RUSSIAN FEDERATION

Management of different terrestrial ecosystems under a changing climate

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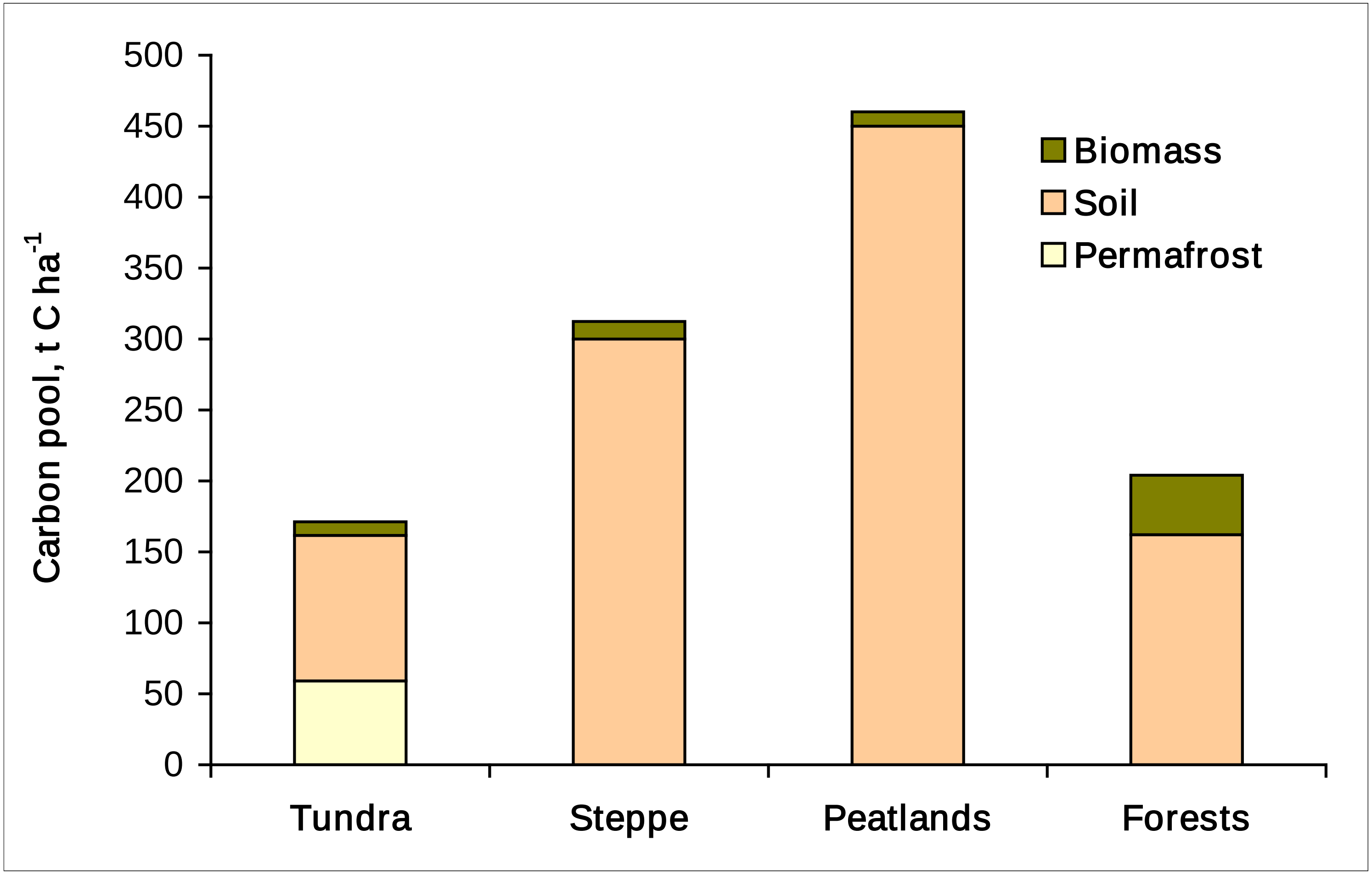
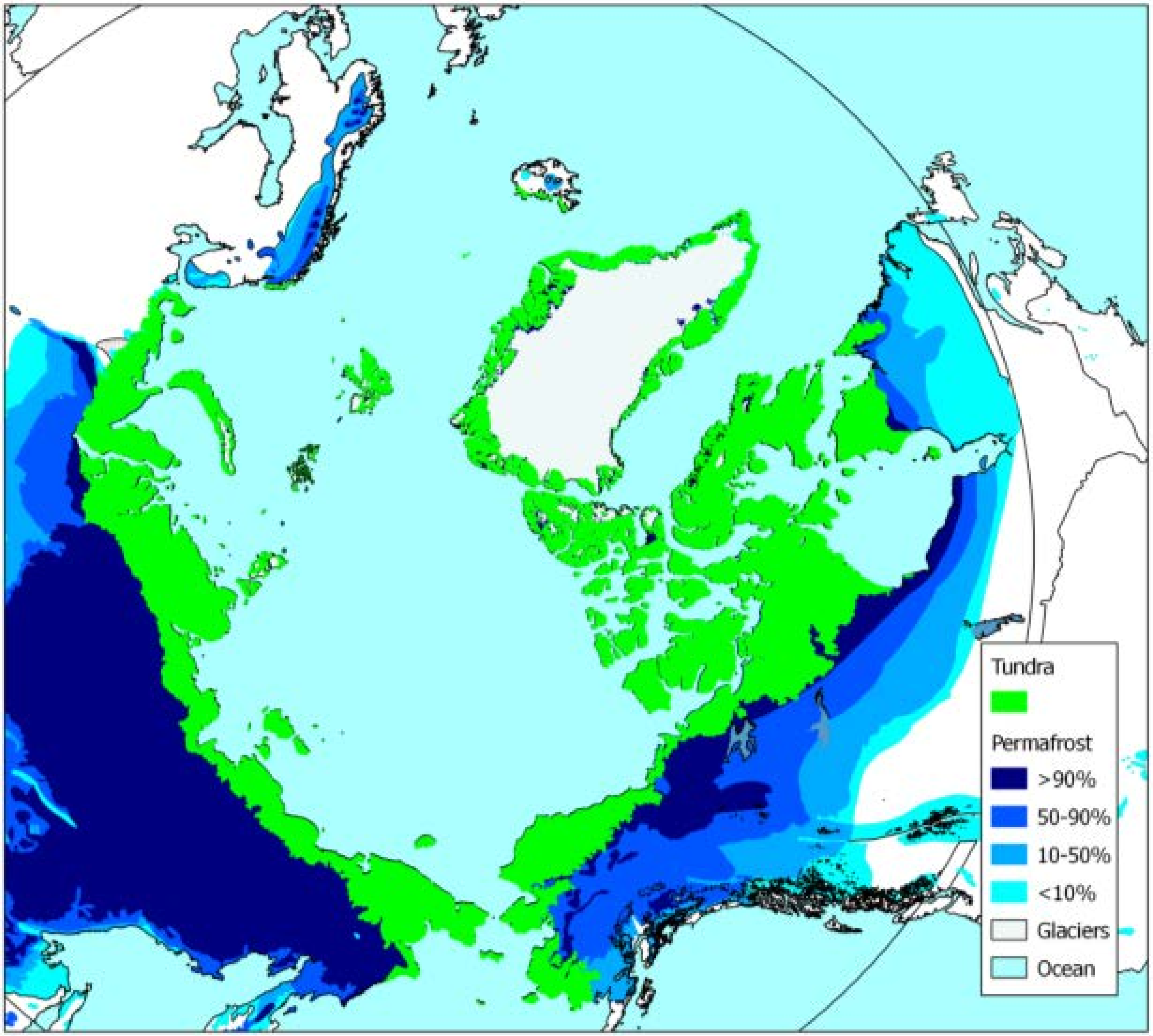
Carbon pools in biomass and soil (1 m layer) in different terrestrial ecosystems of Russia



