

# Progress in NEFI (formerly NEESPI) and the Role of LCLUC Caucasus Projects

**Pavel Groisman, NEFI-NEESPI Project Scientist**

NC State University at the NOAA National Centers for Environmental Information and HS&S, Asheville, NC, USA and P.P. Shirshov Institute for Oceanology, Moscow, Russia



# Role of LCLUC Caucasus projects

## “Long-Term Degradation in Caucasus”



1999

2015

• Problems (governance):

1. Corruption
2. Nationalism
3. Interventions outside the region

**Chechen Wars;**

**1994-2001**

**Artsakh**

**1991-up to date**

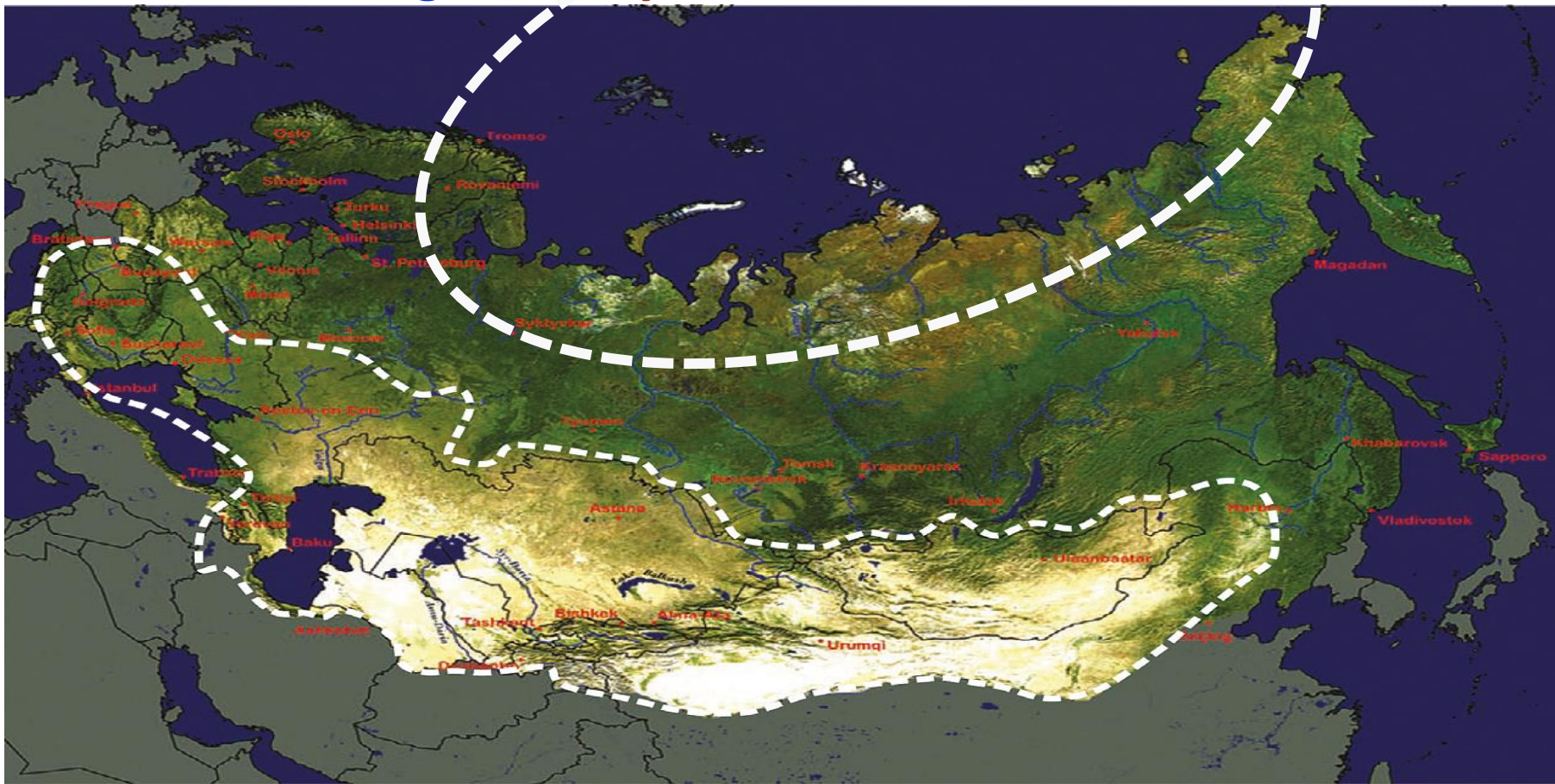
**Georgia vs  
Abkhazia &  
S. Ossetia**

