 1994)

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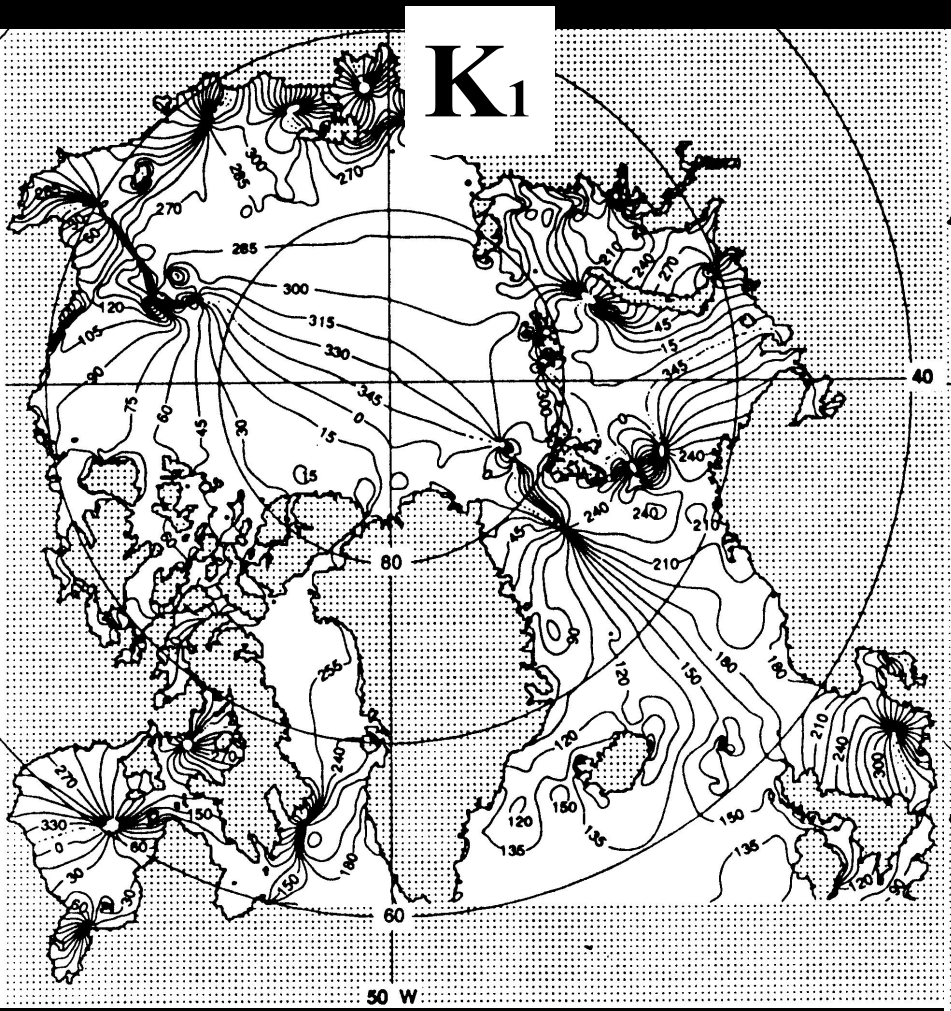