Vompersky et al., 1994, Karelin et al., 1994, Chestnykh et al., 2004, Zamolodchikov et al., 2011

Tundra

Tundra ecosystems



- 7% of the worlds terrestrial ecosystems area
- 15% of terrestrial carbon storage are in tundra soil and plants
- Permafrost at depths from 0.4 to 1.2 m
- Average carbon storage in permafrost 4.2 kg C m^{-3} (up to 15 kg C m^{-3}) [1,2]
- GHGs buried in permafrost, including CH_4-hydrates[2]

[1] *Brown et al., 2002 Circum-Arctic Map of Permafrost and Ground Ice Conditions 1:10M*
[2] *CAVM Team, 2003 Circumpolar Arctic Vegetation Map 1:7.5M*

[1] *Shmelev et al., in print*
[2] *Rivkina et al., 2007*

Permafrost degradation: environmental change

- Main reason of vulnerability is underground ice
- Rise in permafrost temperature and active layer depth are observed[1,2]

- Deeper thawing results in destructive processes – thermal erosion, thermokarst
- Degradation of permafrost = additional flux of unburied carbon to the atmosphere[3,4]

[1] *www.calm.gwu.edu, 2013*
[2] *Romanovsky et al., 2010*

[3] *Zimov et al., 2006*
[4] *Schuur et al., 2010*

Human impact on permafrost

- More than 0.3 mln people live in communities in tundra, including natives
- Permafrost is used as the basement for
  - constructions
  - Industrial objects
  - Infrastructure

- Human impact imbalances thermal regime of permafrost
- Heat flow from constructions leads to
  - carbon flux from permafrost;
  - destabilization of foundations