**LCLUC role: Make a habit of two things: to help; or at least to do no harm (Hippocrates).**

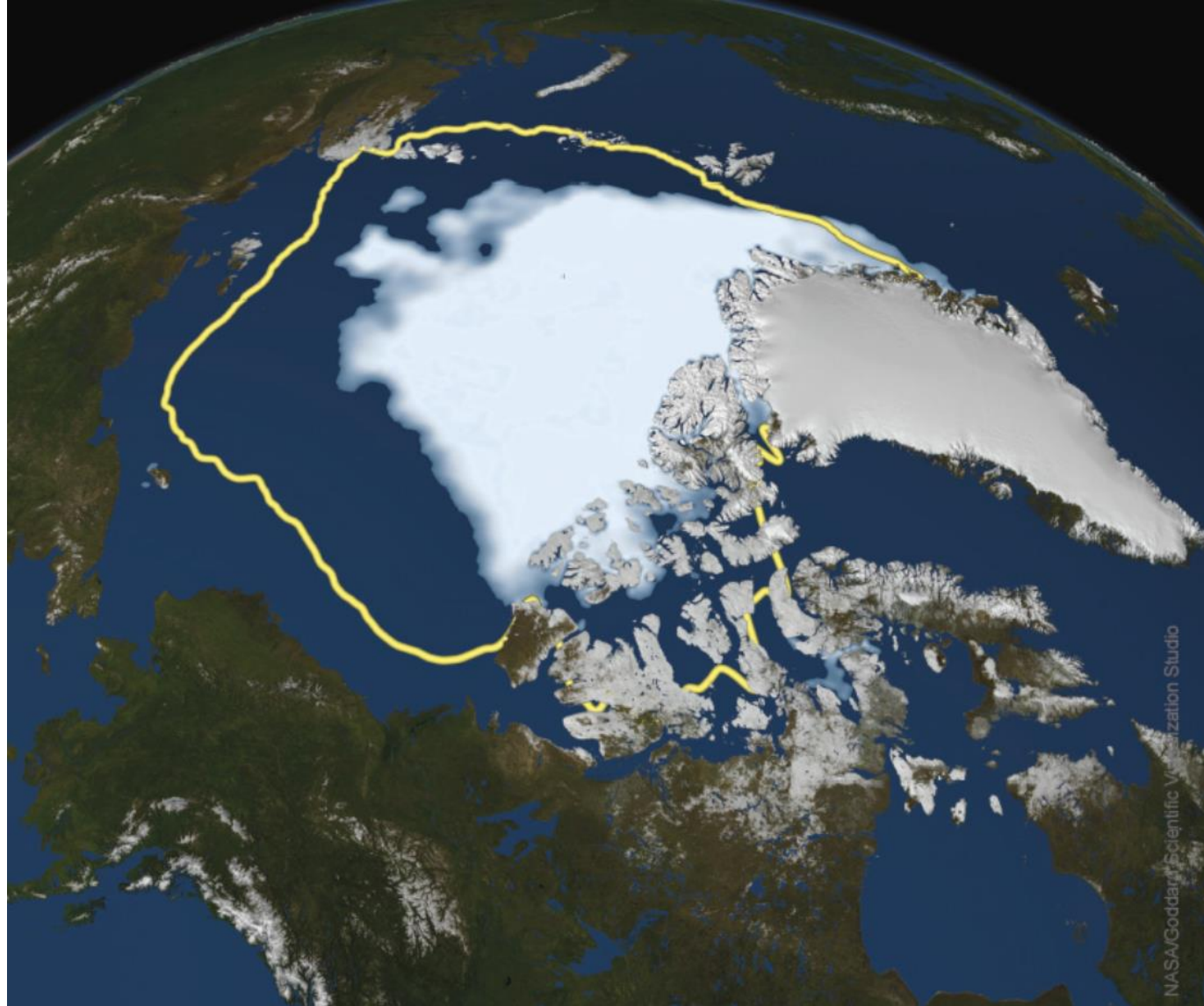
## **The overarching science questions:**

- **NEESPI:** How do Northern Eurasia's terrestrial ecosystems dynamics **interact** with and alter the biosphere, atmosphere, cryosphere, and hydrosphere of the Earth?
- **NEFI:** How to provide in Northern Eurasia a sustainable societal development (economy well-being, activities, health, and strategic planning) in changing climate, ecosystems, and... societies?