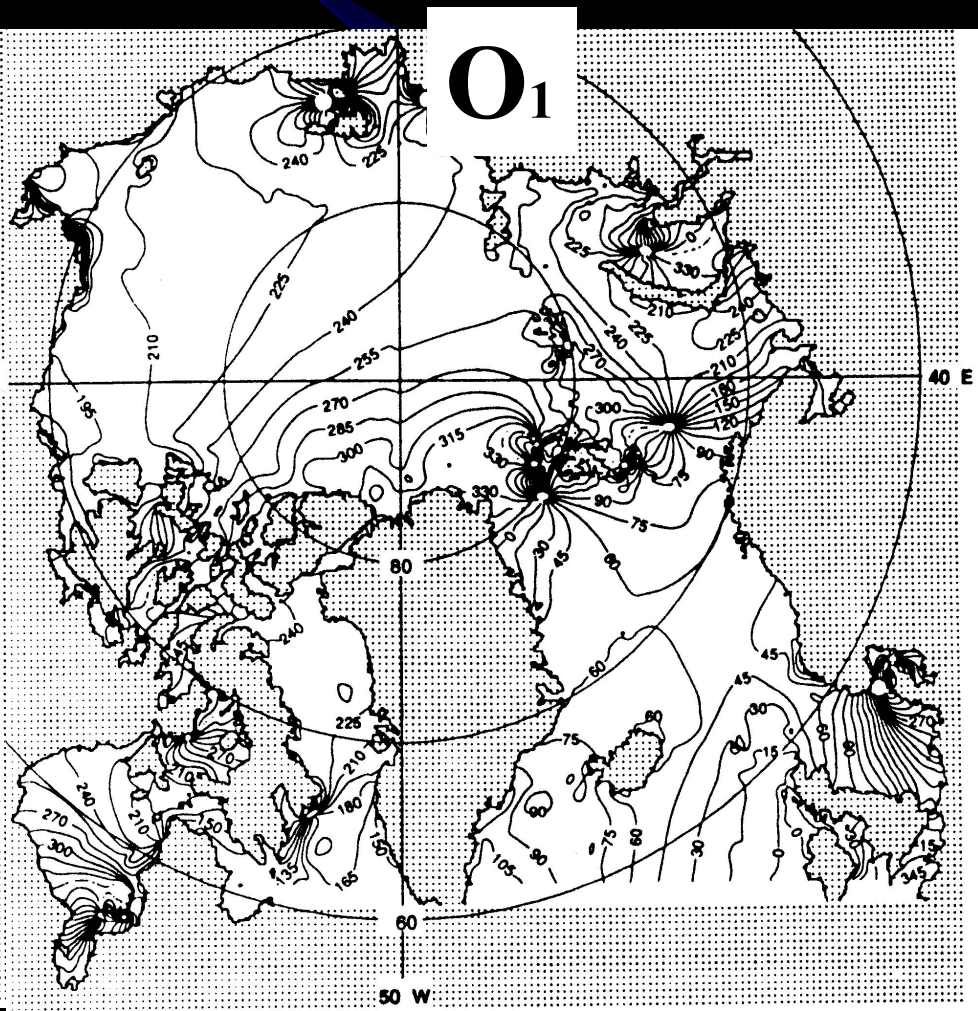
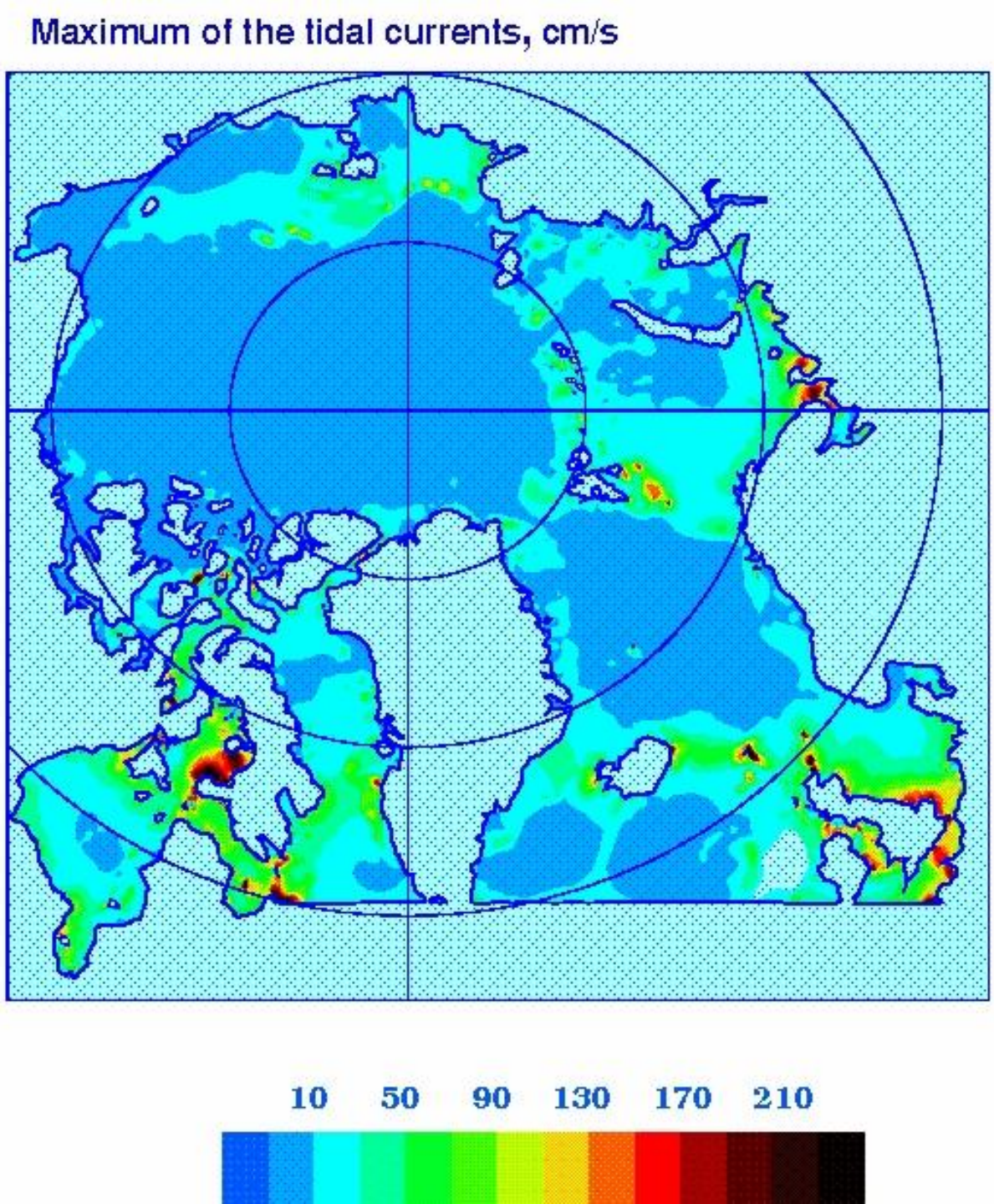
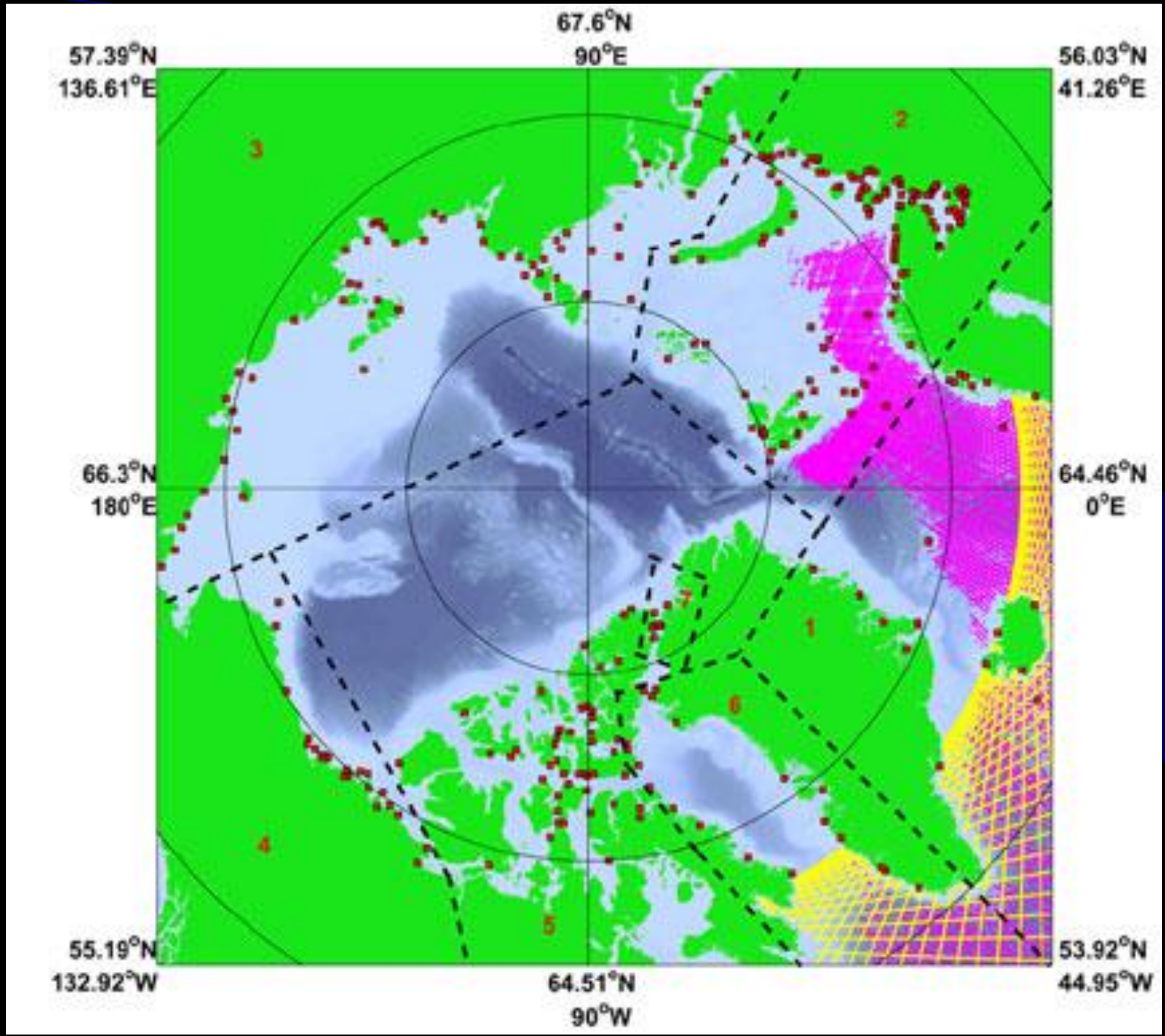




