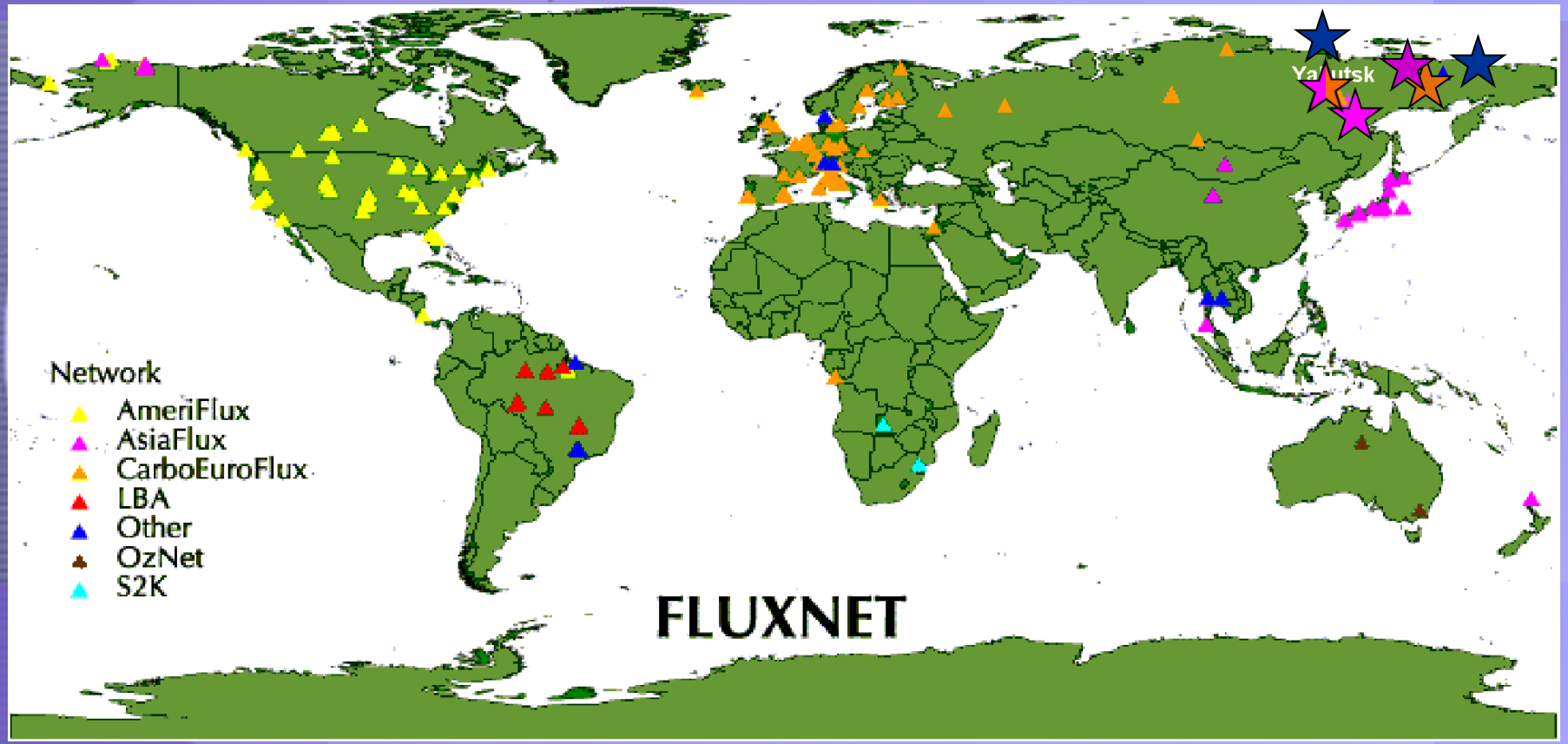
THE *SAKHAFLUXNET* SCIENTIFIC AND EDUCATIONAL ACTIVITY IN NORTH EASTERN OF RUSSIA

Trofim Chr. MAXIMOV, Dr. Sci., Prof.

* Institute for Biological Problems of Cryolithozone, SB RAS. Yakutsk, Russia
* BEST Center of NEFU, Yakutsk, Russia
* Russian Society of Plant Physiologists

Global, continental and regional observational networks of heat, water and carbon dioxide fluxes