- **Dry Latitudinal Belt (DLB) of Northern Eurasia, the largest region with acute water deficit in the extratropics.**
- **Boreal Forest zone northward of DLB is the largest storage of terrestrial carbon.**
- **The Eurasian Arctic is the region of the most prominent natural changes. Ecosystems' boundaries here are unstable.**



# The Arctic sea ice on September 16, 2012.



NASA/Goddard Scientific Visualization Studio

That day the National Snow and Ice Data Center identified to be the minimum reached in 2012. The yellow outline shows the average sea ice minimum from 1979 through 2010.

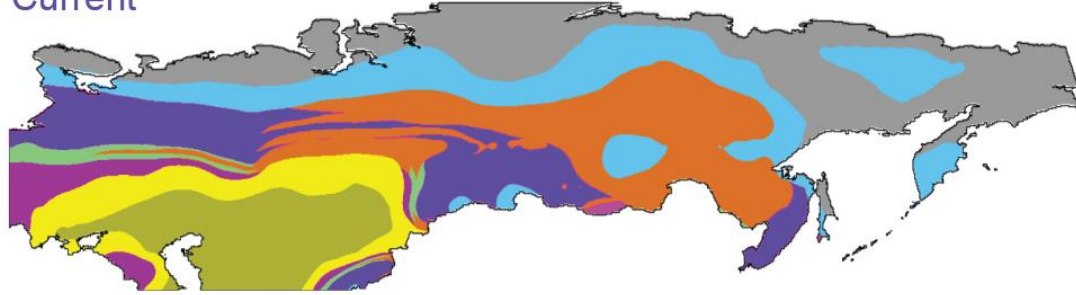
# Latest NEFI Projects in the Arctic

- Barnier (**France**) + Gulev (**Russia**) state, oceanic variability and climate impact in the Arctic (Mega-Grant of the Russian Ministry of Sciences)
- ARCTIC ERA (**France, USA, Russia**): Change and impact on infrastructure (BELMONT GRANT)
- ARCTIC CHI (**Japan + Russia**) Hydrological cycle changes and impact on sustainability. PIs: Iijima and Gulev
- Atmospheric Moisture Transport & Extremes (**France + Russia**); PI: Zolina
- Hydrochemistry of the inner water bodies in Eurasian Arctic (**Russia, UK**) PI: Moiseenko (two projects)

