

The Lena Delta region of the Laptev Sea - a unique confluence for the study of changing Arctic dynamics

Observations

LENA2010 stations and calculated euphotic depth (MERIS 05-08-2010)

Basic parameters measured during the LENA2010 expedition

The seabed topography based on observed bathymetry data, m (0m- terrestrial area)

LENA2011 stations (Jun 26 to Jul 7 2011)

TSM (Total Suspended matter) and Particulate Carbon content in sequence of sample number

Physical modeling

The goal is modeling the shelf circulation dynamics under the action of varying atmospheric forcing, Lena runoff and tidal forcing, and their impact on ecosystem dynamics. An unstructured-grid Finite Volume Coastal Ocean Model (FVCOM) is used as a modeling tool.

Phase of modeled M2 constituent for ice-free conditions in the Laptev Sea, [deg]

Phase of modeled M2 constituent for ice-free conditions in the Laptev Sea, [m]

Modeled impact of an open polynia on the temperature field at 3 m, [°C]. Forcing is from COSMO simulations under conditions that polynia is

(a) absent
(b) present
Period of simulations 9 - 31 May 2008

Ecosystem dynamics

Sample-environment biplot of the redundancy analysis of the 2010 phytoplankton data. Three clusters occurred: 1. freshwater species, 2. brackish marine cluster, 3. cluster dominated by sub-surface samples. The dominant environmental factors were temperature, salinity and stratification strength

The theoretical slope of the line is significantly different from 0 with 82% probability

$y = -0.2159x + 5.4094$
 $R^2 = 0.1278$

The season when the daily flow of Lena reaches a maximum (based on daily observation data)

Red line - Delta transects, blue line - coastal transects

Estimated Primary Production for Lena 2011 07 approx. 600 mg C m⁻² d⁻¹

The Lena Delta region of the Laptev Sea serves as an indicator of climate change. We estimate the impact of different factors on the dynamics in the region.

Hydrodynamics and bio-optical analysis via remote sensing

04-07-2011 MERIS ADG absorption coefficient_{443nm} (absorption detritus & gelbstoff) shows the far-reaching transport of organic matter

04-07-2011 MERIS TSM shows that particle suspension dips down as bottom suspension or settles close to the Delta

Relationship between DOC and the absorption coefficient_{442 nm}

$f(x) = 0.56x - 0.71$
 $R^2 = 0.60$

Relationship between TSM and Secchi disk depth for all Lena River stations

$f(x) = -0.91x + 91.09$
 $R^2 = 0.92$

Our partners

Trier University, State Hydrological Institute (St. Petersburg), Helmholtz-Zentrum Geesthacht Centre for Materials and Coastal Research, Arctic and Antarctic Research Institute (St. Petersburg), Institute of Computational Mathematics and Mathematical Geophysics (Novosibirsk), Helmholtz Centre for Ocean Research (Kiel)