Characteristics of tidal currents

(Kowalik, Proshutinsky; 1994)



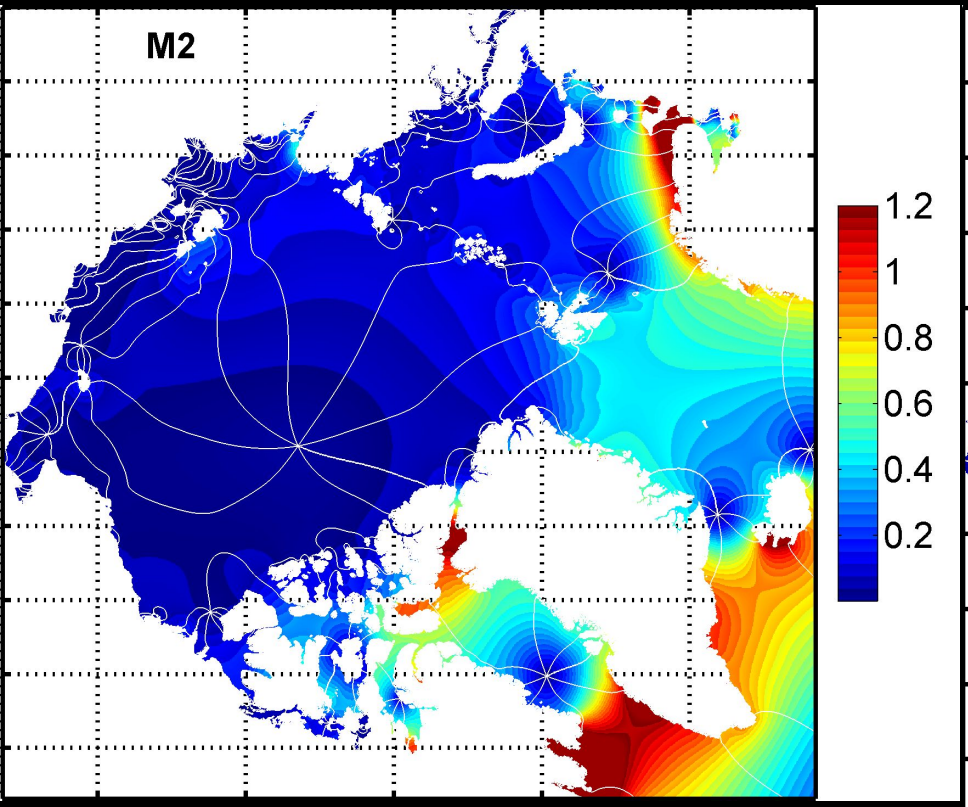

67.6°N
90°E
57.39°N
136.61°E
56.03°N
41.26°E
66.3°N
180°E
64.46°N
0°E
55.19°N
132.92°W
64.51°N
90°W
53.92°N
44.95°W
1
2
3
4
5
6

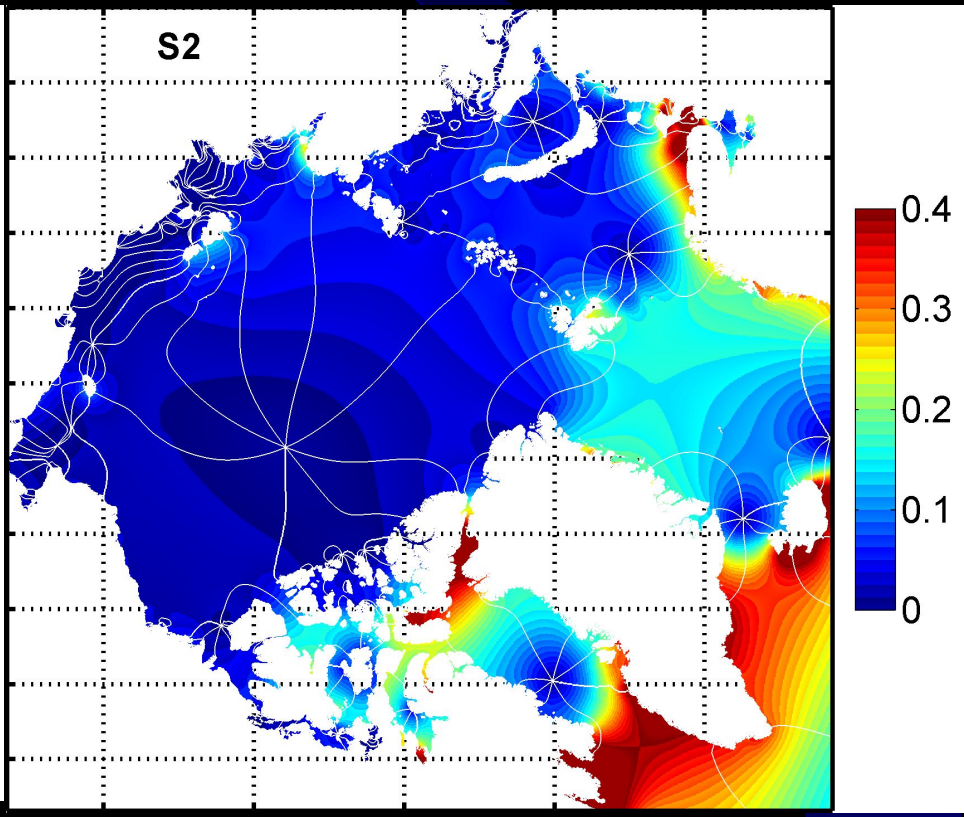
Padman, L., Erofeeva S. A barotropic inverse tidal model for the Arctic Ocean, Geophys. Res. Lett., 2004 ,Vol. 31, No. 2.