Samoylov Station

Northeast Science Station

Chokurdakh

Tundra station

Kodac

Forest-Tundra station

Spasskaya pad

Forest station

Yakutsk

Ust-Maya

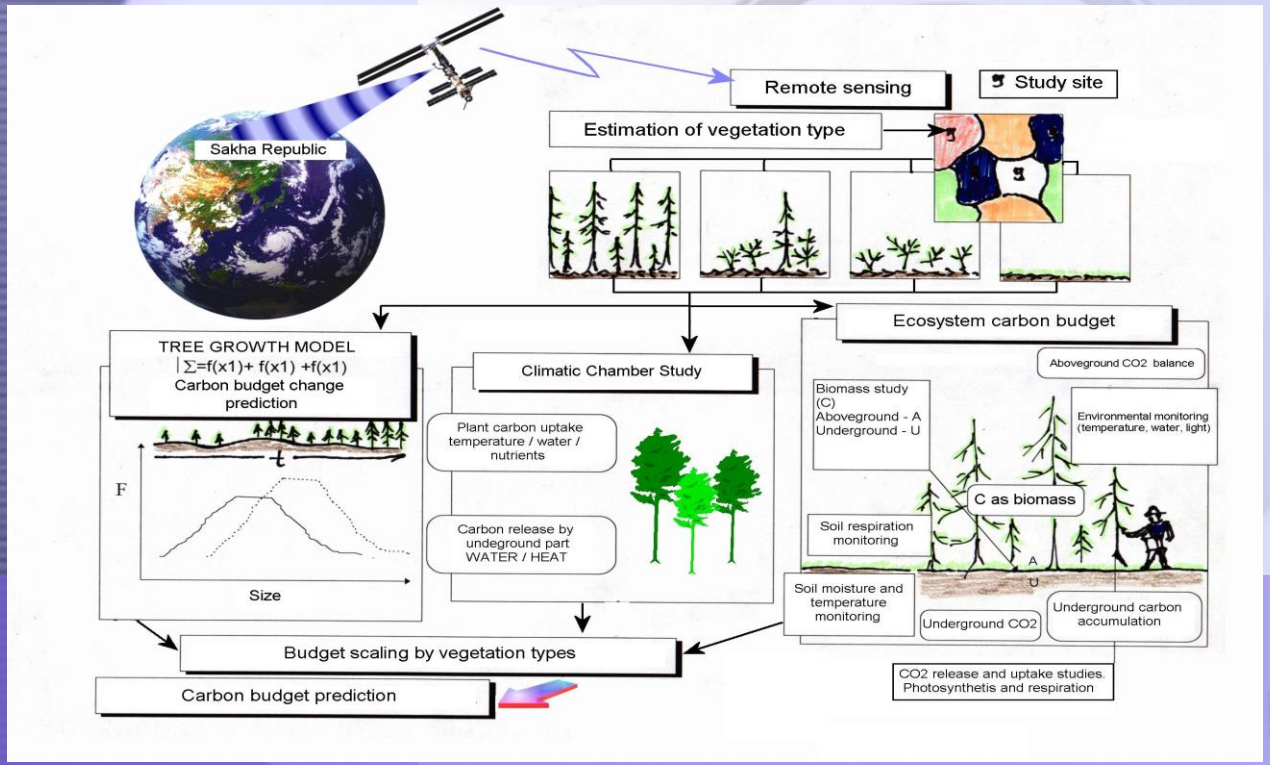
Elgeeii

Forest station

Interdisciplinary studies on global climate changes in North-Eastern Russia

SAKHAFLUXNET

The main purpose of research is to carry out interdisciplinary scientific research to address fundamental issues that reveal a complete real picture of the status of the environment, the nature of the interaction of all its parts (atmosphere, biosphere, hydrosphere, cryolithosphere), their impact on biodiversity, parameterization of ecosystems and forecasting and mitigation of possible directions and the consequences of global changes in the environment, as well as for solving the tasks of short-term monitoring of various aspects of human life



4M methodology is using for research on climate change at local, regional and global scales

1M – Monitoring ;
2M - Manipulation;
3M – Modeling;
4M – Management

Monitoring of climate change at SakhaFluxNet research stations

- Space (Aqua, NASA & JAXA),
- Aerovisual (IL-18, AN-2, drones and aerostat),
- Land surface (high-rise towers and masts),
- Permafrost

SakhaFluxNet instrumentations

❖ Elgeeii highly productive forest station, 60 ° N

Since 2009

❖ Spasskaya Pad temperate productive forest research station 62°N

❖ Kodac forest-tundra research station, 69°N

❖ Chokurdakh typical tundra research station, 70°N

Since 2003

Biogeochemical study of aquatic ecosystems of North Eastern Russia

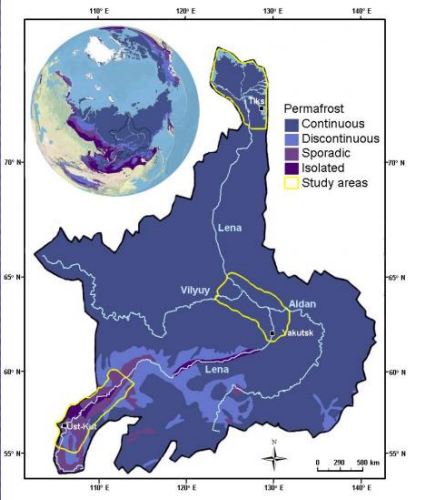
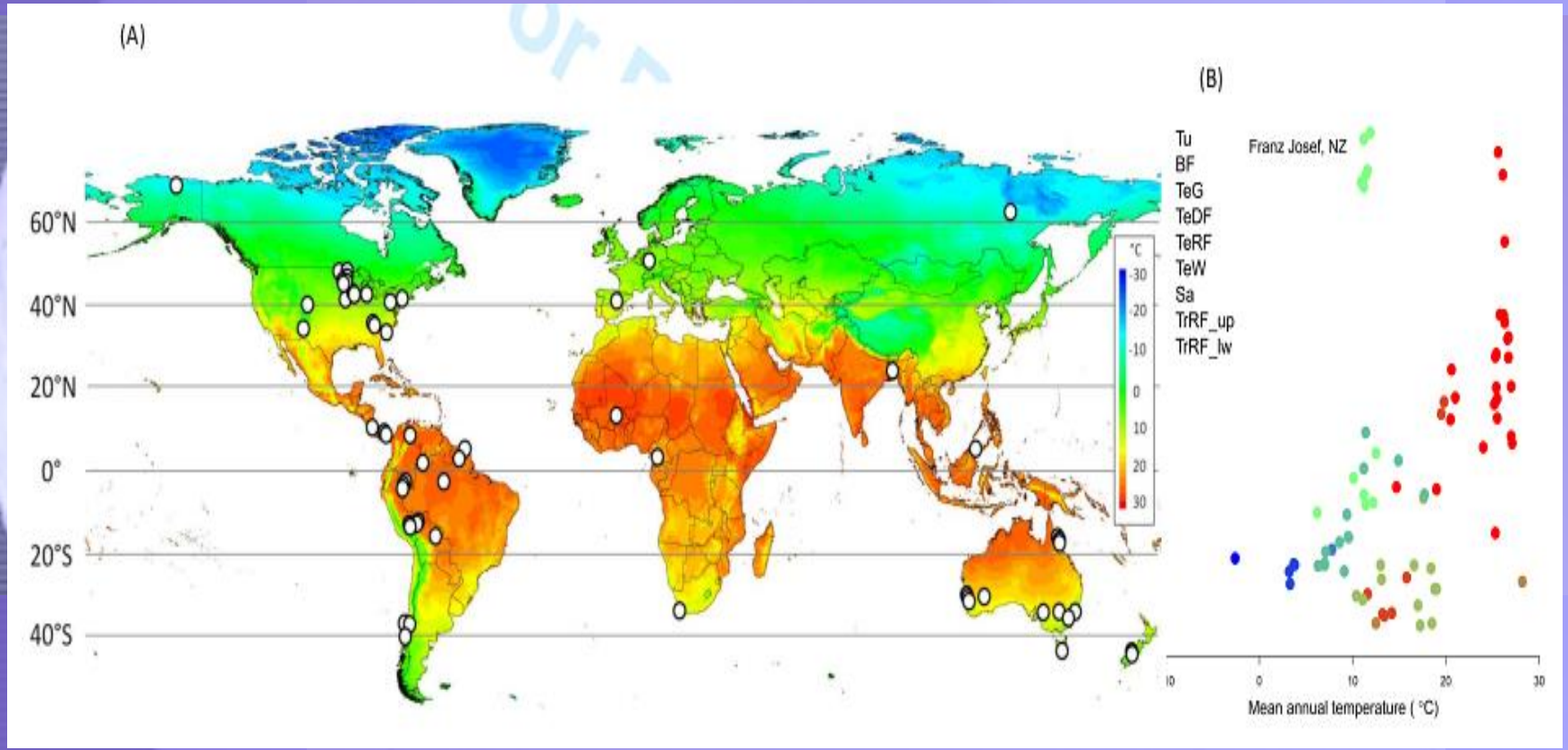
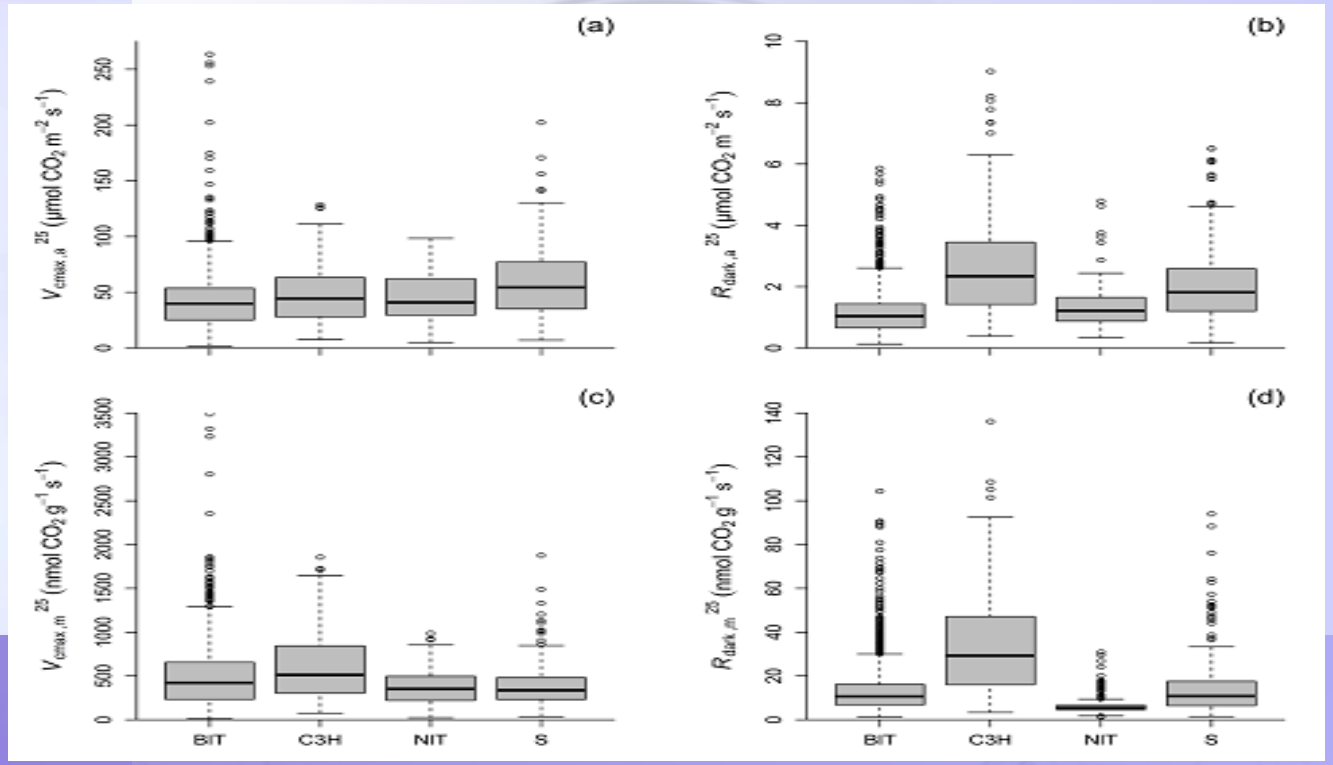