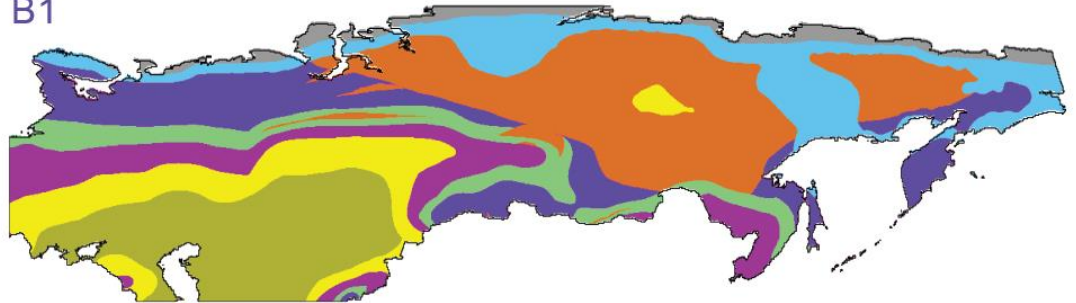
Bilateral  
collabo-  
ration

# Scenarios of projected Ecosystems' Shifts to 2090

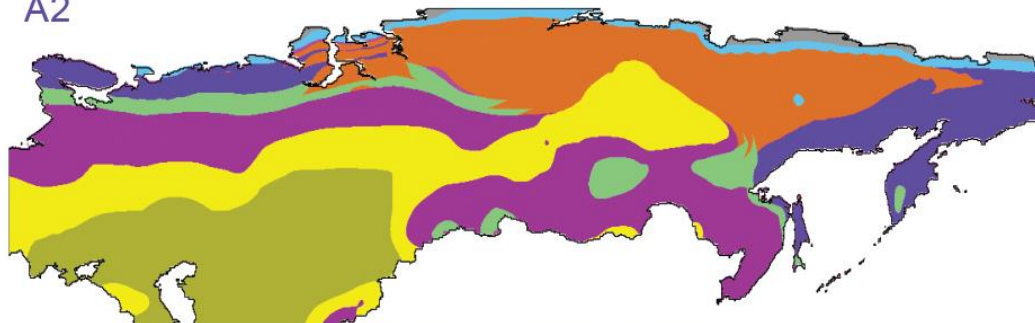
Current



B1



A2



Vegetation classes



Vegetation distribution under present conditions and equilibrium vegetation distribution under future climate conditions (scenarios) over Northern Eurasia in current climate and by year 2090 (Archive of Tchebakova et al. 2016).

# Latest NEFI Projects in the Boreal Zone

- Carbon Cycle studies (**Japan + Russia**):
  - Greenhouse gas monitoring from aircraft over Siberia; Machida, Sasakawa (Japan); Belan, Trofimov (Russia)
  - JR-Station monitoring network in West Siberia (Sasakawa, Arshinov)
- Wildfire disturbance-recovery dynamics in southern Siberia (**UK + Russia**)  
PI: K. Barrett
- Research into information, and ground action for primary forest protection. Boreal and Temporal forests PI: B. Mackey (**Australia**)
- Vegetation dynamics in the Sayan-Altai region since late Glacial (T. Blyakharchuk, (**Russia**) and Hong Chun Li (**Taiwan**))
- Long-term dynamics and projection of the geosystem changes in the upper-Ob River Basin (PI, Mukhanova, **Russia**)



# III. Trends in water vapor transport into Central Asia

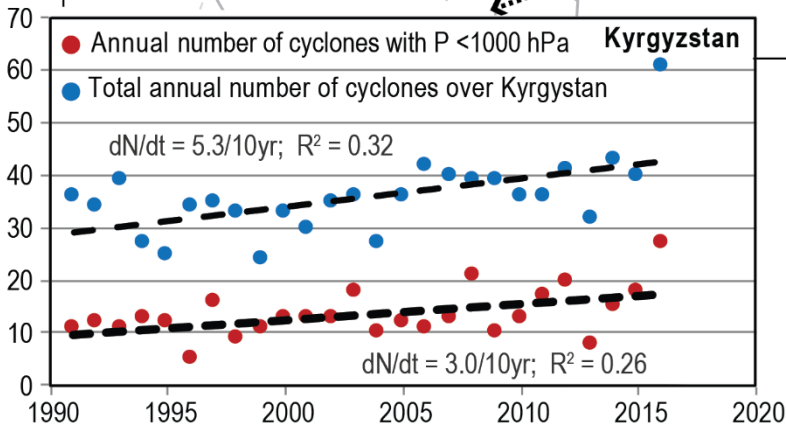
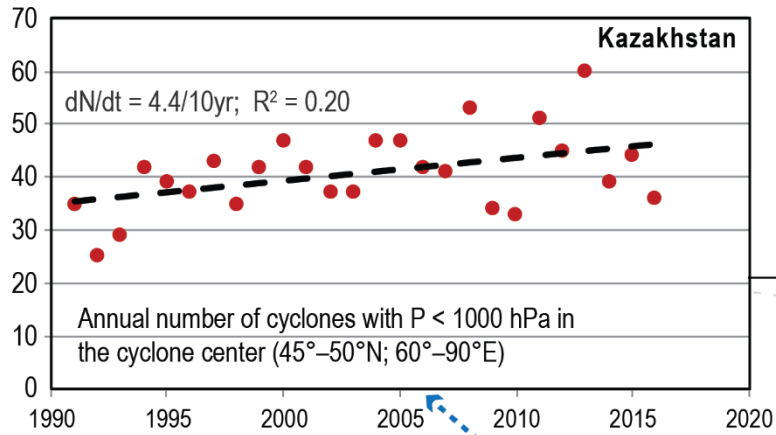


Table 1: Water vapor flux into Central Asia during 1990-2017

Period	Southward annual flux through $50^\circ N$ [ $kg (m \times s)^{-1}$ ]	Eastward annual flux through $50^\circ E$ [ $kg (m \times s)^{-1}$ ]
1990-1999	0.14	46.4
2000-2009	-0.48	43.4
2010-2017	1.11	39.6

Down 15%

Extratropical cyclones bring water vapor into Central Asia during spring & summer.