Model is available from

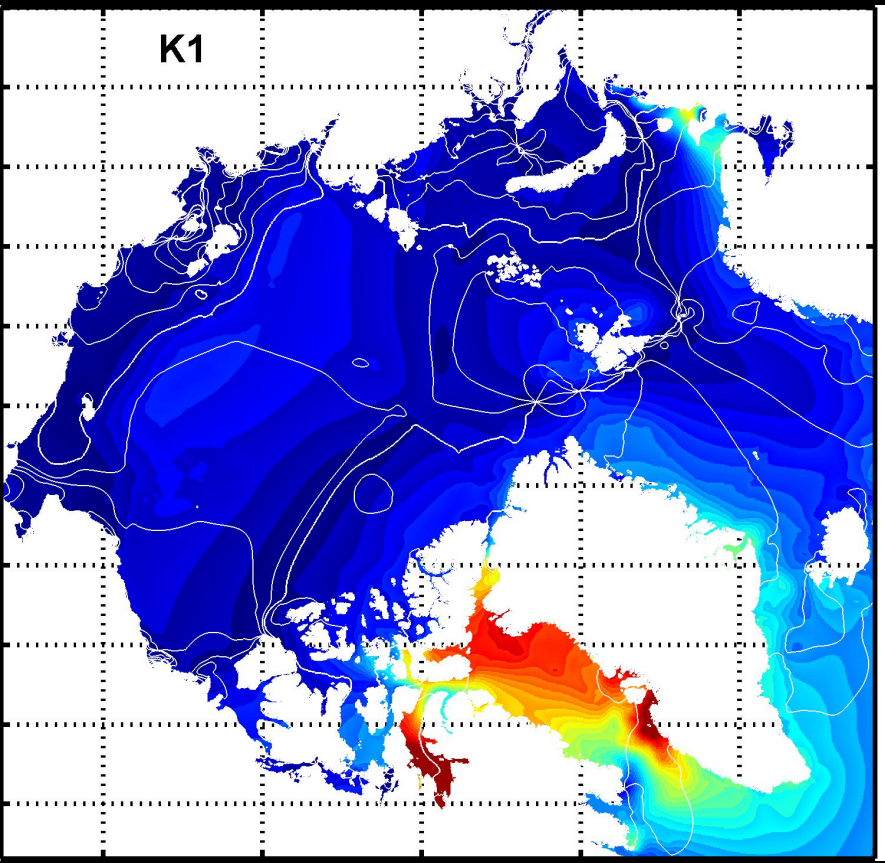
http://www.esr.org/AOTIM/arctic_summary.html

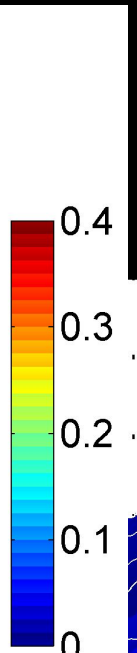
Amplitudes and phases of semidiurnal tidal wave (Padman, Erofeeva; 2004)

