Joint NASA LCLUC Science Team Meeting and
GOFC-GOLD/NERIN, NEESPI, MAIRS Workshop
16-21 September, Almaty, KAZAKHSTAN

The experience of land cover changes detection by satellite data

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Almaty, 2009

Development of methods of the analysis of landcover\landuse changes for territory of Kazakhstan with use satellite data of the various spatial resolution

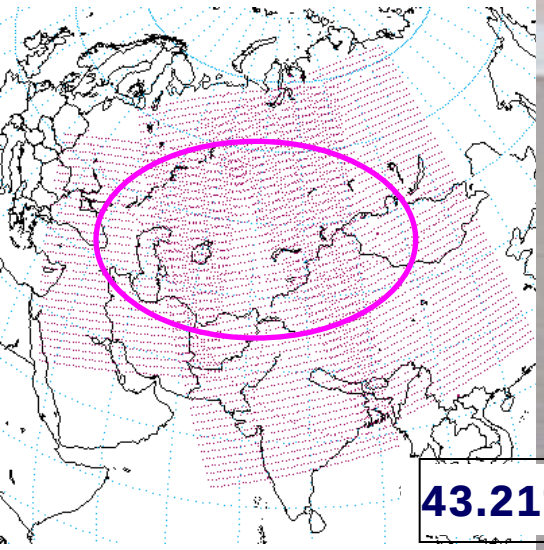
Estimation of change of vegetative cover productivity of Kazakhstan territory with use of long-term series of the remote sensing data of the Earth

Creation of sets of vegetation indexes for territory of Kazakhstan

Monitoring of values of vegetation indexes for various spatial/time scales in various practical problems

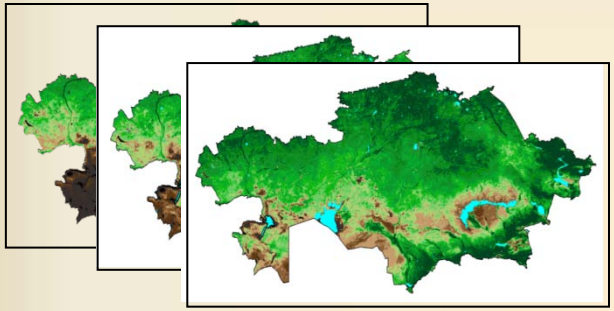
Estimation of cropland productivity

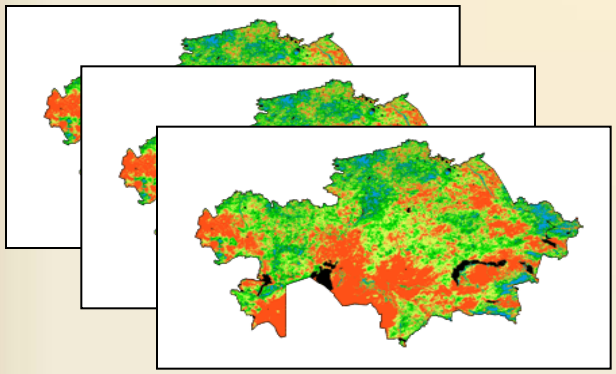
Recommendation for land use optimization