Yamburg settlement, V.I. Grebenets, 2008

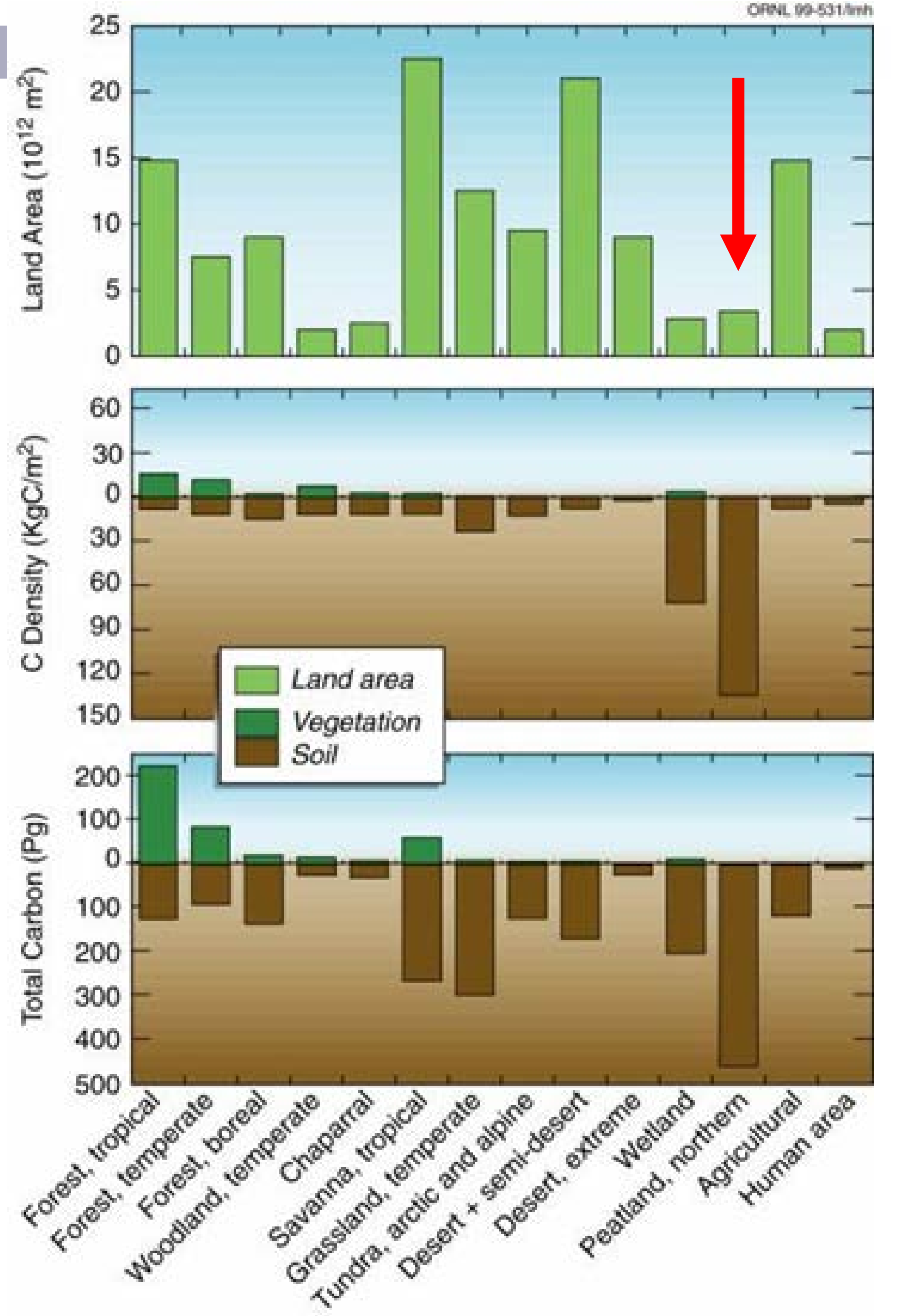
Peatlands

Russia presents high diversity of peatlands

Vompersky et al., 2005, 2011

Peatland ecosystems (including peat and vegetation) contain disproportionally more organic carbon than other terrestrial ecosystems on mineral soils:

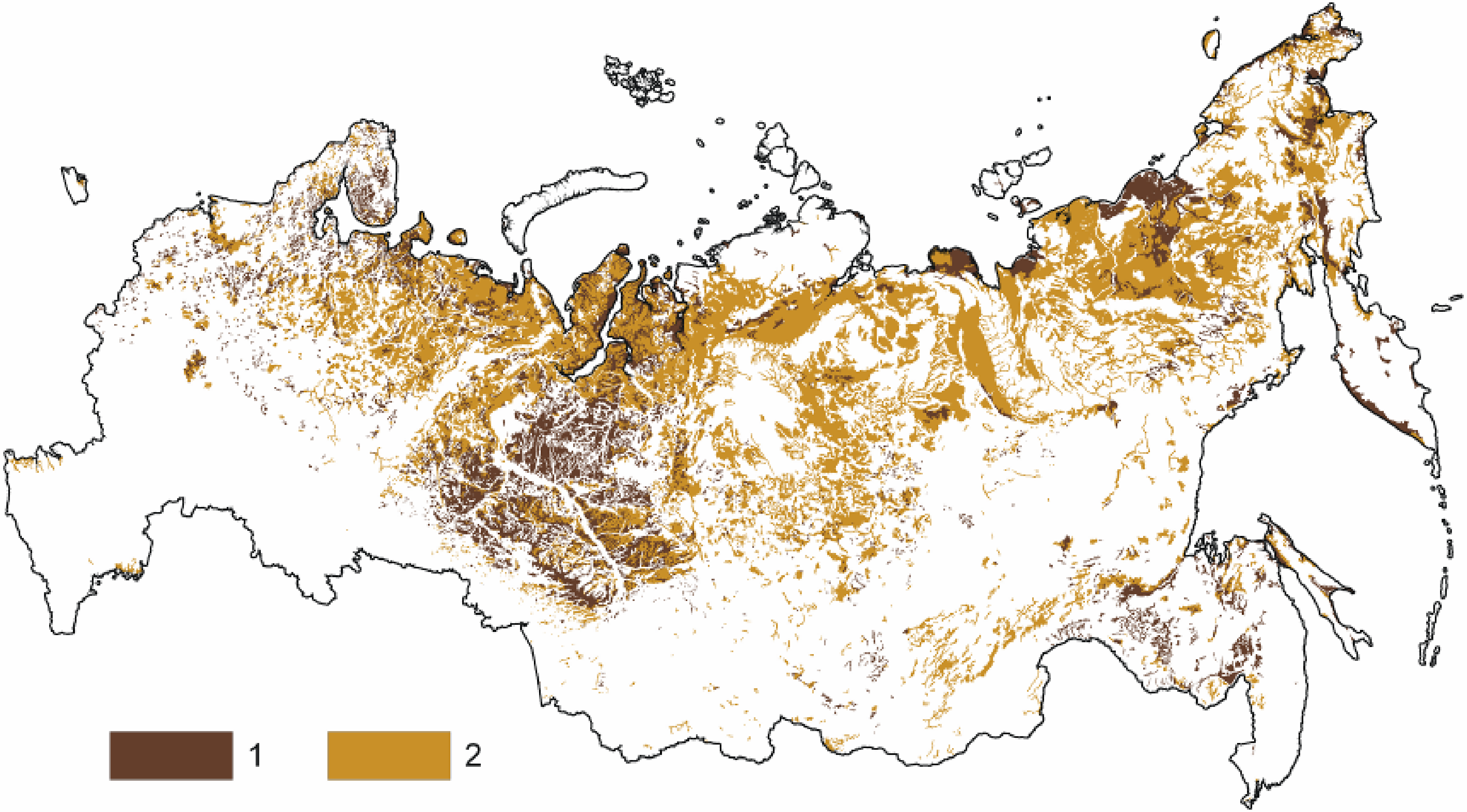
- *in the sub)polar zone 3.5 times*
- *in the boreal zone 7 times*
- *in humid tropics 10 times*