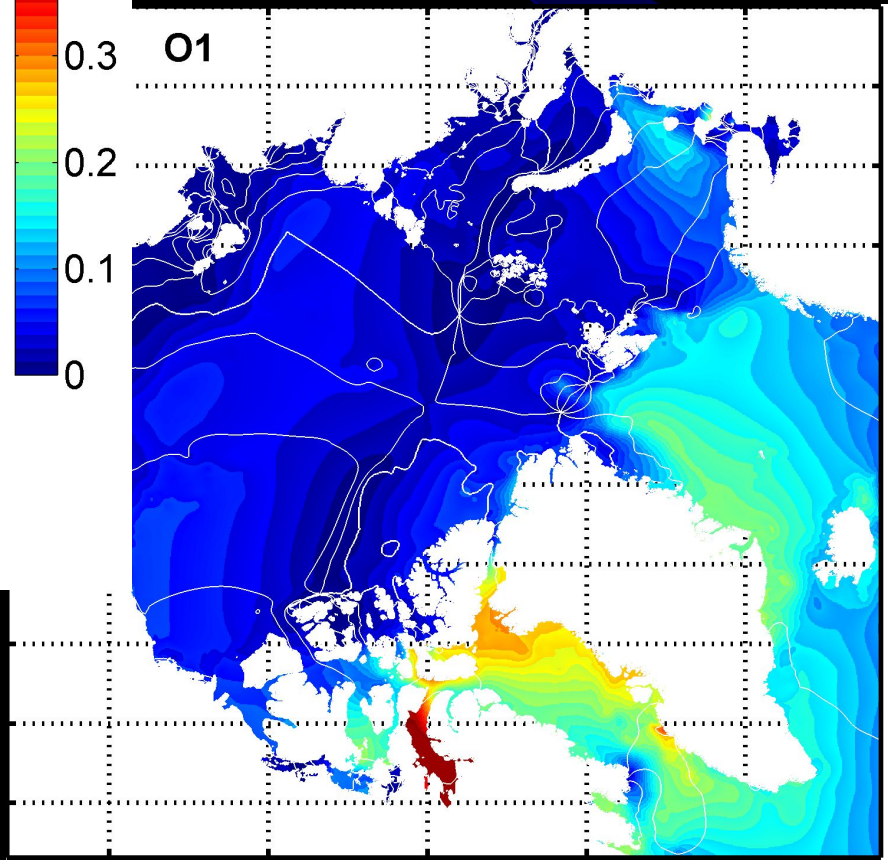




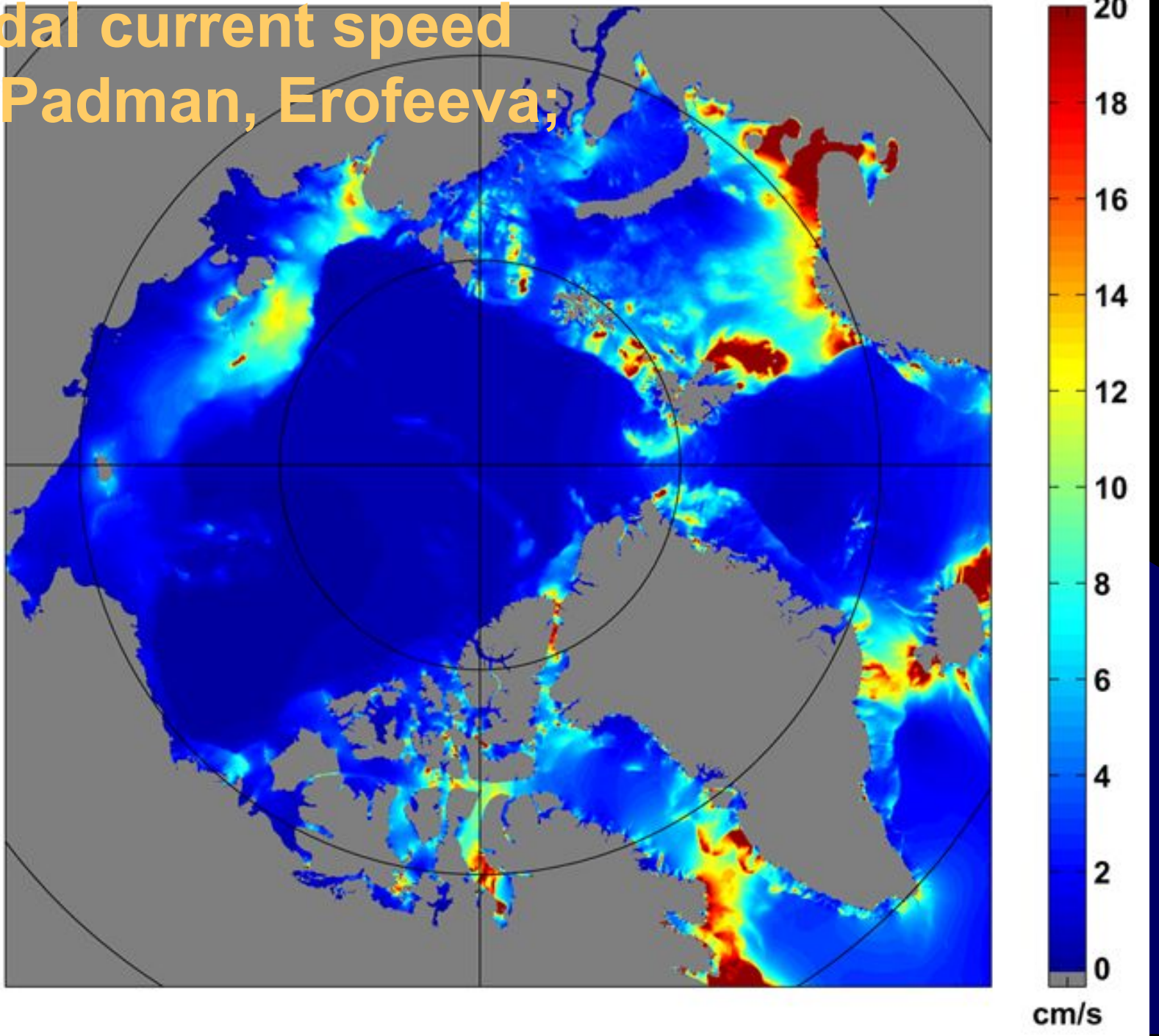
Amplitudes and phases of diurnal tidal wave (Padman, Erofeeva; 2004)







Mean tidal current speed (cm/s) (Padman, Erofeeva; 2004)

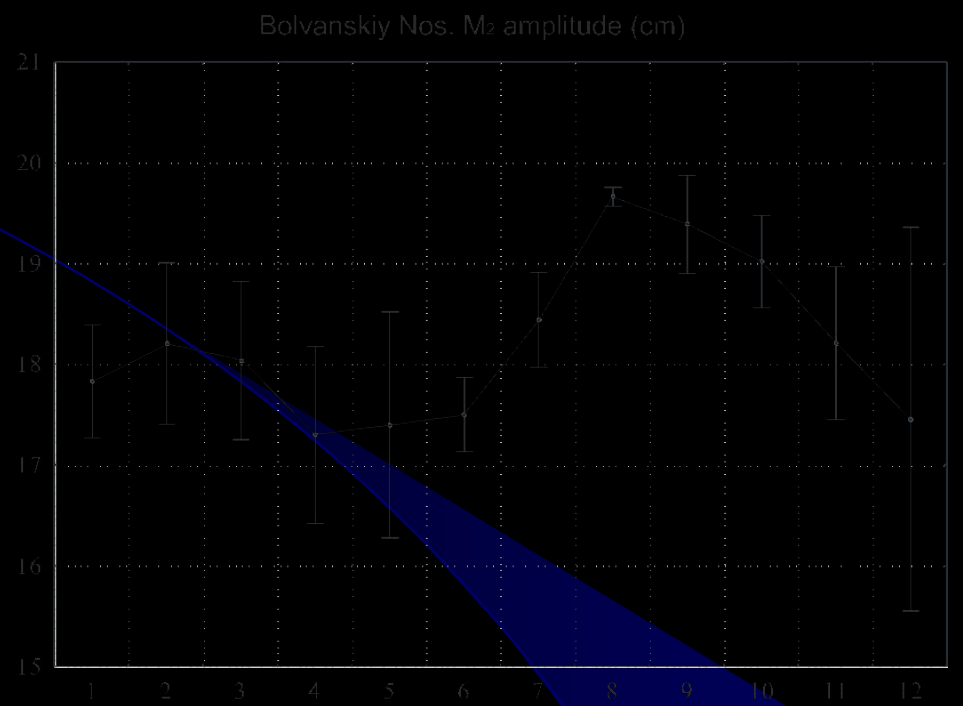


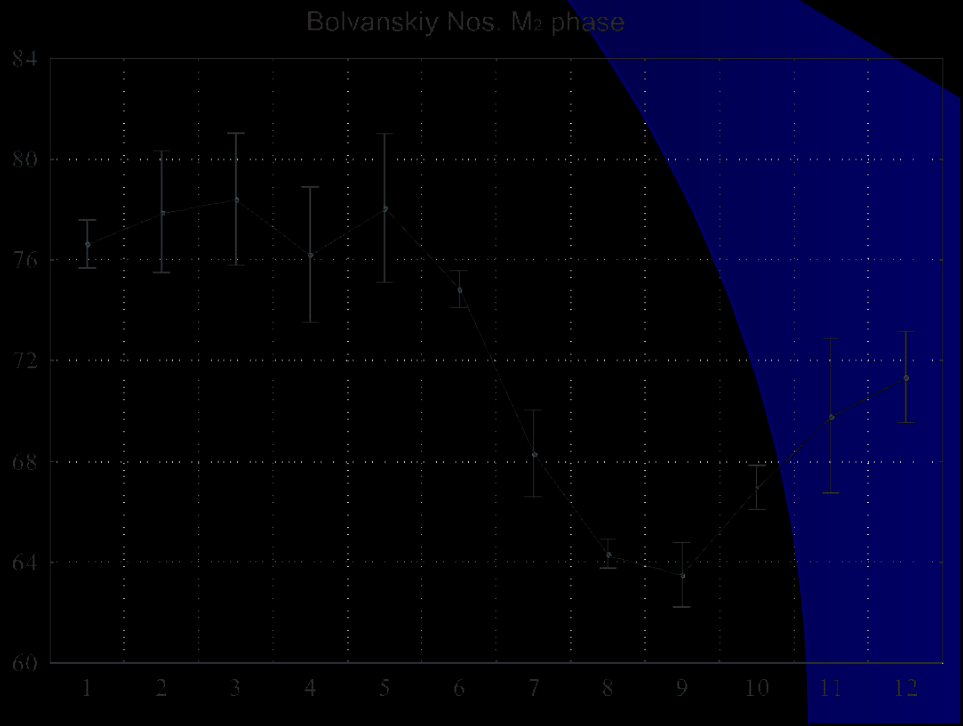
The ice cover influence on tidal movements has following effects:

- The occurrence in a tidal stream the under-ice boundary layer
- The tidal wave reflection from border between sea ice and open water
- Reduction of propagation speed and amplitudes of tidal waves under fast ice.

Variability of harmonic constants in Arctic

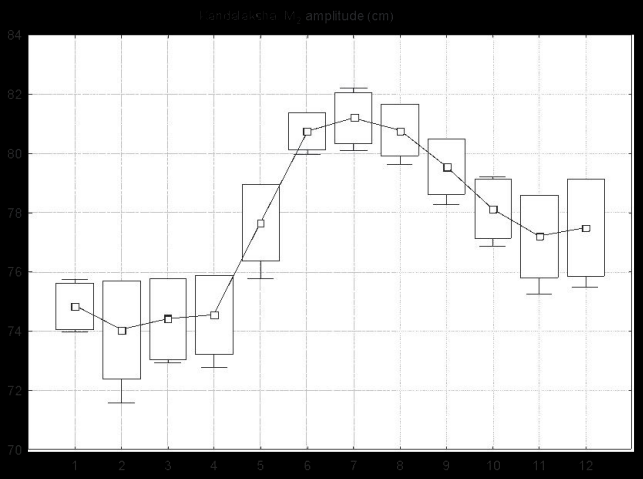
Владимир Юльевич Визе
Vladimir Wiese
(1889-1954)