Table 1. Facts about the Lena River [4]	
Length	~ 4400 km
Discharge area	~ 2,5 million km^2
Discharge volumes	~ 525 km^3/year
Suspended load	> 20 million ton/year
Major tributaries	Aldan, Vilyui, Vitim, Olekma

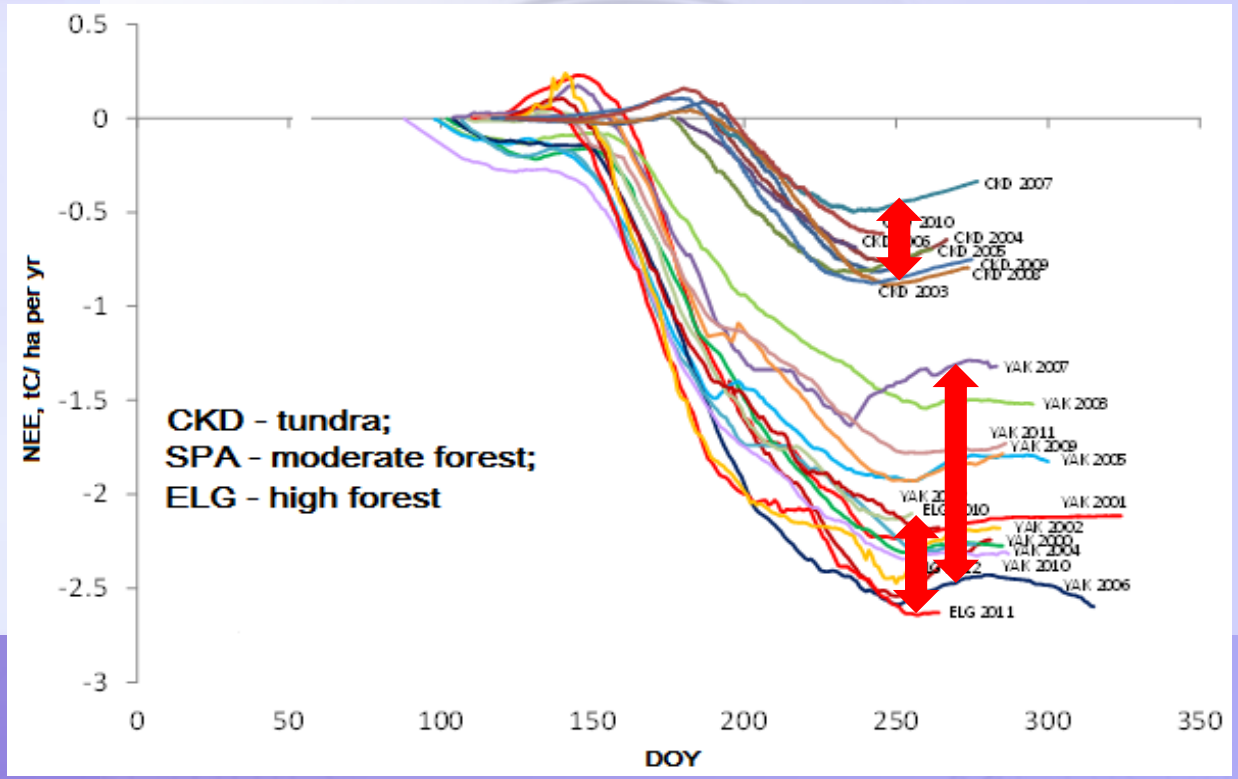
Location (A) and climate envelope (B) of the sites at which leaf dark respiration and associated traits were measured