Assessment of Peatlands, Biodiversity and Climate Change, 2008

(Adopted by CBD COP 10 (2008)

Peatlands (peat >30 cm) make up over 8% (1.39 · 10⁶ km) and with shallow peat lands (< 30 cm) up to 22% (2.30 · 10⁶ km) of Russia



Vompersky et al., 1994, 1996, 2011

Man induced Peatland Losses

Nontropical World Areas

(Joosten, 1999)

Russian Federation

(Sirin, Minayeva, 2001)

Human disturbances to peatlands in Russian Federation

- Peat extraction > 250 000 ha
- Drainage for Agriculture > 3 000 000 ha
- Forest Drainage > 3 000 000 ha

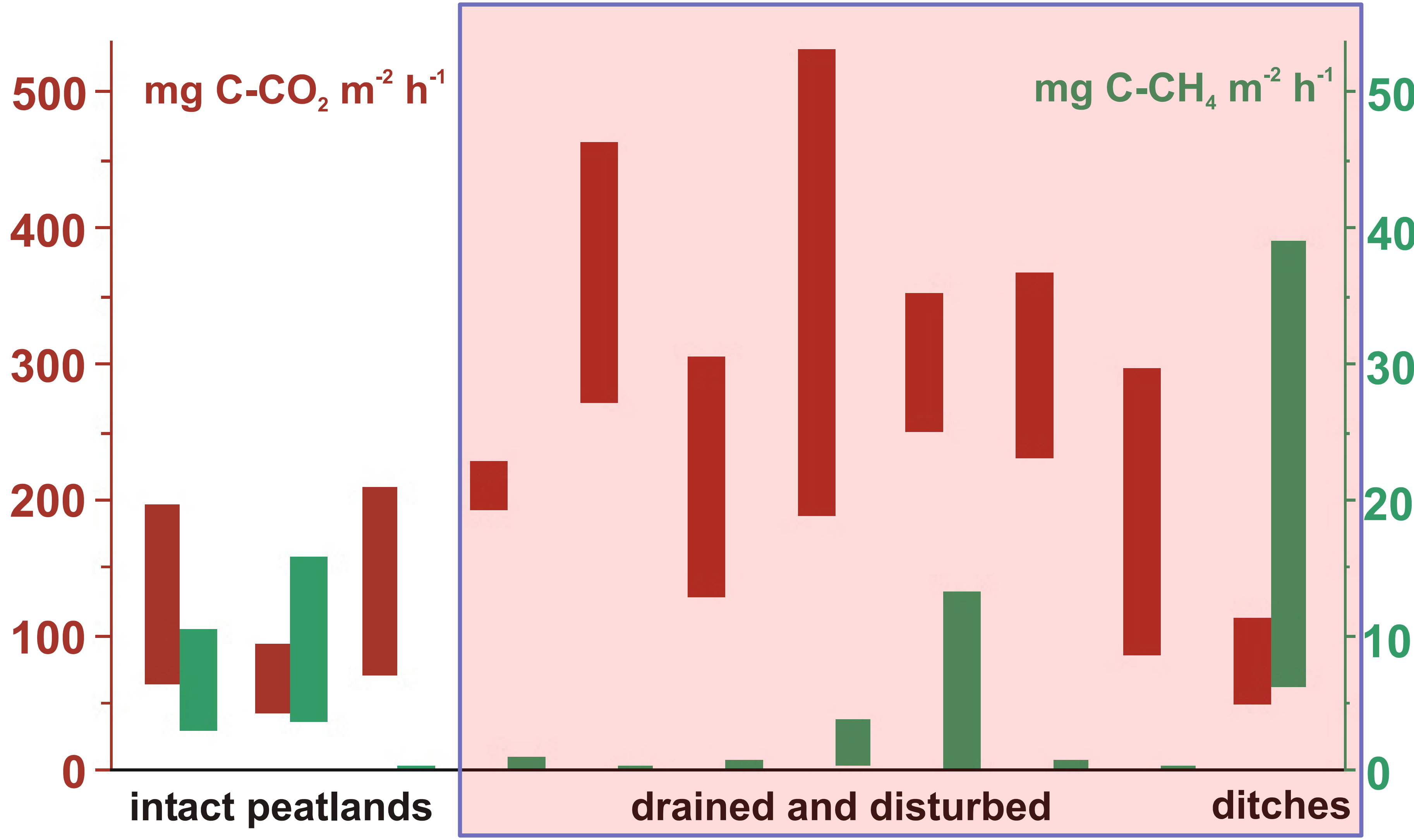
Indirect impacts:

- linear constructions (roads, pipe lines, etc.)
- water contamination and air pollution
- others

Minayeva, Sirin, Bragg, 2009

Carbon dioxide and methane fluxes from intact and disturbed peatlands

(observed from over 70 sites in Tomsk Oblast (southern part of West Siberia).