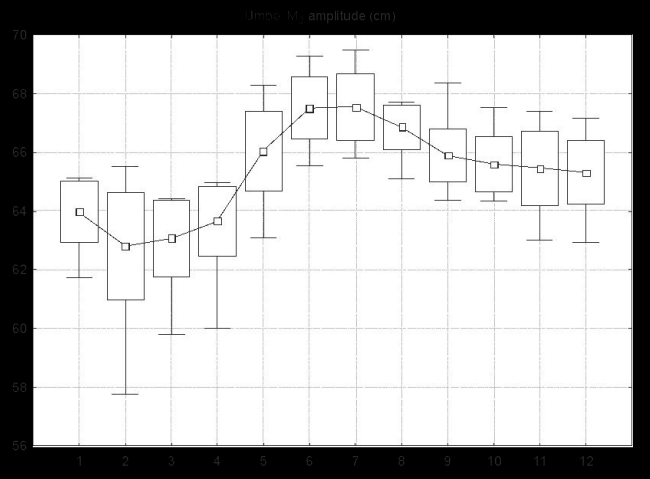


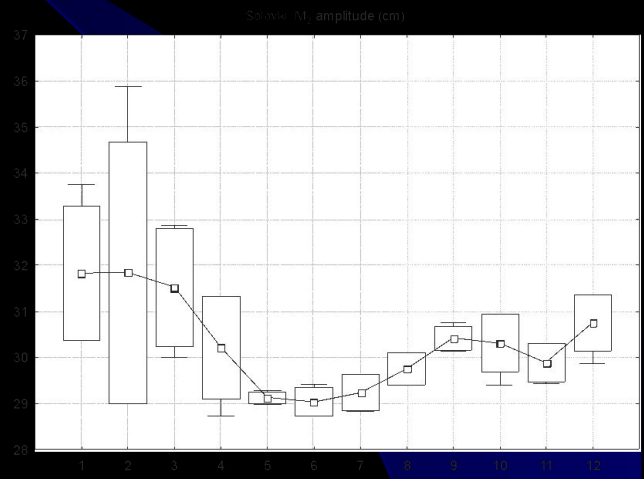


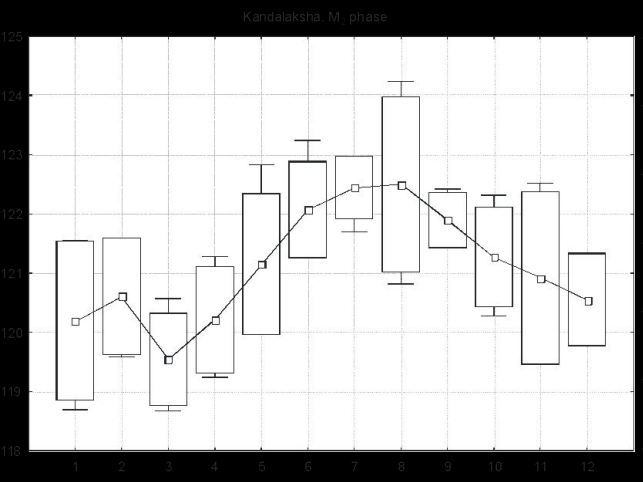
Variability of harmonic constants

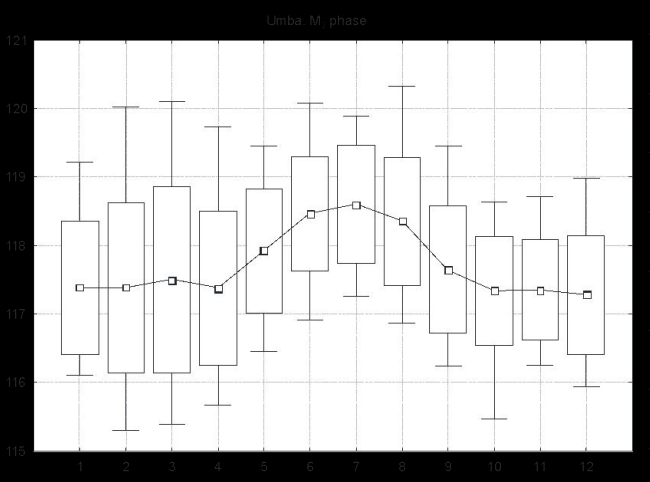
White Sea

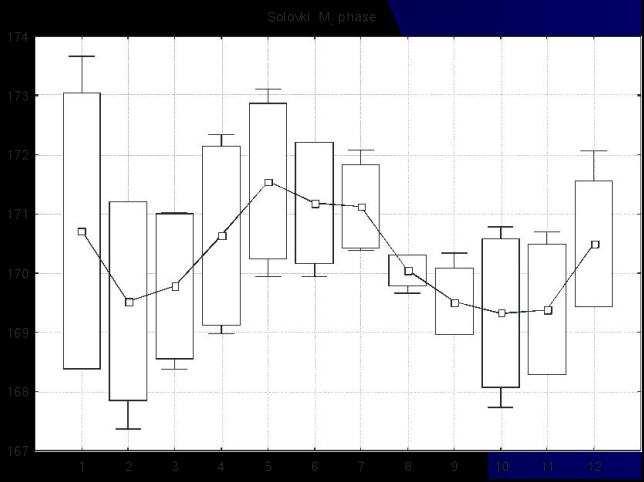




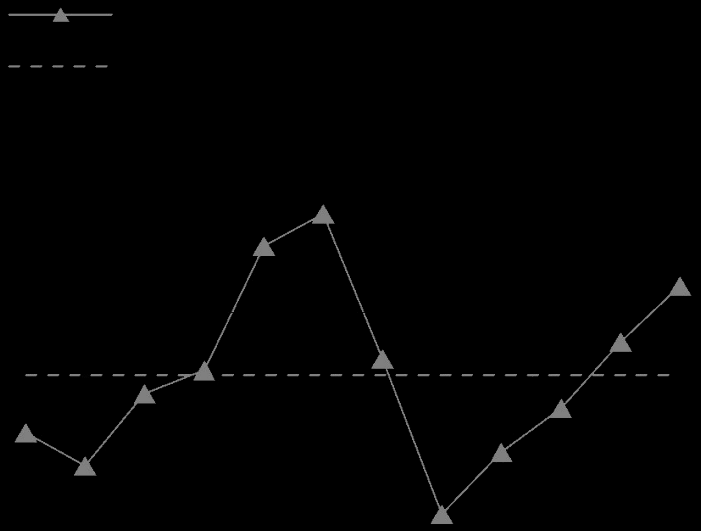


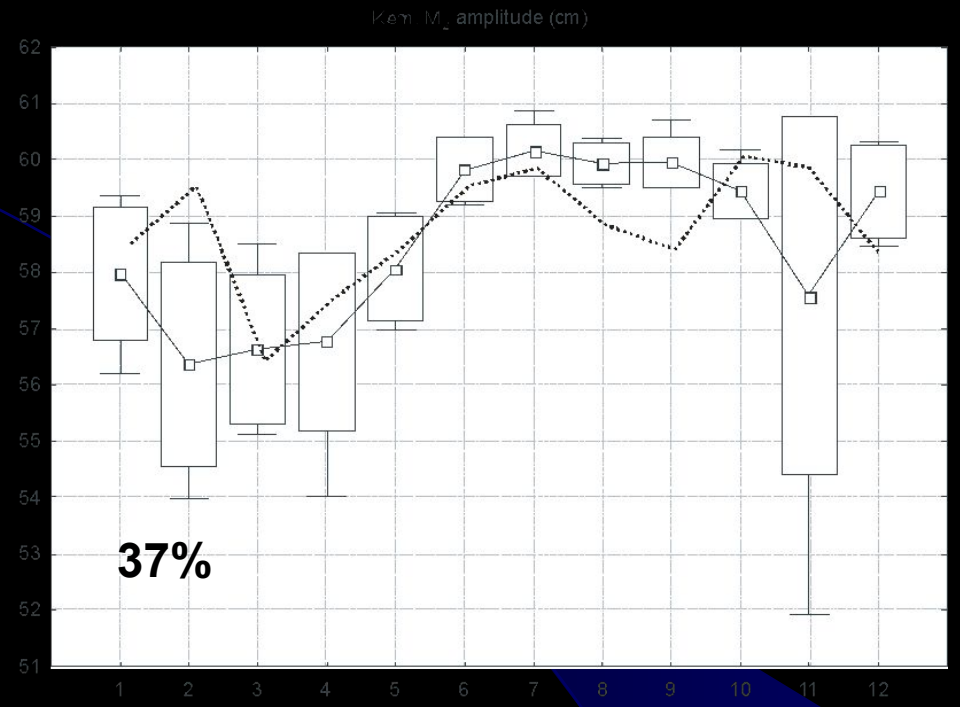


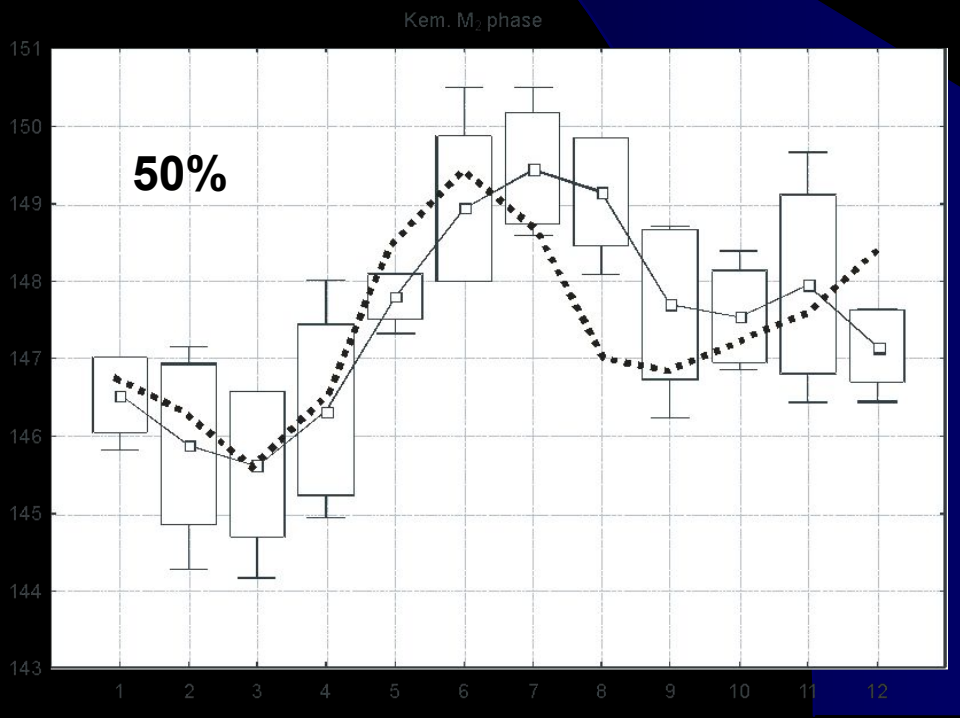




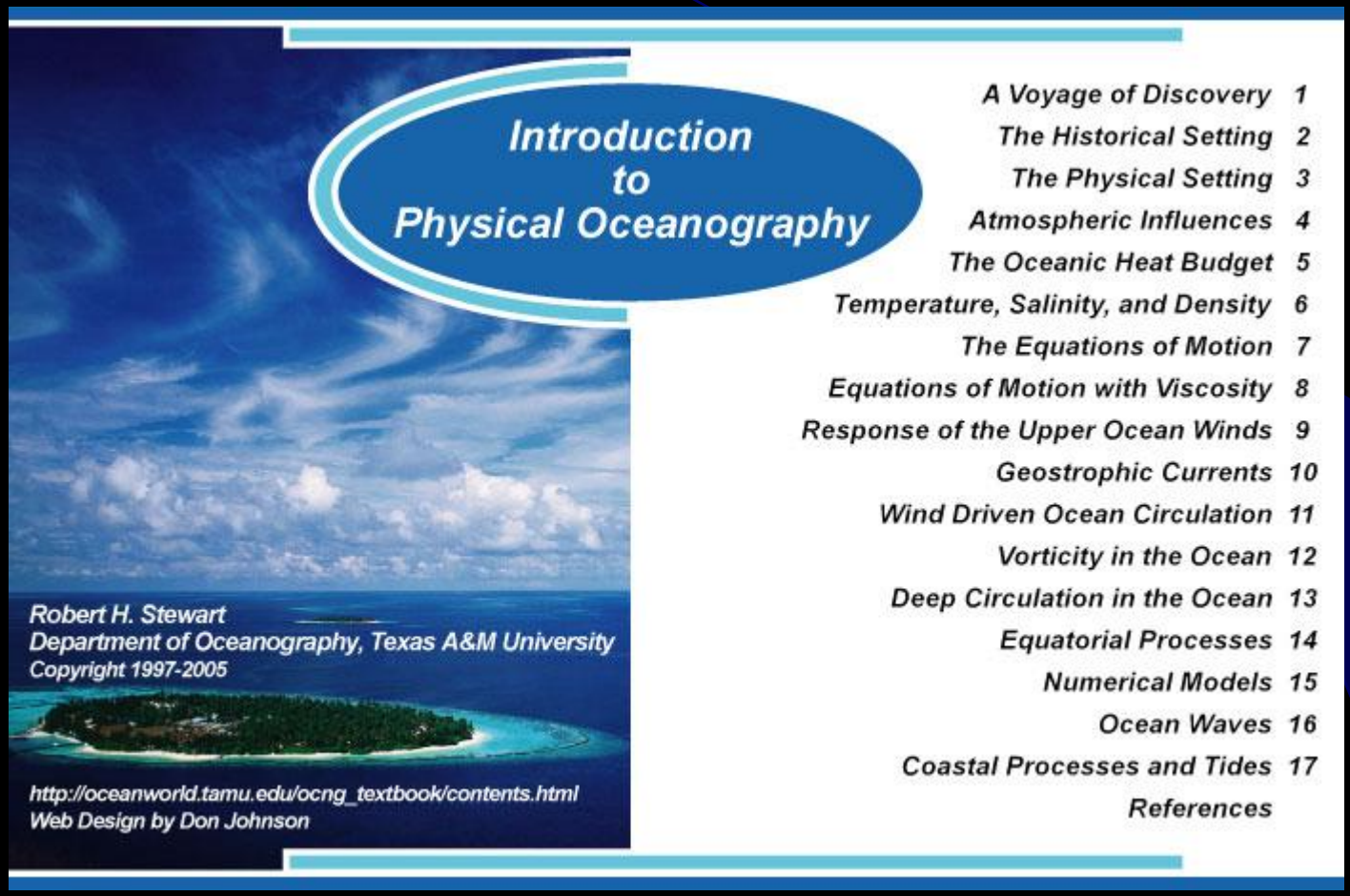
long-term variability of harmonic as modulation by nonlinear tidal waves







http://oceanworld.tamu.edu/resources/ocng_textbook/contents.html



http://www.oceanographers.ru/

Literature

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В.Р. Ржонсницкий “Приливные движения” – Л.: Гидрометеоиздат, 1979 г.

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А.И. Дуванин “Приливы в море” – Л.: Гидрометеоиздат, 1960 г.

А.В. Некрасов “Приливные волны в окраинных морях” – Л.: Гидрометеоиздат, 1975 г.

А.В. Некрасов “Энергетика океанских приливов” – Л.: Гидрометеоиздат, 1990 г.

Tidal questions in the examination paper № 1

- **What are tides and tide-producing forces?**
- (*At what zenith length values horizontal and vertical components of tide-producing forces will be minimum and maximum? The vertical or horizontal component of tide-producing forces form tides in the Ocean? Why?)*

Tides № 2

№ 2

- **Describe elements of a tidal wave.**