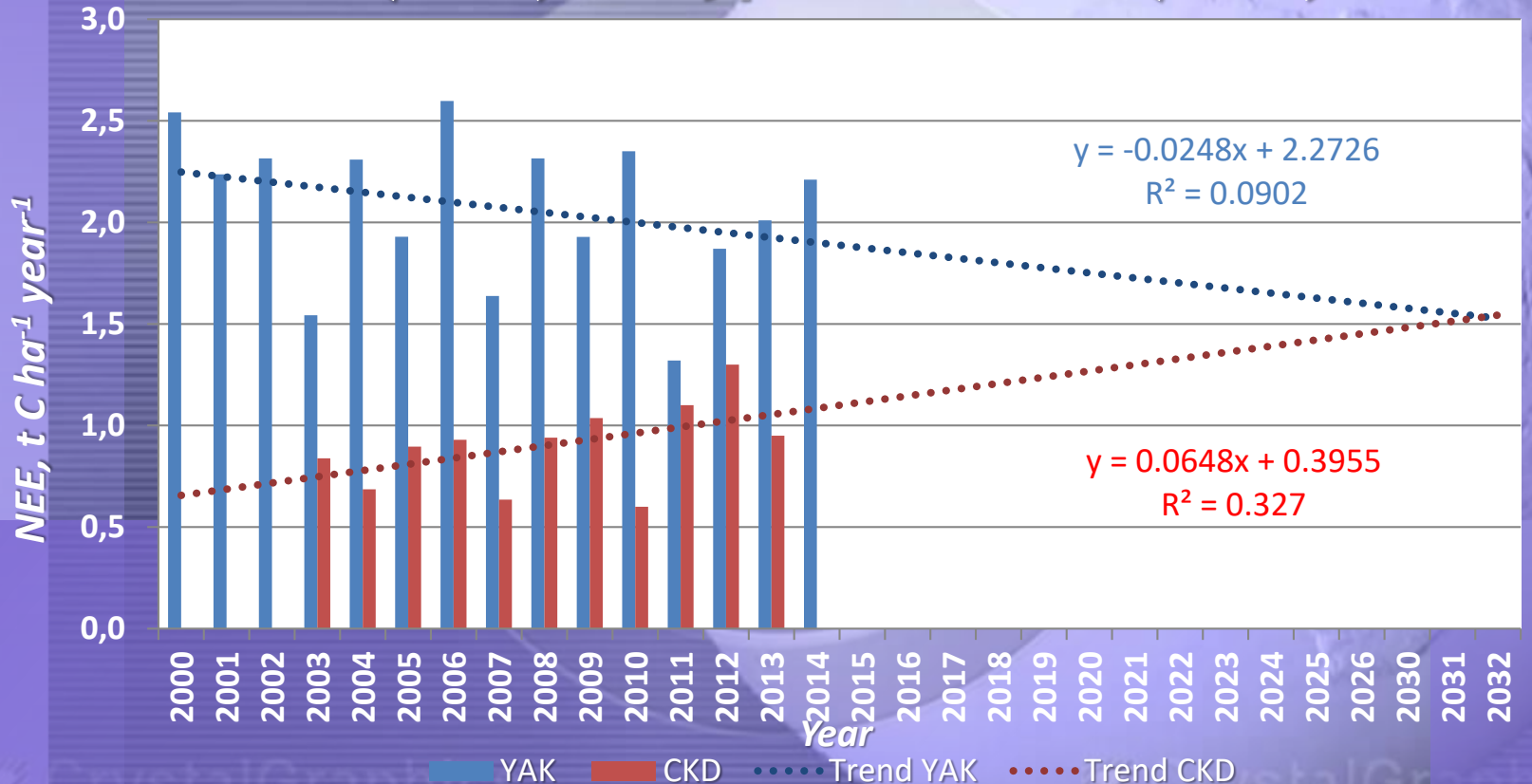
Modulation of Vcmax and Rdark by plant functional type classifications



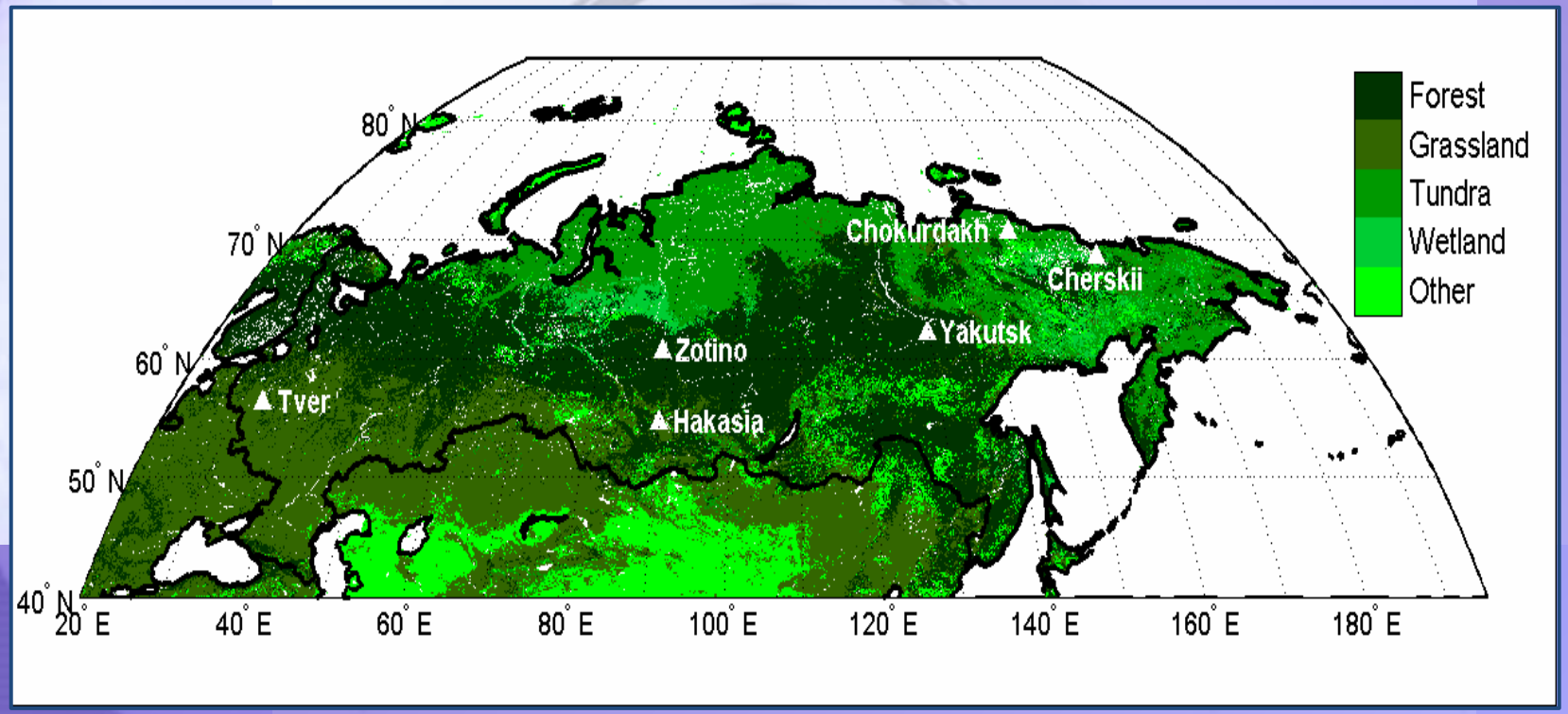
Cumulative carbon of representative permafrost ecosystems in eastern Siberia