Table 2: Mean number of cyclones with atmospheric pressure  $< 1,000$  hPa at its center during 1979-2016 by season

Region	JFM	AMJ	JAS	OND	Annual
Kazakhstan	3	17	18	2	40
Kyrgyzstan	1	6	7	0	14

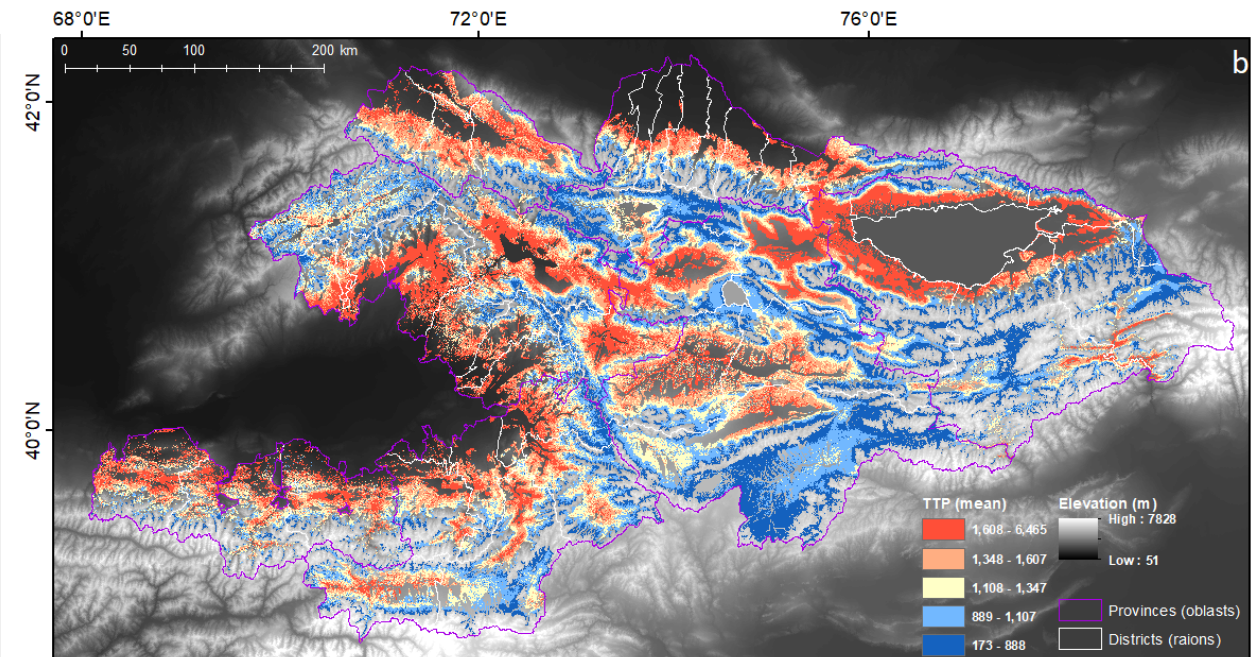
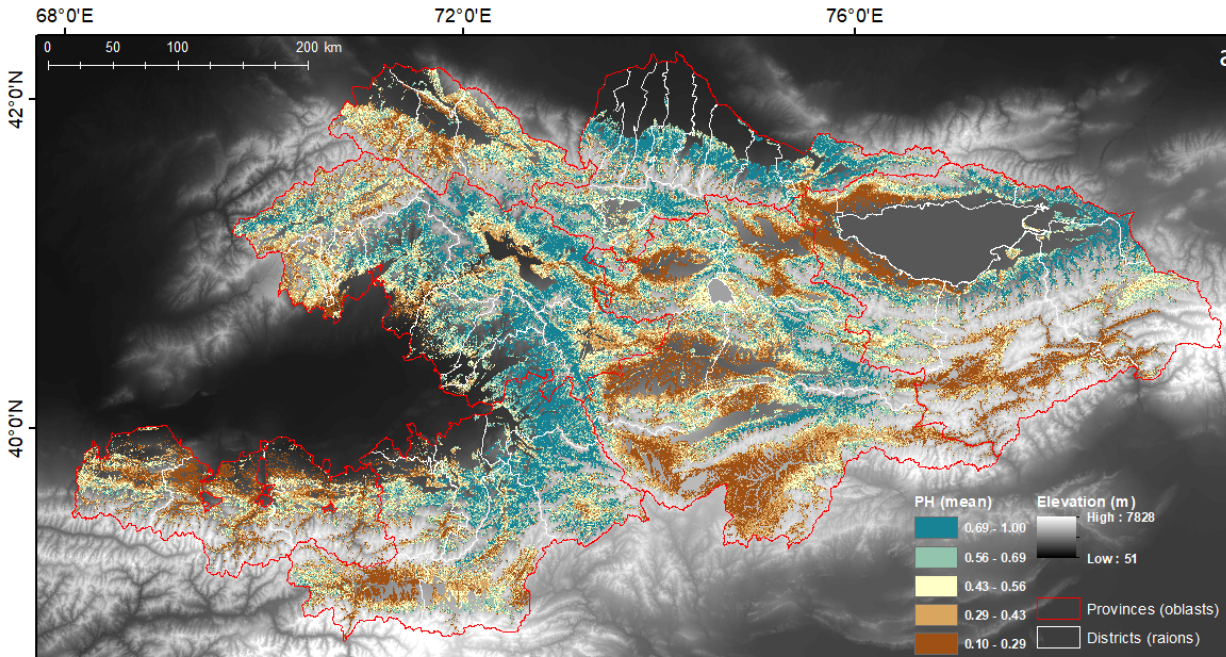
← Some evidence of increasing trend of cyclones.