43.21^0 N 76.91^0 E, 921m

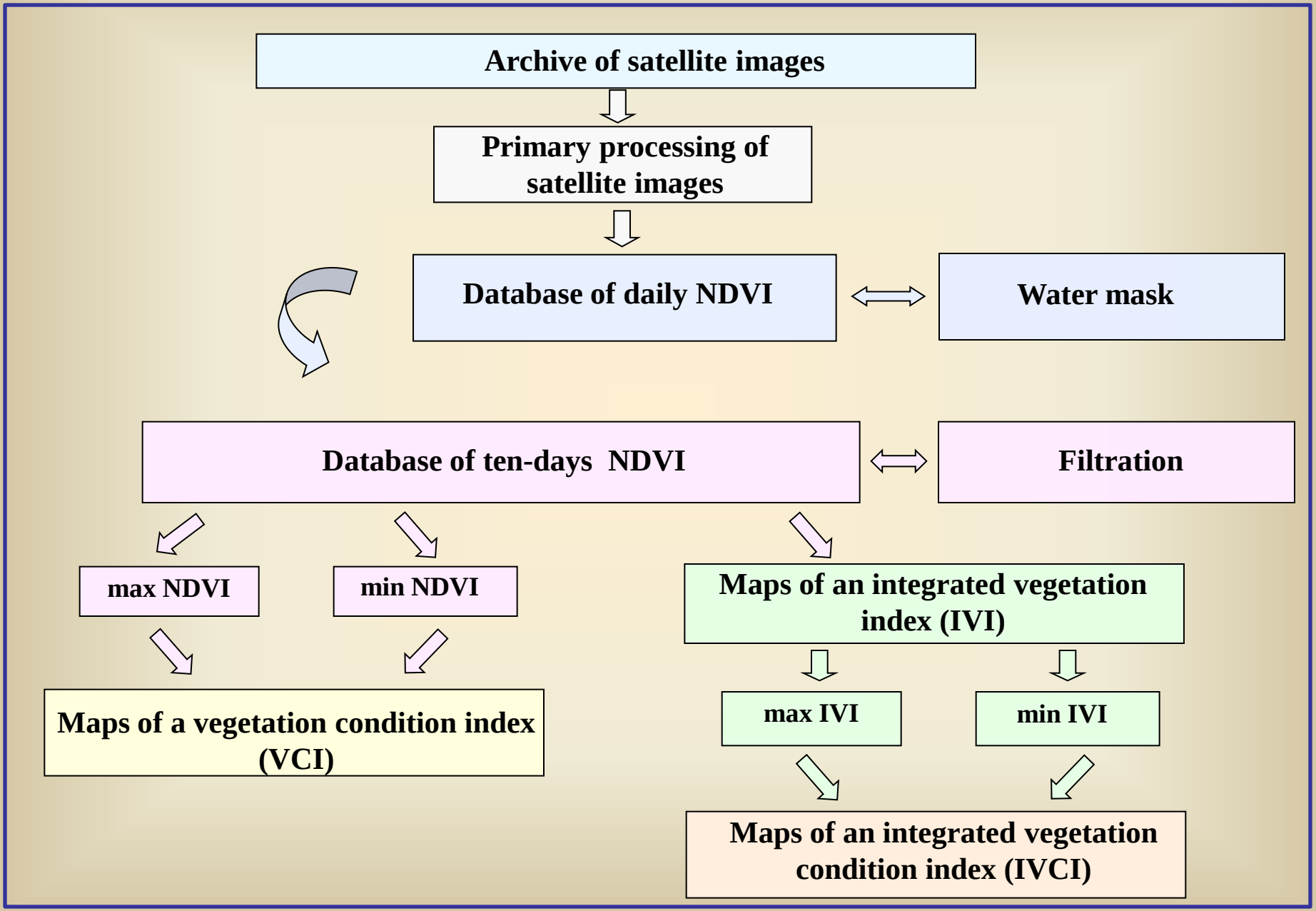
Calculation of vegetation indexes

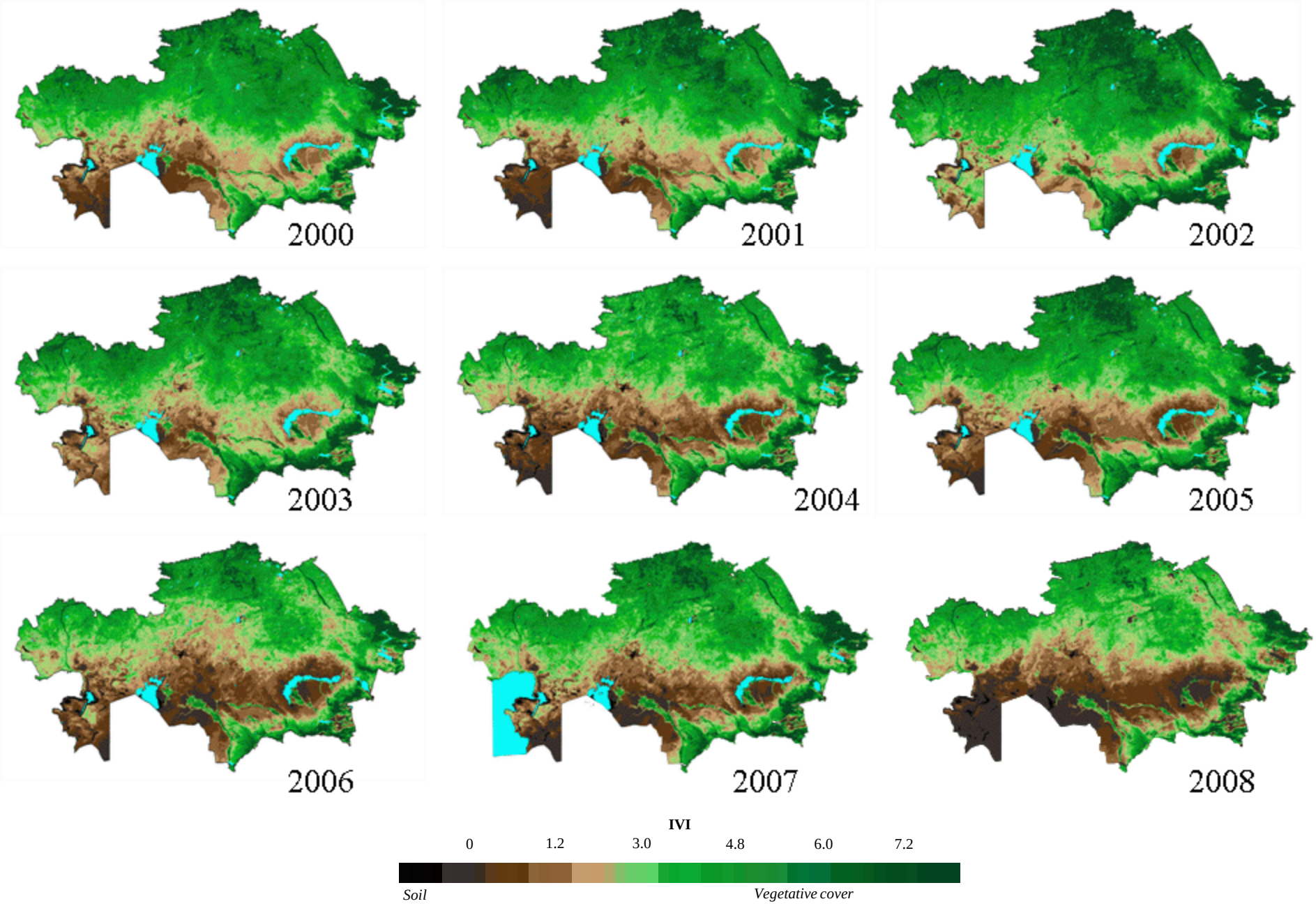




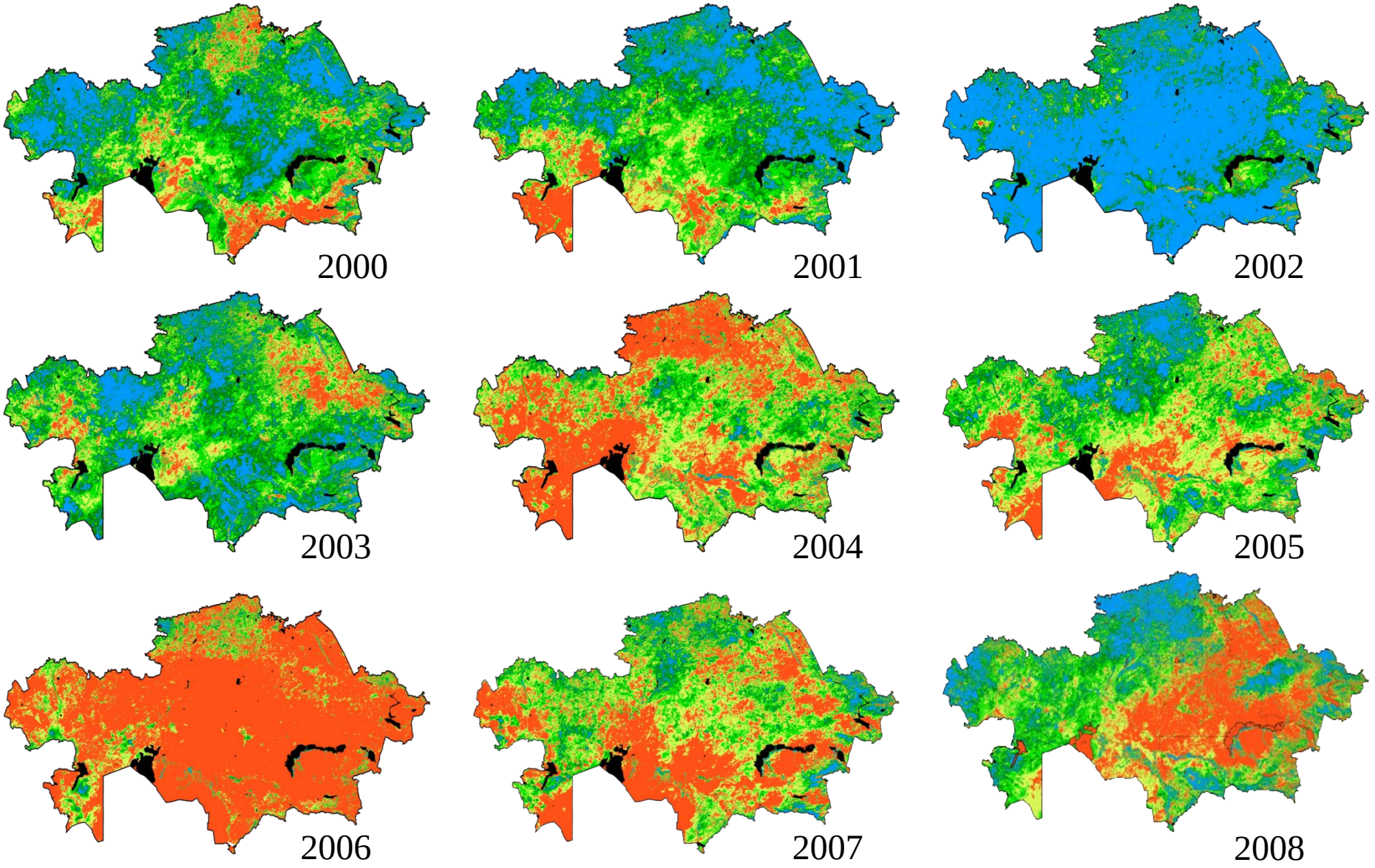
Vegetative indexes	Formulas
NDVI everyday	$NDVI = \frac{ch2 - ch1}{ch1 + ch2}$
NDVI ten-day	$NDVI(t) = \max_{i=1}^{10}(NDVI_{jk})_i$
IVI	$IVI = \sum_{i=1}^{21} NDVI(t)_i$
$NDVI_{min}$	$NDVI_{min} = \min_{c=1}^{7}(NDVI(t)_{jk})_c$