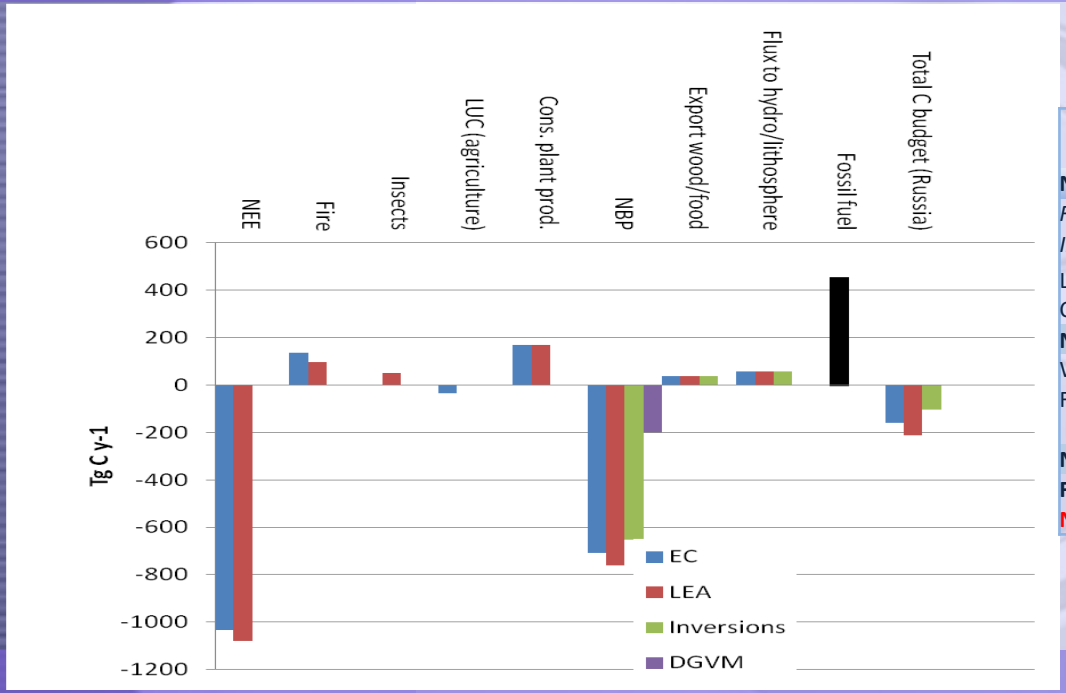
Cumulative fluxes
Larch forest (YAK) vs Typical tundra (CKD)



Land cover map of the Russian Federation and measurement sites



Carbon budget of Russia



	Carbon fluxes (Tg C-CO2/y)			
	EC	LEA	Invers.	DGVM
NEE	**-1033**	**-1079.2**		
Fire	137	97.2		
Insects	50.8	50.8		
LUC (agriculture)	-34			
Cons. plant prod.	170.4	170.4		
NBP=NEE-D	**-708.8**	**-760.8**	**-653**	-199
Wood net export	20	20	20	
Food net export	18	18	18	
hydro/lithosphere	56	56	56	
NBP=NEE-D-F	**-614.8**	**-666.8**	**-559**	
Fossil fuel*	454	454	454	
NEE-D-F-Fossil Fuel	**-160.8**	**-212.8**	**-105**	

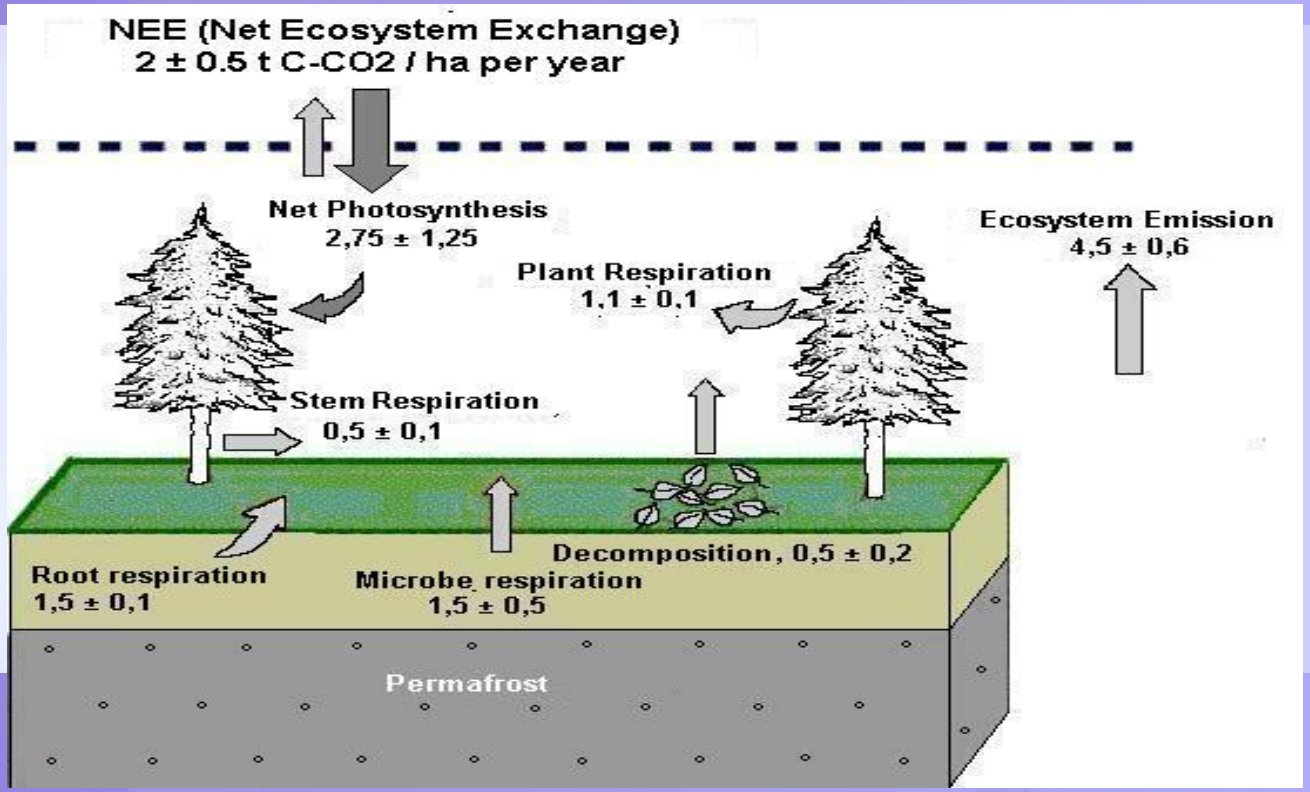
*UNFCCC, Shvidenko et al. 2011

CH_4 emissions not included but estimates are uncertain:

19.5 Tg C-CH_4 /y (EDGAR)- all sources

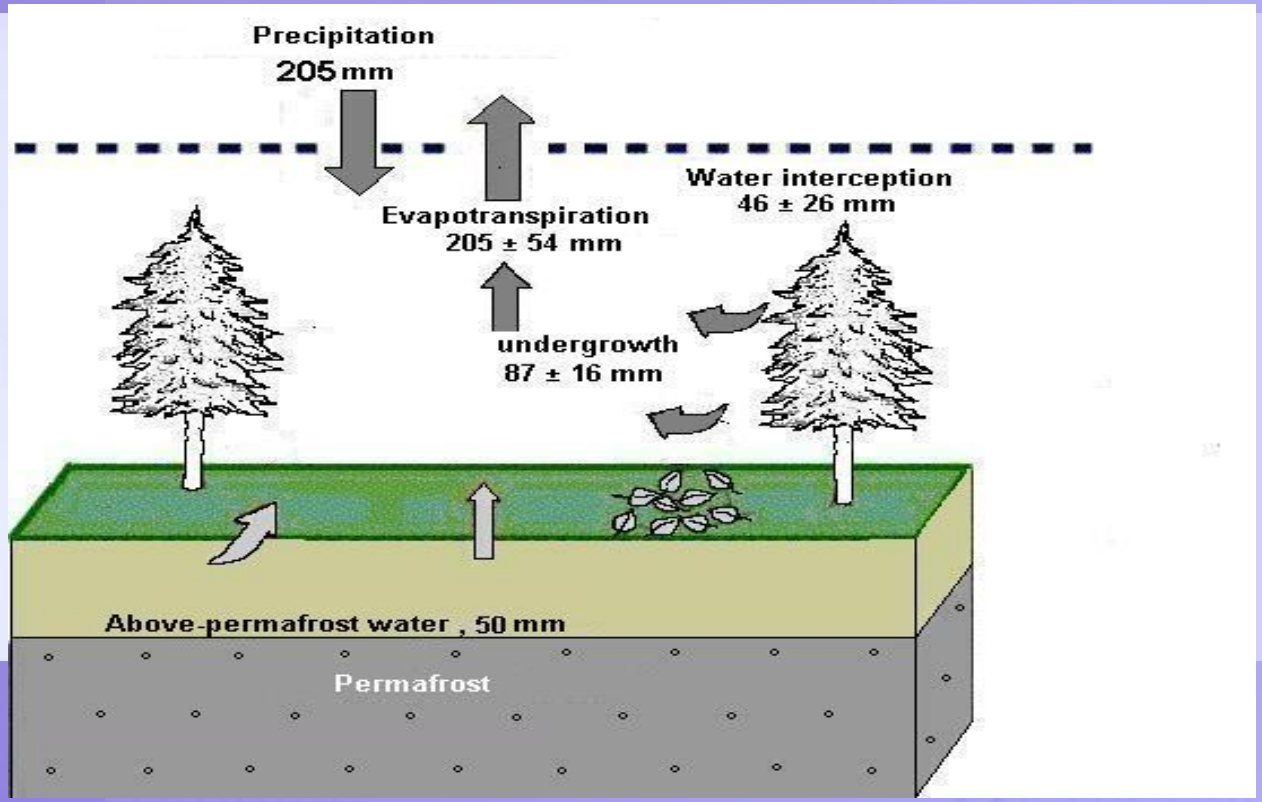
27.6 Tg C-CH_4 (Petrescu et al. 2010)-only boreal arctic wetlands