# How Environmental Change in Central Asian Highlands Impacts High Elevation Communities.

NASA LCLUC [NNX15AP81G], 2015-2019, \$970K, PI: G. Henebry, Michigan State University

Average values of NDVI Peak Height (PH) during 2001-2017 modeled using Landsat TM/ETM+/OLI and MODIS

Average values of Thermal Time to Peak (TTP) during 2001-2017 modeled using Landsat TM/ETM+/OLI and MODIS



Maps of average phenometrics from Convex Quadratic model of land surface phenology are draped over the SRTM 30 m DEM and display only data for pasture land use areas in Kyrgyzstan. Classes divided by quintiles.

# Latest NEFI Projects in the Northern Eurasia Drylands

- How environmental changes in Central Asia Highlands affect local communities? PI, Henebry (USA) Co-I Kelgenbaeva (Kyrgyz Rep.)
- Post-agrogenic steppe landscapes in Buryat Republic. PIs, Yekimtseva and Ponkina (Russia) and Prishchepov (Denmark)
- Solutions for climate-smart land use in the dry steppe of Russia (PIs from Denmark, Russia, Germany, Slovakia, and Switzerland)
- Post-USSR land cover change in Eastern Europe (*ended in 2018*) PIs from Denmark, Germany, and the USA
- Evaporation over the Azov Sea (PI, Speranskaya, Russia)
- **ASIAN DRYLANDS.** PI: J. CHEN (MSU); in waiting for the NASA LCLUC support (Workshop, more than 10 papers and a Springer book).

# Infrastructure NEFI Projects

- Three Sessions per year (AGU, JpGU, SCERT: Enviromis/CITES)
- Dedicated Special Issue of the *Environ. Res. Lett.* (incomplete list of publications in 2018-2019: 44 per-reviewed papers and book chapters)
- Dedicated News Groups
- ***Baltic Earth*** Working Group on Regional Variability of Water and Energy Exchange in the Baltic Sea Region (Zhuravlev, Russia and Danilovich, Belarus)
- Overarching study of transport network in the Krasnoyarsk Krai and south Siberia (PI, Kirill V. Chistyakov)
- Trans-Caucasian Projects (PIs, Radeloff, de Beurs, Olofsson)