$NDVI_{max}$	$NDVI_{max} = \max_{c=1}^{7}(NDVI(t)_{jk})_c$
VCI	$VCI = \frac{NDVI_i - NDVI_{min}}{NDVI_{max} - NDVI_{min}}$
IVCI	$IVCI = \frac{IVI_i - IVI\ \mathbf{min}}{IVI\ \mathbf{max} - IVI\ \mathbf{min}}$

The scheme of formation of vegetation indexes sets



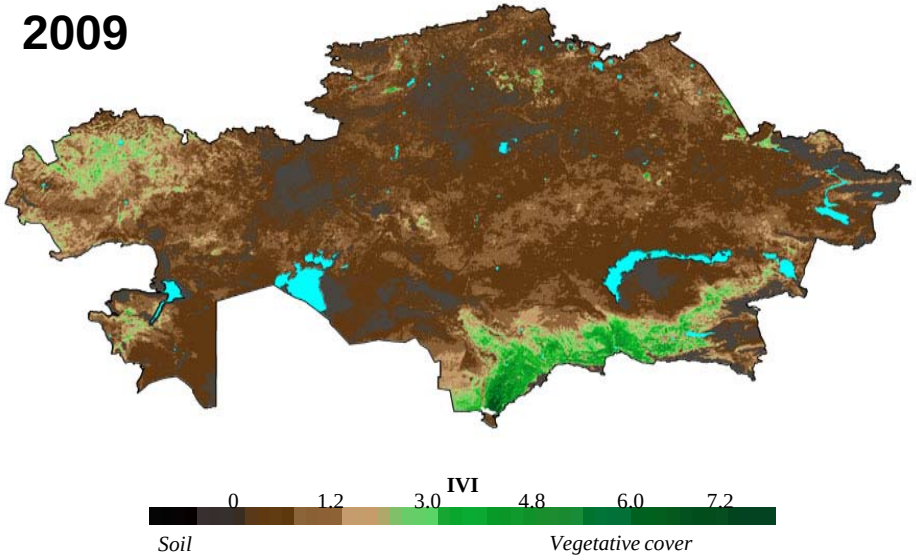


Dynamics of an integrated vegetation index for the vegetation season in Kazakhstan (2000-2008)