- (*What are the High Water, Low Water, Lunitidal interval, a tidal range, amplitude of tide, the period of a tidal wave? How the period and frequency of tidal wave are connected? What types of tides exist in the Ocean? What type of tides has widest distribution? Where are the maximum tidal ranges in the World and in Russia?)*

Tides № 1

№ 3

- **By means of the Equilibrium theory of tides explain the reason of diurnal, semidiurnal, mixed tides and tidal inequalities.**
- *(List the basic assumptions of Equilibrium theory of tides. What are tidal inequalities? What tidal inequalities of tides do exist?)*

Tides № 2.

№ 4

- **Than the Laplace's tidal equations differ from the modern equations of tidal dynamics?**
- (*Write equations of tidal dynamic, specify the nonlinear terms of equations. What methods of the decision of the dynamics equations exist?)*

Tides № 3, Tides № 7

№ 5

- **What is the harmonic analysis of tides?**
- *(Write a basic equation of tidal prediction. List the Darwin's names of the basic tidal waves on Darwin's classification, specify their periodicity. What are shallow-water constituent (overtides and compound tides) of tides? What reason of overtides and compound tides?)*

Tides № 4, Tides № 6, Tides № 7

№ 6

- **Describe elements of cotidal map.**
- *(What are the cotidal line, co-range line, amphidromic point, amphidromic systems, nodal zones? How are differ Harris's and Taylor's amphidromic systems? How to define direction of tidal waves propagation using cotidal maps?)*

Tides № 5