Figures represent gross emissions; GHG sequestration by peat and vegetation growth not included.

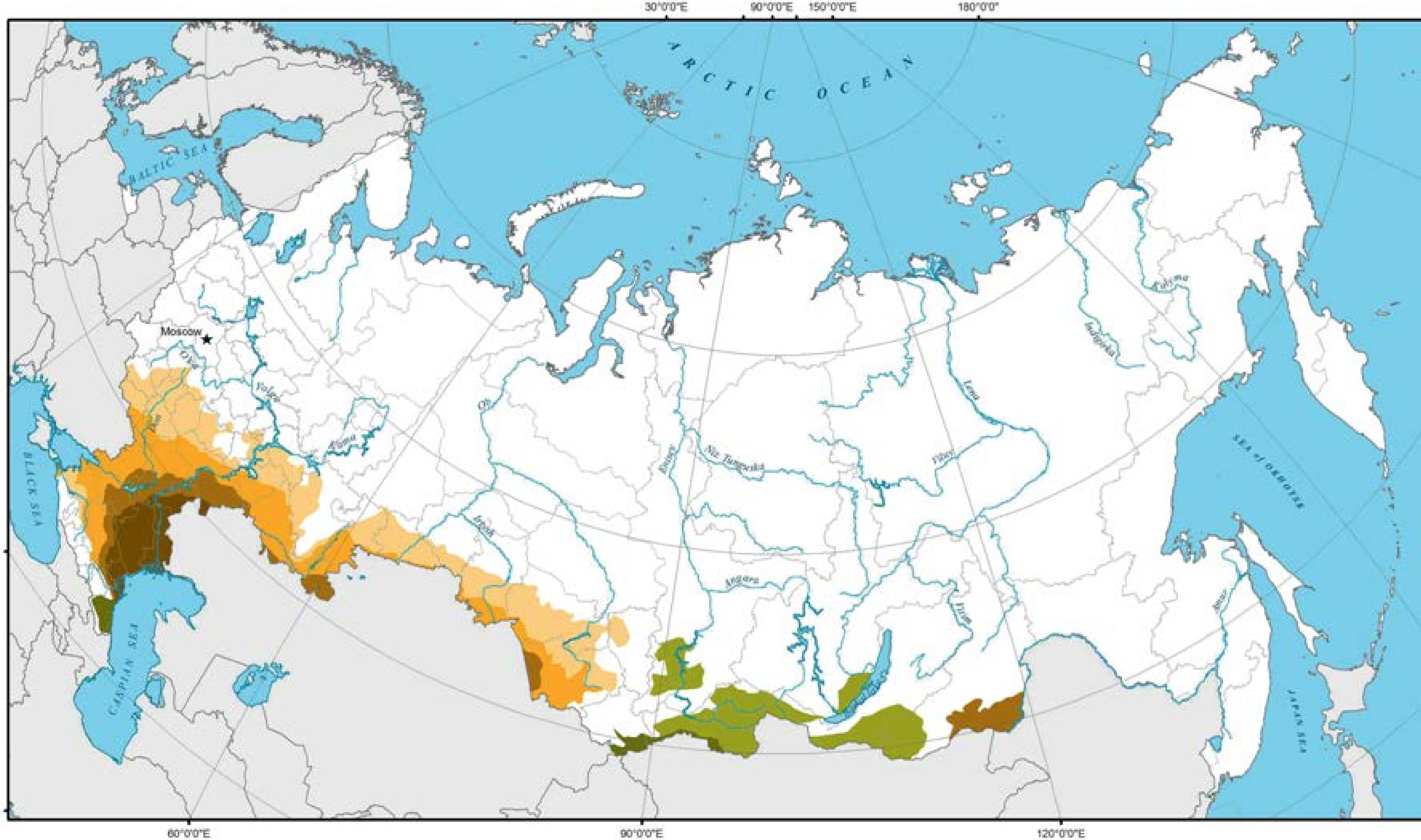
Glagolev et al. 2008

Forest-peat fires 2010

Photo: NASA, 9 August, 2010

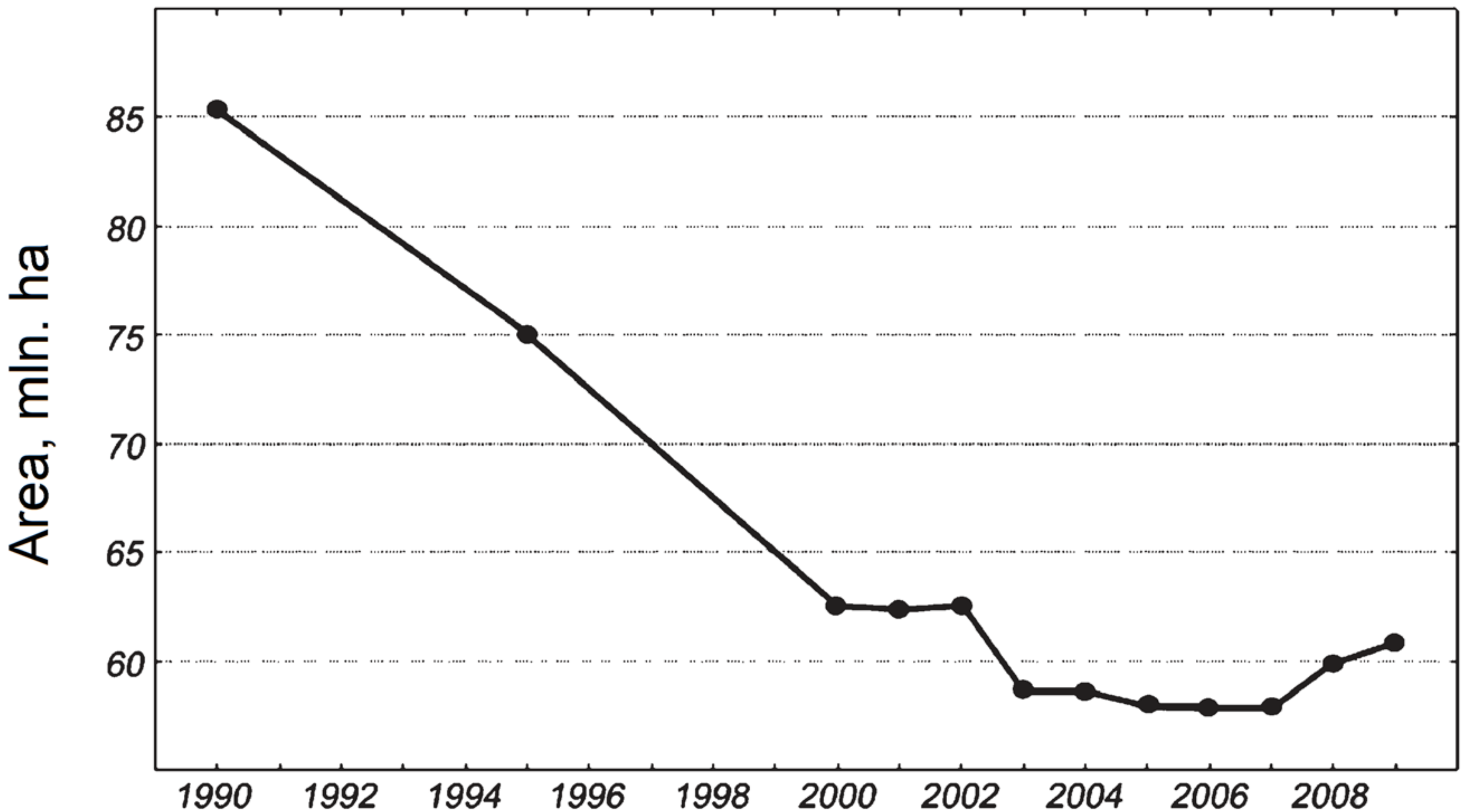
Steppe

Steppe biom in Russian Federation



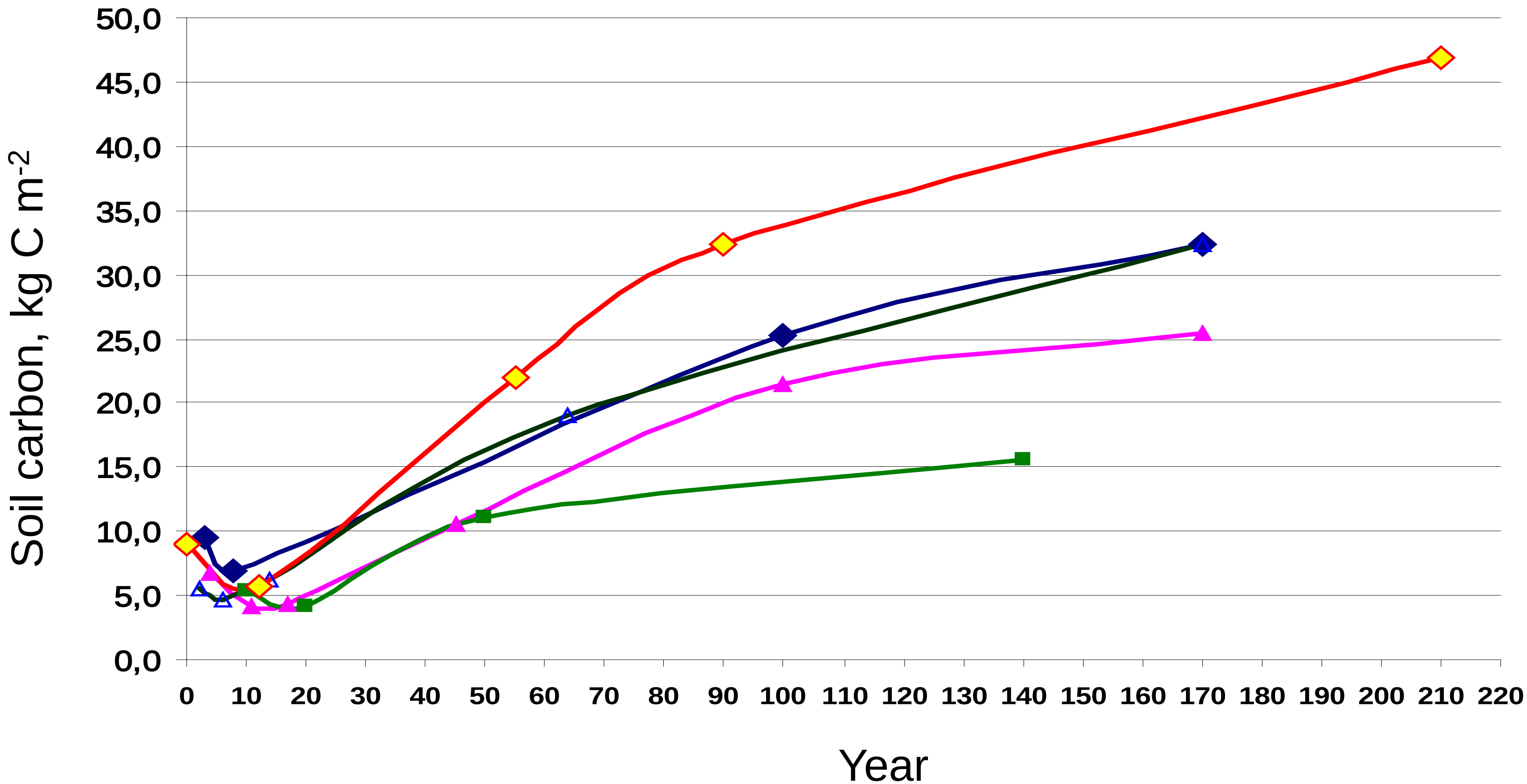
Smelansky, Tishkov, 2012

Cropland area in steppe regions of Russia