Dynamics of an integrated vegetation condition index for the vegetation season in Kazakhstan (2000-2008)

2009



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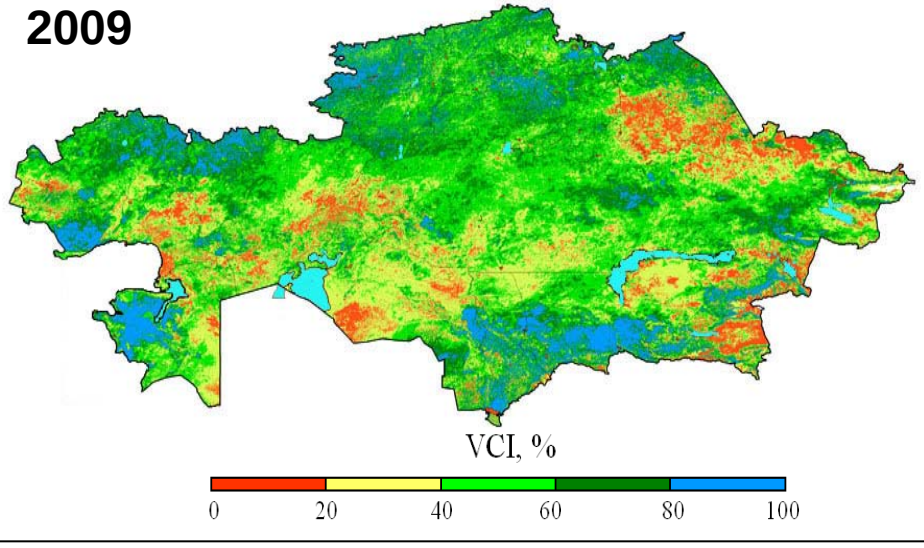
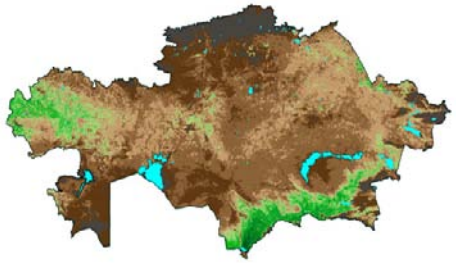
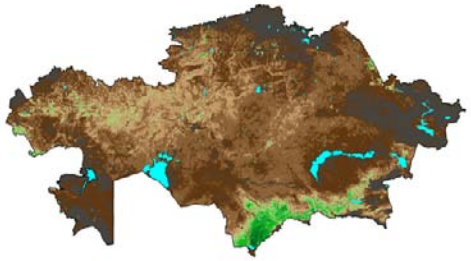