# Two News Groups, created by Alexander Prishchepov, Denmark

- Land System Science - Northern Eurasia

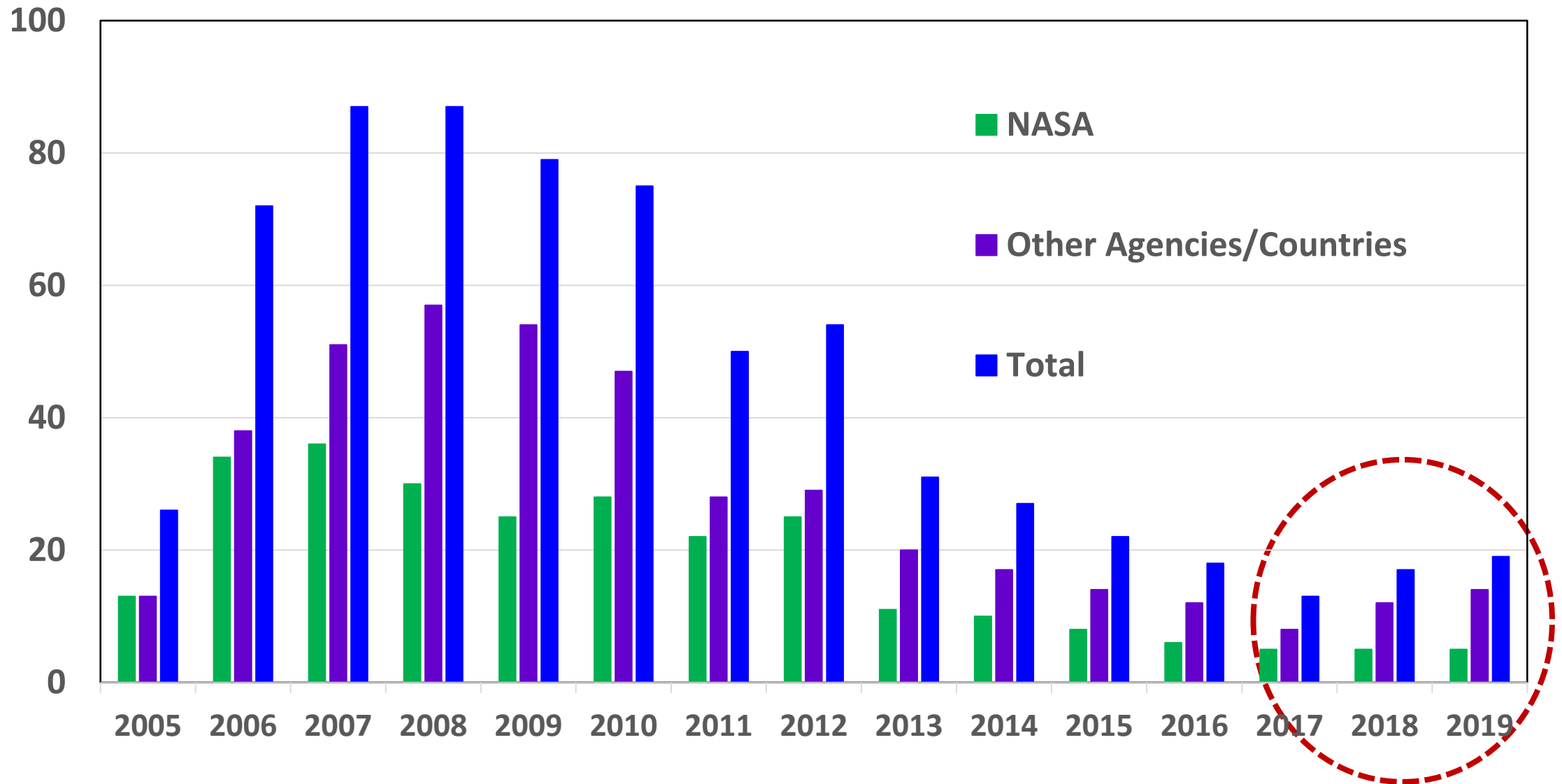
<https://www.facebook.com/groups/750485808469684/?ref=bookmarks> (in Russian; 71 members)

- IALE-RU (Международная Ассоциация Ландшафтной Экологии - Россия)

<https://www.facebook.com/groups/163523310796406/>

(in Russian with English translation; 230 members)

# Active NEESPI-NEFI Projects by year



Since The Prague Workshop in **May 2015**, we discontinued accepting new projects to the NEESP Initiative redirecting them to NEFI.