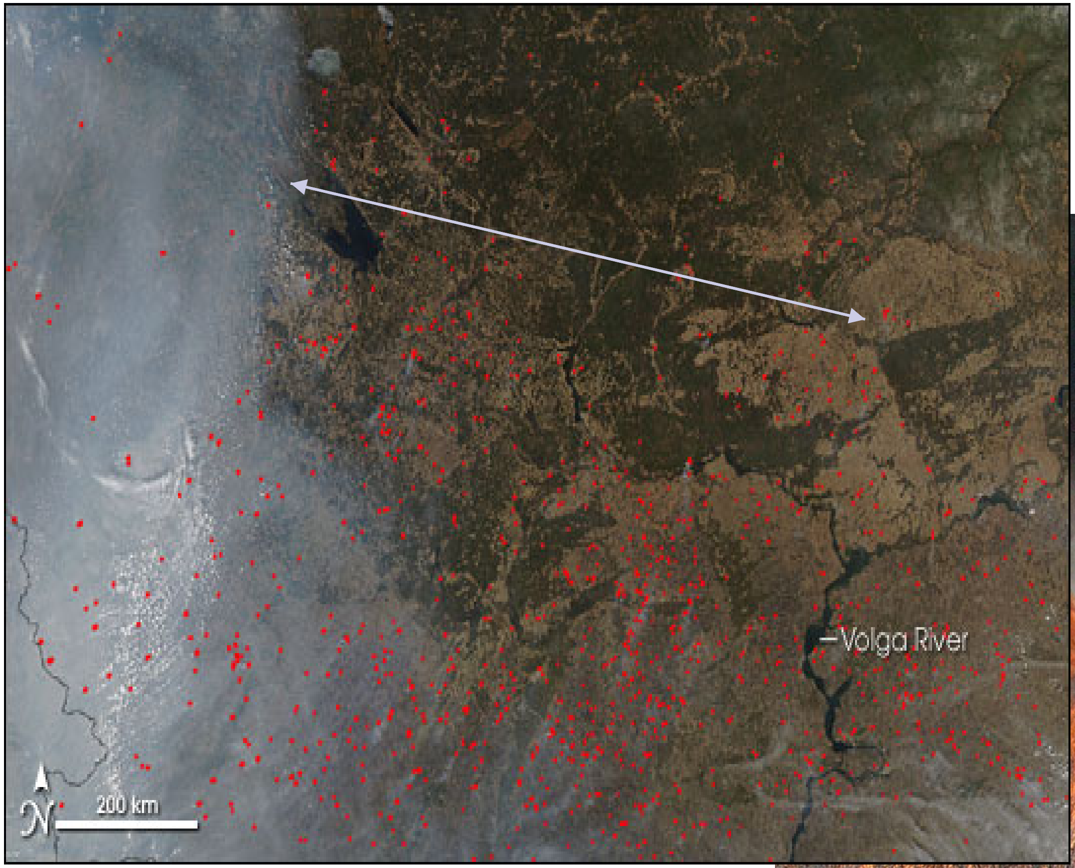


Smelansky, Tishkov, 2012

Carbon pool dynamics in soil of abandoned agricultural lands

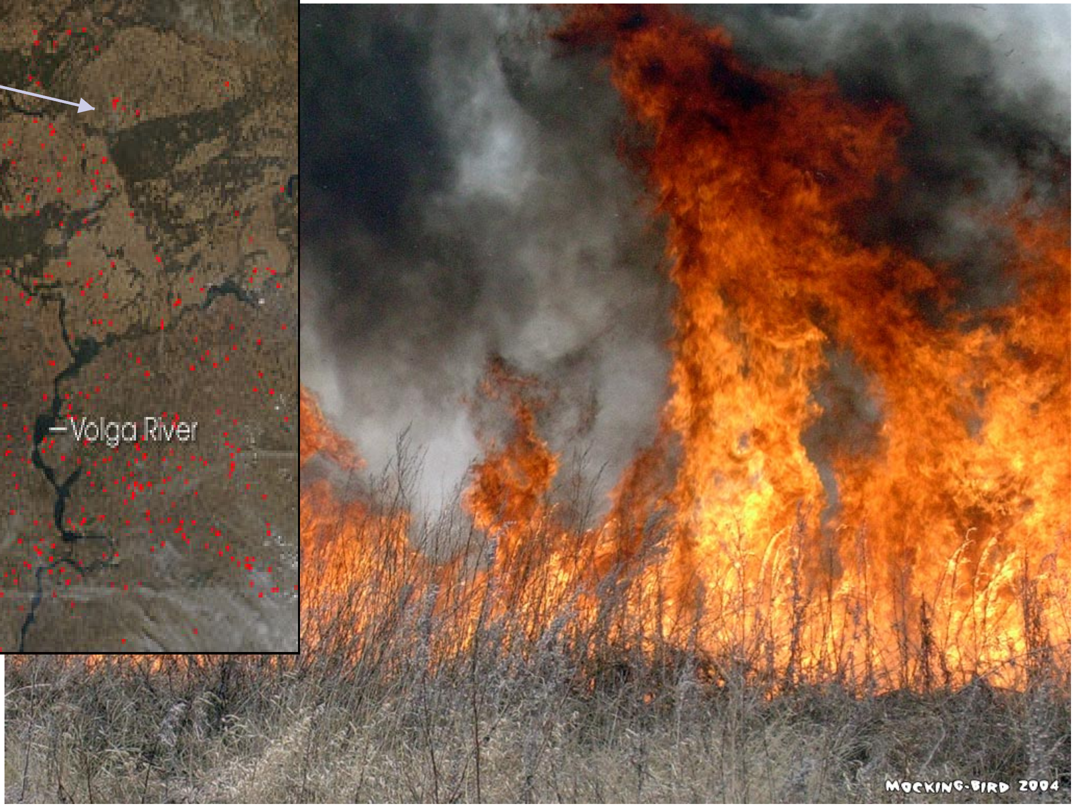


Fire areas in Russia are concentrated in steppe regions



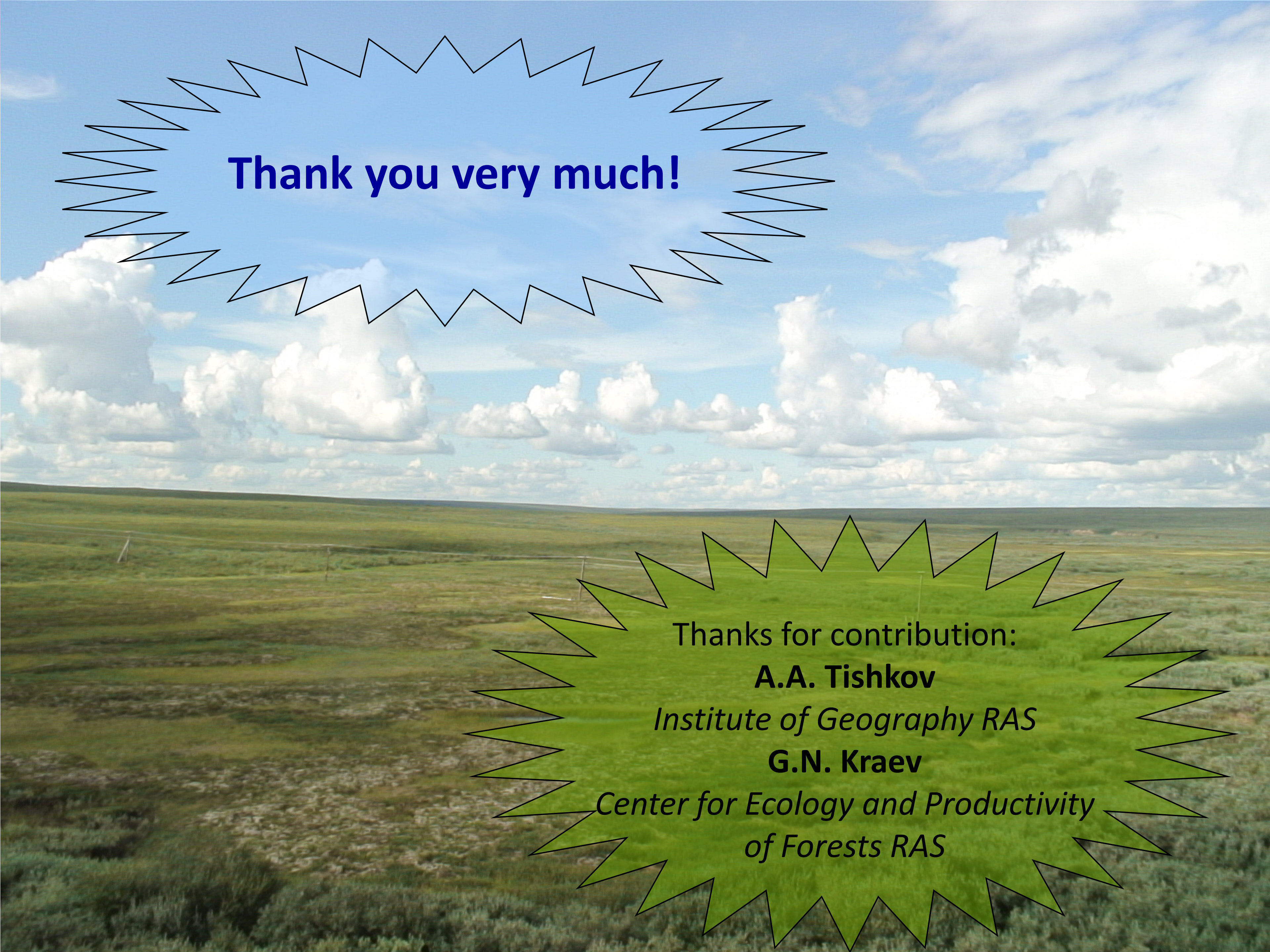
Fires in steppe regions of European Russia

Fire in steppe ecosystem



Several issues, significant in the framework of the research dialogue:

- assessment of carbon balance in tundra, steppe and peatlands considering various human impacts:
  - mechanical disturbance and pollution in tundra;
  - drainage and changes of water regime for peatlands;
  - plowing, grazing, fallow successions in steppe;
- development of methods and techniques for monitoring of greenhouse gases emissions and carbon losses resulting from natural and anthropogenic fires in steppe fallows and drained peatlands;
- development of positive incentives for nature protection and restoration in steppe, tundra, and peatlands for carbon sequestration and reduction of greenhouse gases emissions.



Thank you very much!

Thanks for contribution:

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