2002

Humidity year



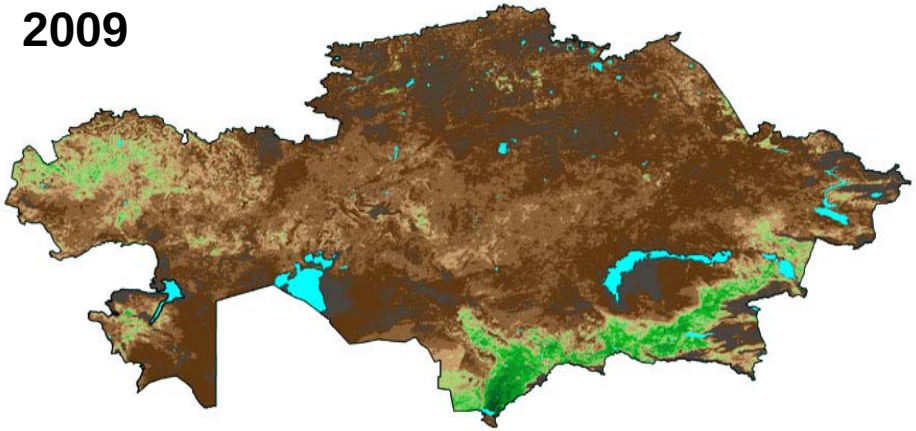
2006

Dry year

1 decade of April

Decade dynamics of vegetation indexes in Kazakhstan

2009



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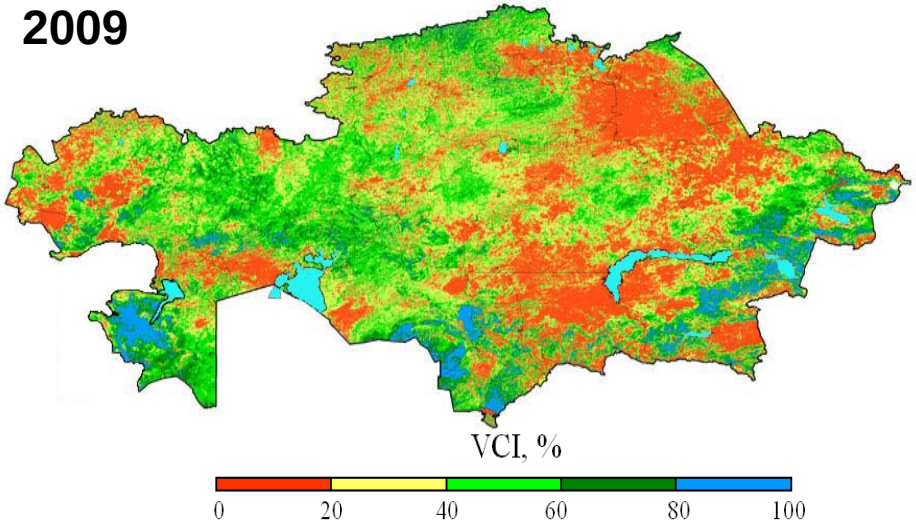
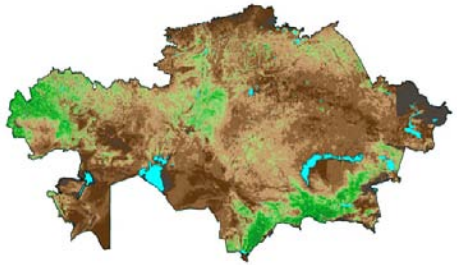
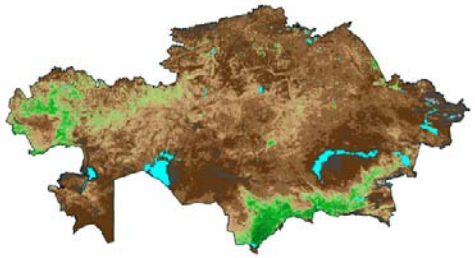




2002

Humidity year



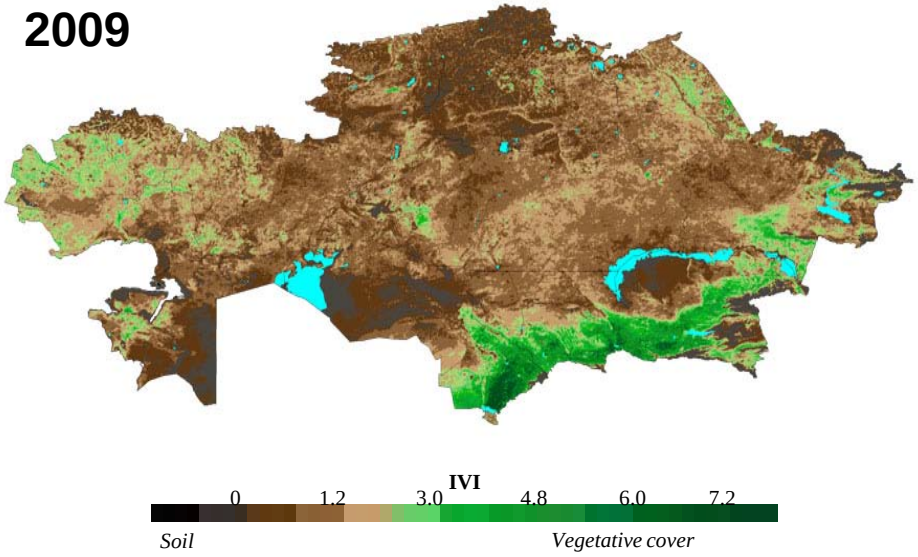
2006

Dry year

2 decade of April

Decade dynamics of vegetation indexes in Kazakhstan

2009



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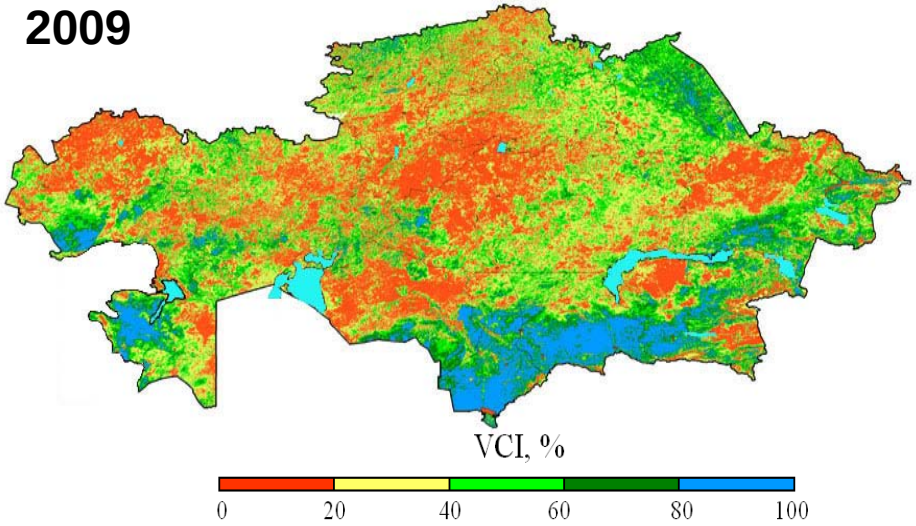
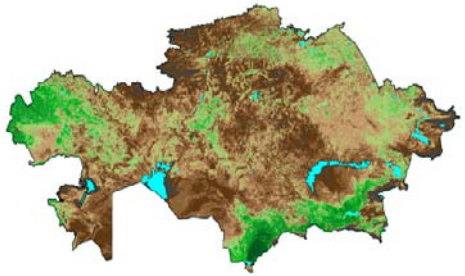
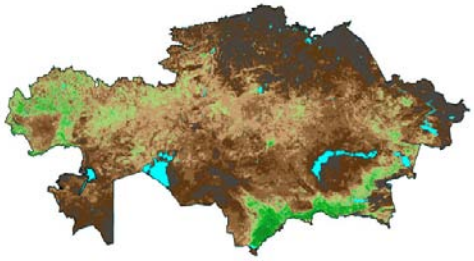