Annual carbon budget of permafrost forest ecosystems, *t C/ha per year*



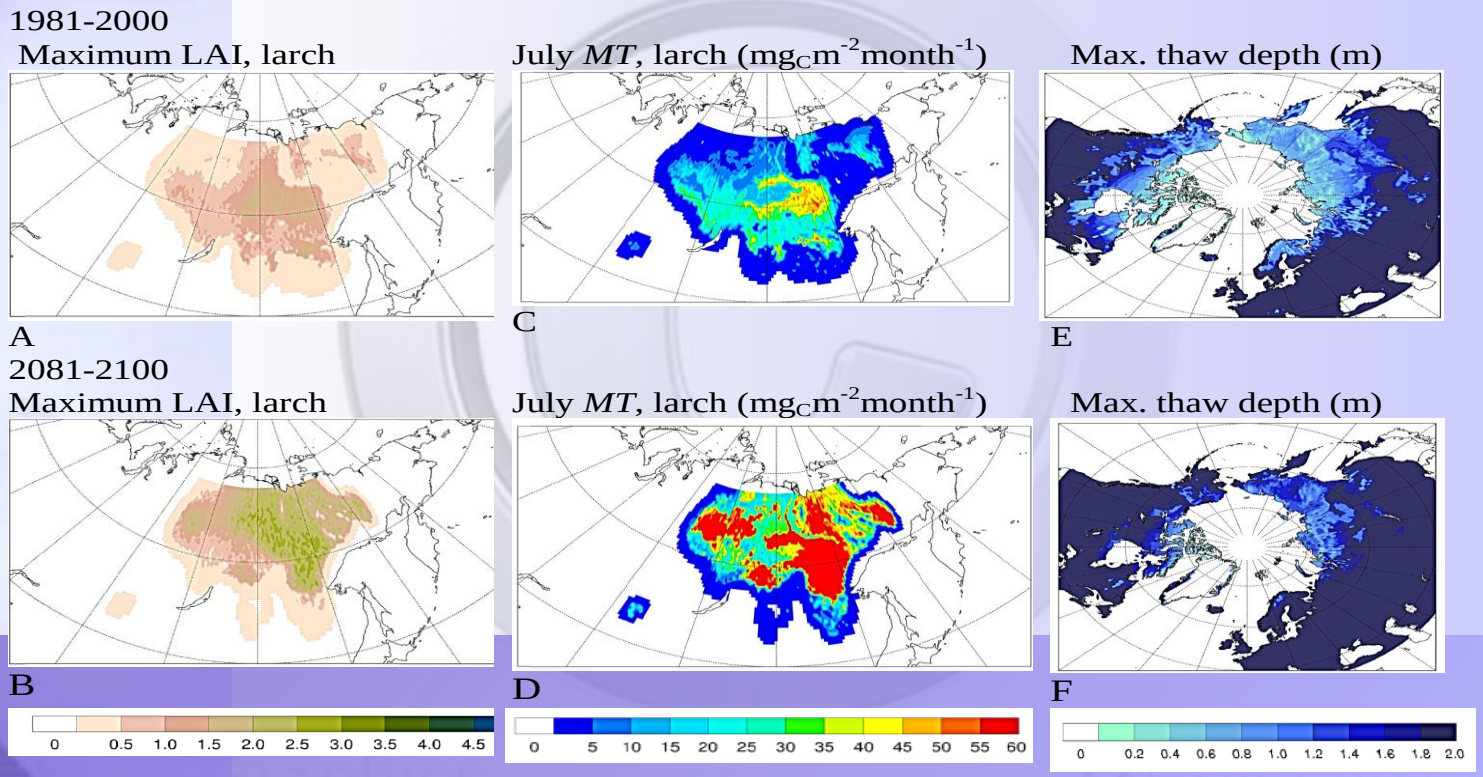
Maximov, 2003

Annual water budget of permafrost forest ecosystems, *mm per year*

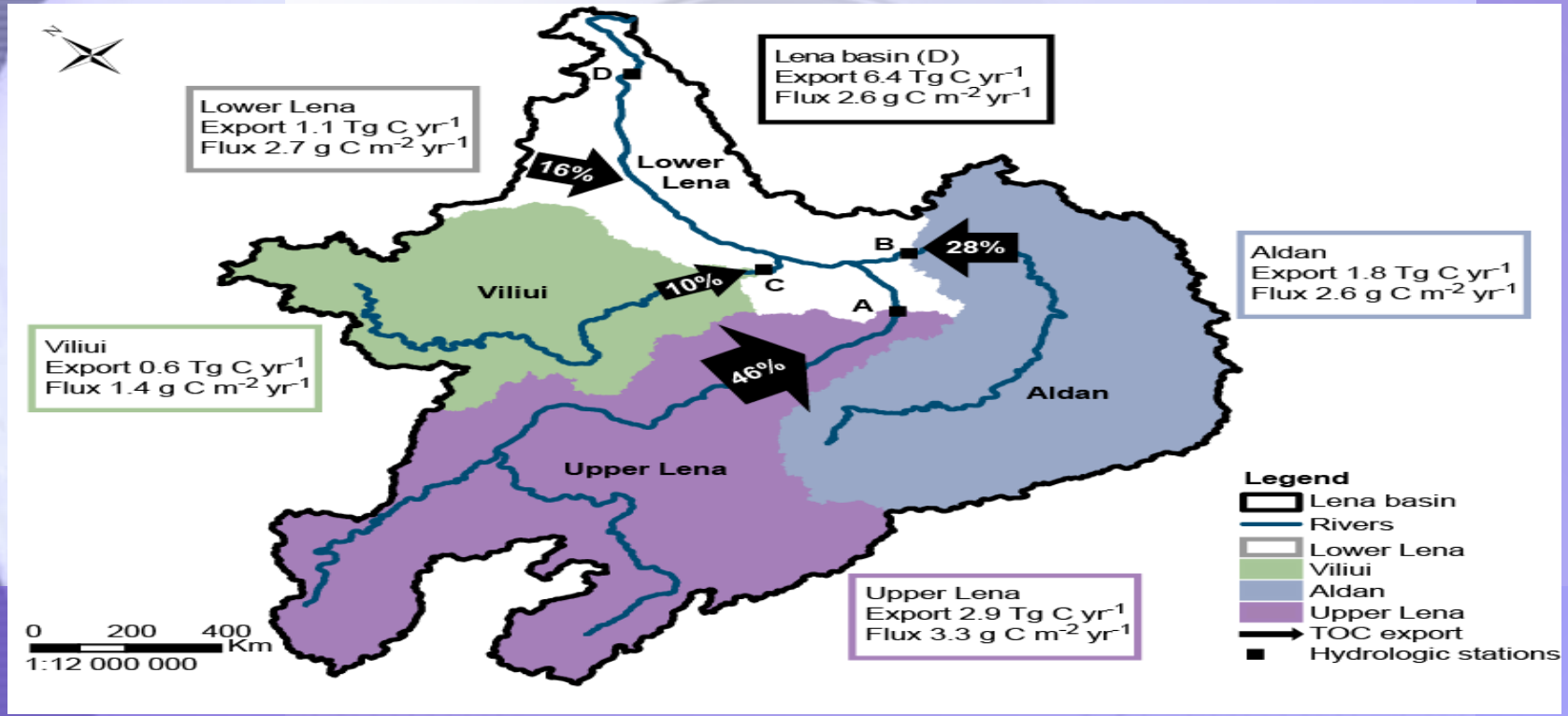


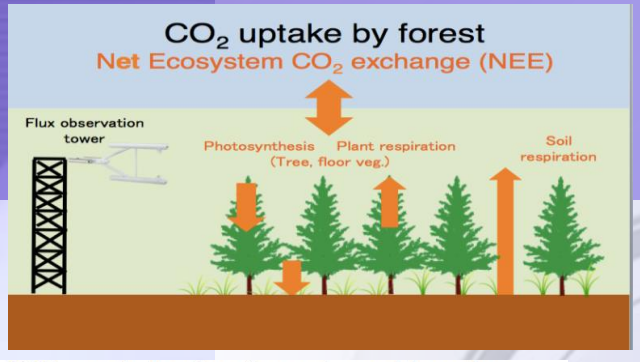
Maximov, 2003

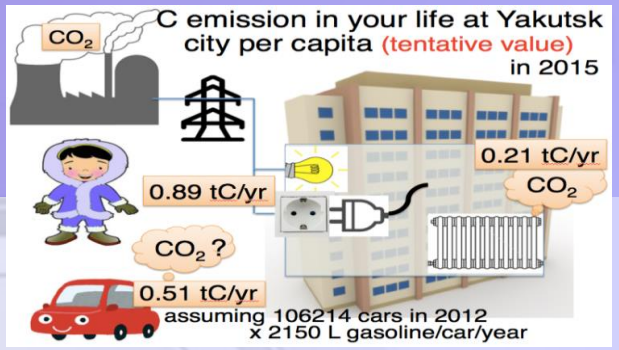
Simulated maximum summer leaf area index (LAI; A, B) and July emissions of monoterpenes (C, D; mgC m^{-2} $month^{-1}$) from Eastern Siberian larch



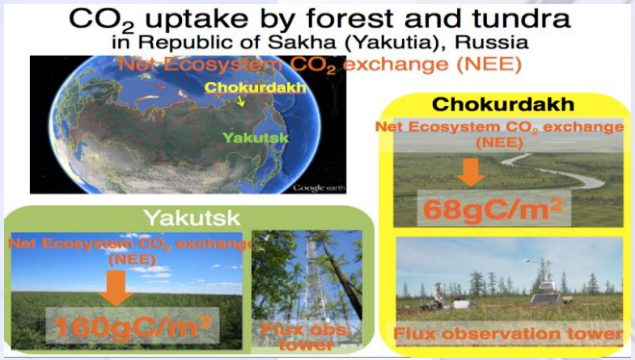
Annual export and total organic carbon flux from the Lena river basin (1Tg C = 1 million tons C)