2002

Humidity year



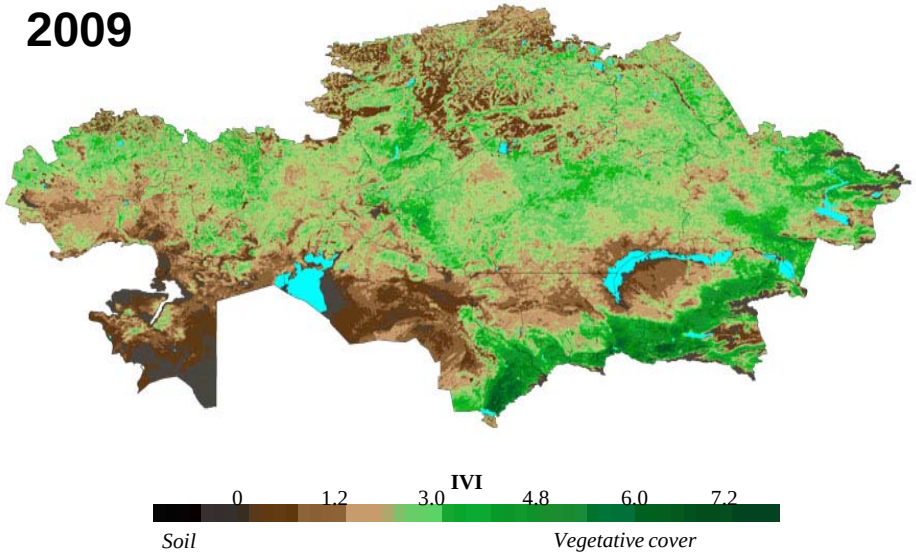
2006

Dry year

3 decade of April

Decade dynamics of vegetation indexes in Kazakhstan

2009



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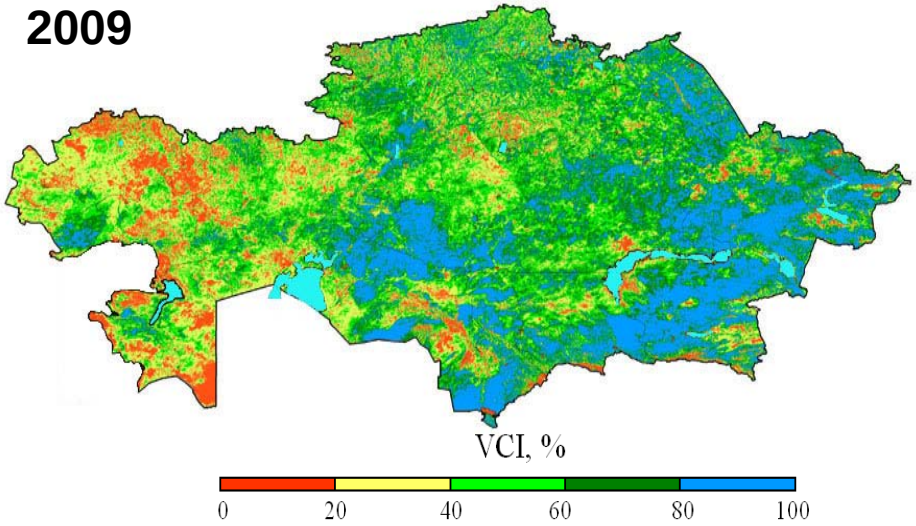
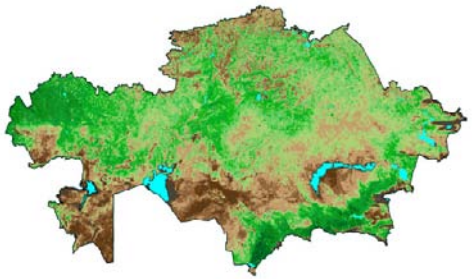
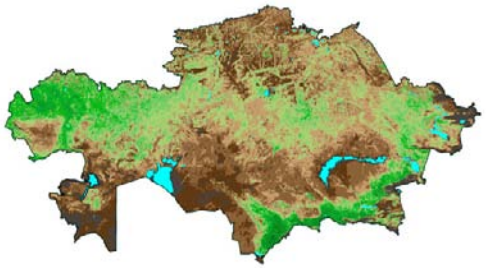