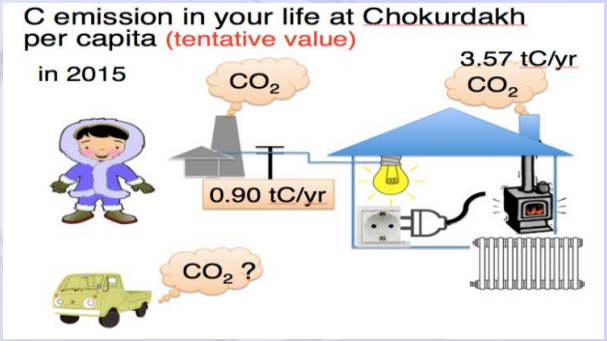




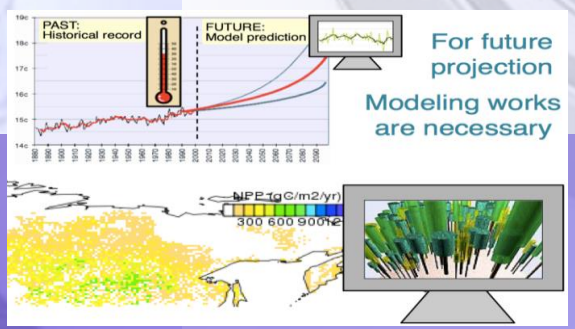


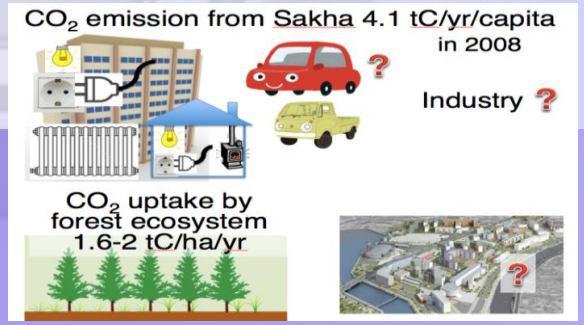
cities





villages

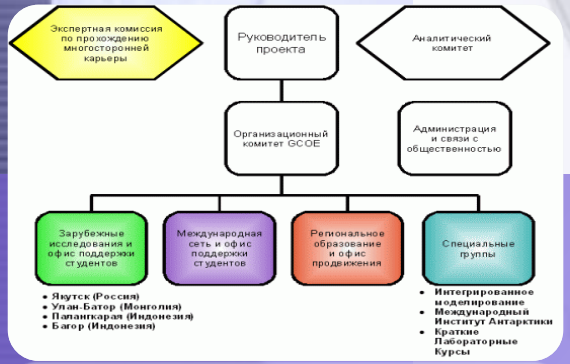


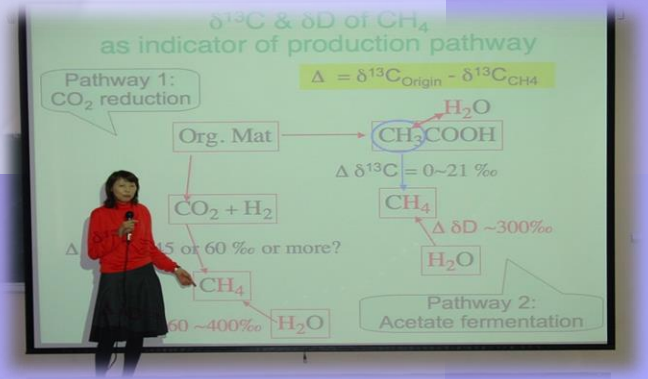


SCIENCE AND EDUCATION

- One of the main items of our activity is the attraction and support of students and scientists who are able to direct their knowledge in the field of Earth science into various areas of career growth, not only in the academic, but also in socially significant areas related to the policy of environmental protection, educational institutions and commercial and industrial corporations.
  - In 2008, the Russian Liaison office of the Global Center for Scientific Excellence (GCOE) at the Institute of Biological Problems of the Cryolithozone of the SB RAS
  - In 2012, the International BEST Center at the Institute for Natural Sciences of the North-Eastern Federal University named after M.K. Ammosov.

The creation of unique international centers raises the world status and prestige of Russian education and strengthens the connection between Russian education and world science in the field of exchanging famous scientists in the field of studying biogeochemical cycles and developing measures to mitigate the effects of global climate change. Currently, students and graduate students from different countries (Russia, Japan, Mongolia, China, South Korea, Singapore, Indonesia, Holland, Spain, Czech Republic, Italy, Yugoslavia and others) continue their education and research at scientific stations.



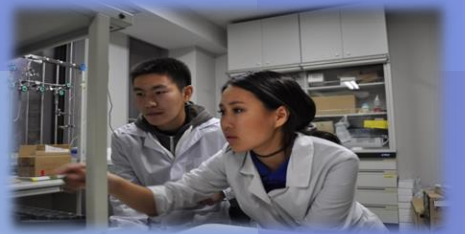


Creation and management of Russian and international scientific and educational programs – Syllabuses

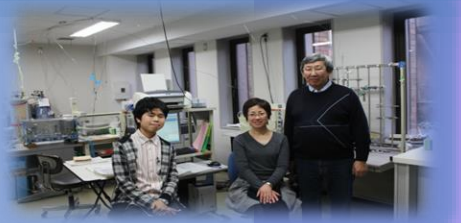
- Basic courses (for Russian students) - since 2012
- Annual international special courses on climatology, permafrost and biogeochemistry - since 2008
- The annual summer (every August) and winter (March) field and laboratory short schools “The role of permafrost in global climate change” - since 2008 (over 200 alumnuses)
- International Master's Programs (MSci. Course). The program "Sustainable Development of the Arctic" - since 2017 (15 alumneses).

SCIENCE AND EDUCATION



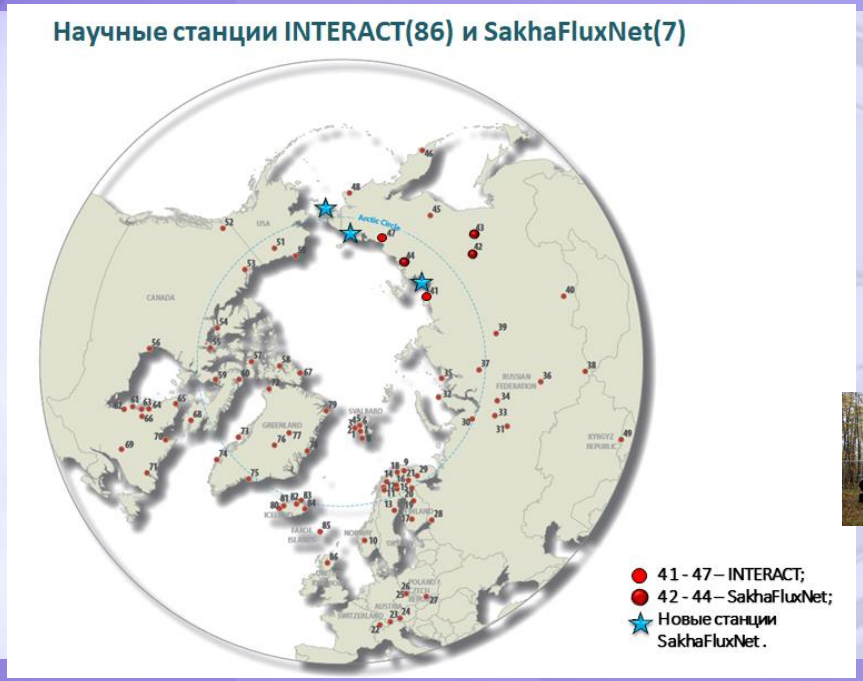




- A joint multidisciplinary Russian-Japanese laboratory has been established. IBPC SB RAS - NEFU - Hokkaido University (Yakutsk, Sapporo) - since 2017
- The creation of the new International Arctic Research Center in Russia is planned - 2020 plan
- An international consortium for the SakhaFluxNet was established at the IBPC SB RAS together with Japanese and European scientists for expanding the observing network, directions, instrumentations etc. - since 2019.г.

New Proposal to RG: Creation of a scientific base and infrastructure in NE Russia

SakhaFluxNet IPI of INTERACT Project from 2010



Expanding the network of monitoring observations based on 4 universally recognized global scientific stations SakhaFluxNet for global environmental monitoring with the organization of three additional research stations along the coast of the Arctic Ocean (Tiksi, Yakutia - Pevek, Chukotka - Uelen, Chukotka).


Thank you for your attention!