2002

Humidity year



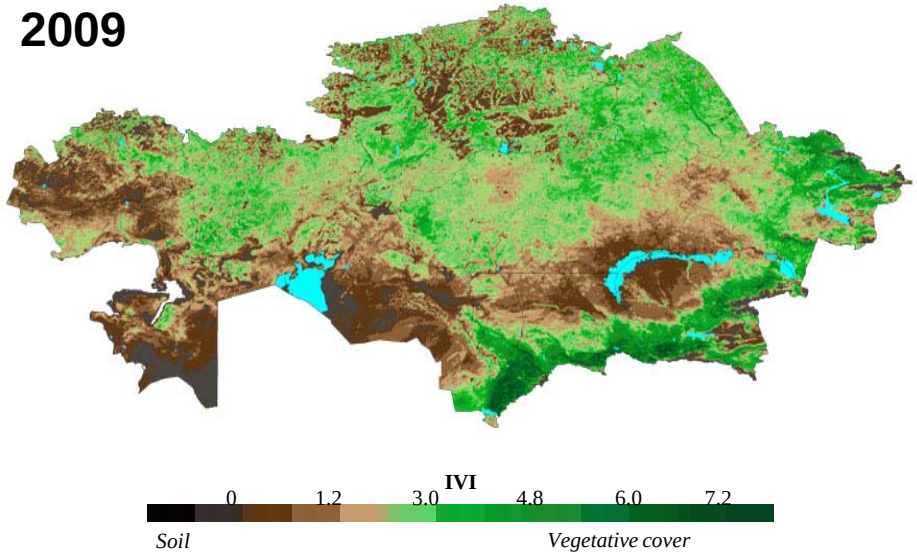
2006

Dry year

1 decade of May

Decade dynamics of vegetation indexes in Kazakhstan

2009



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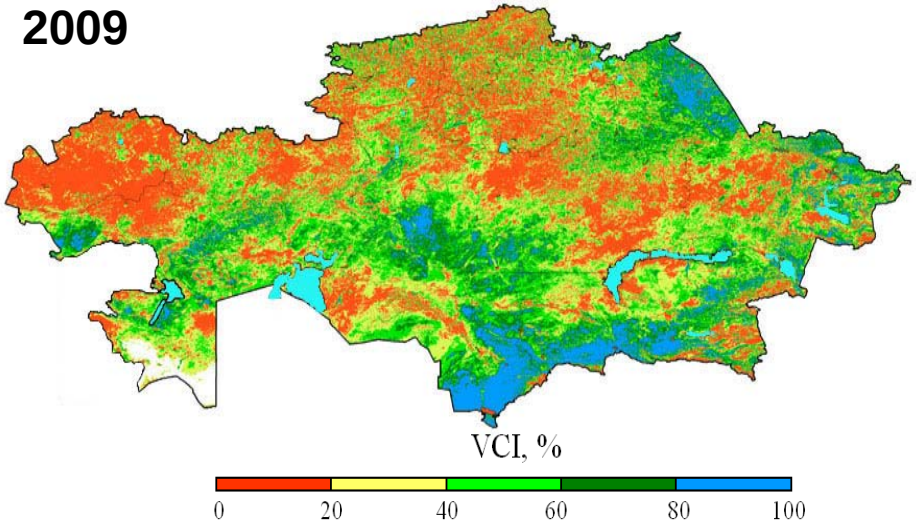
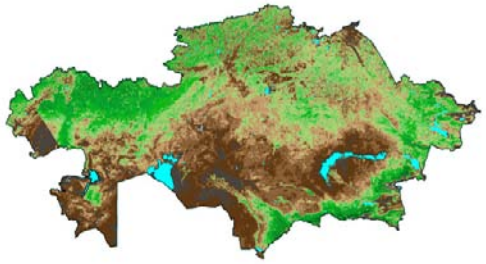


2002

Humidity year



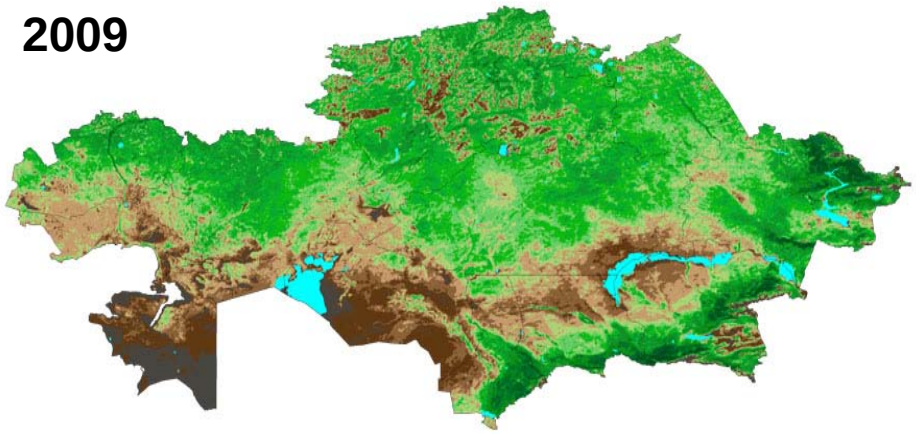
2006

Dry year

2 decade of May

Decade dynamics of vegetation indexes in Kazakhstan

2009



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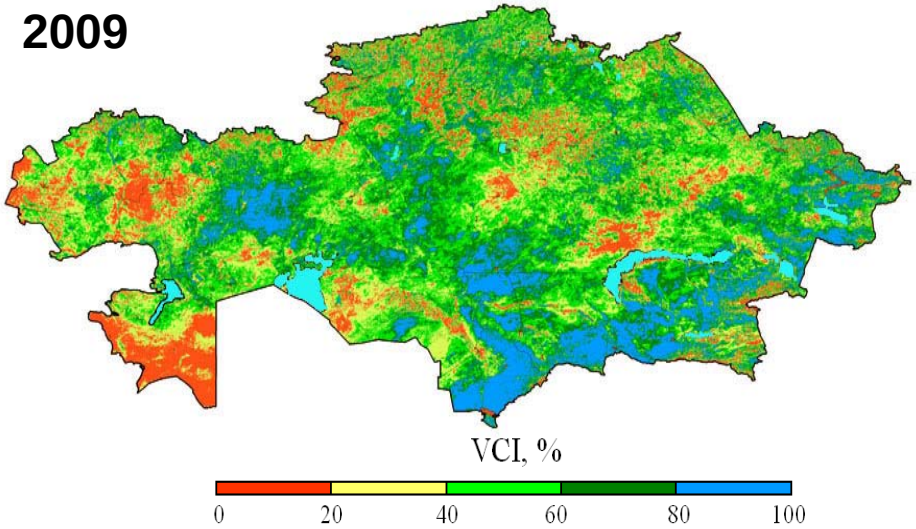
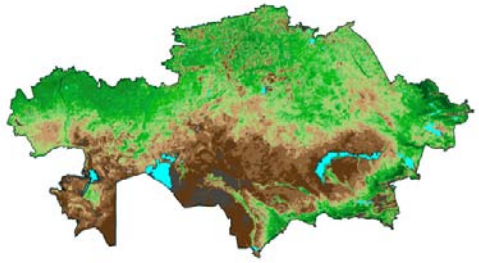


2002

Humidity year



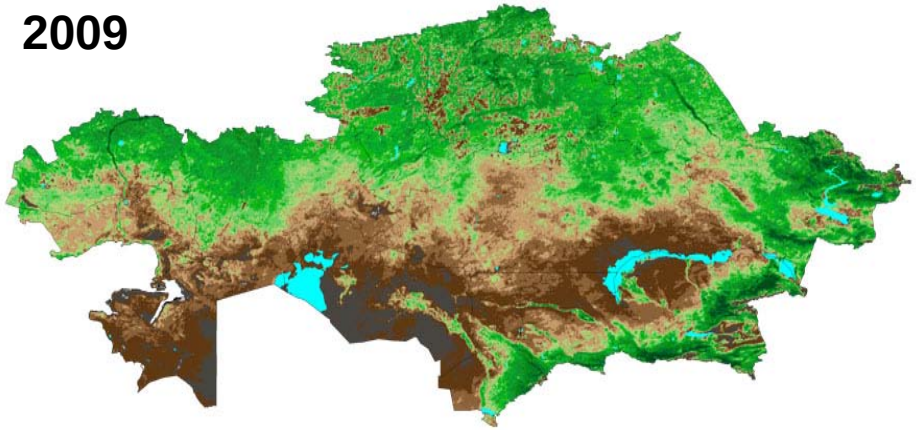
2006

Dry year

3 decade of May

Decade dynamics of vegetation indexes in Kazakhstan

2009



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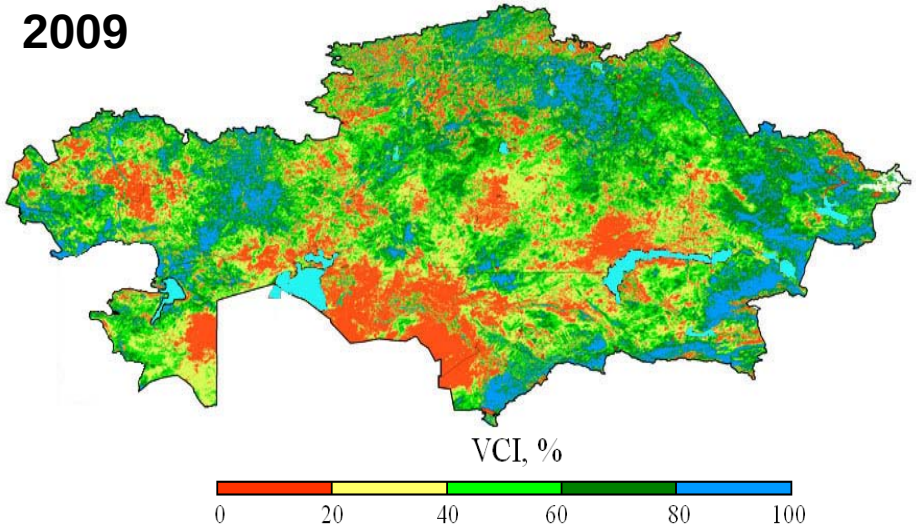
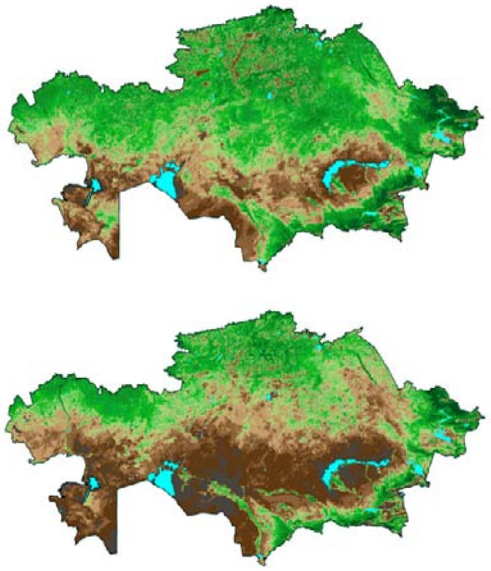




2002

Humid year

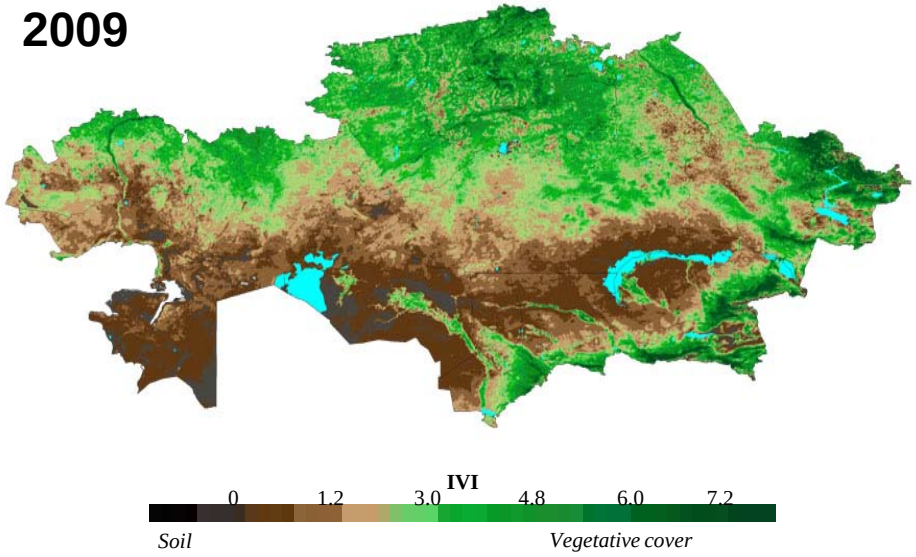
2006

Dry year

1 decade of June

Decade dynamics of vegetation indexes in Kazakhstan

2009



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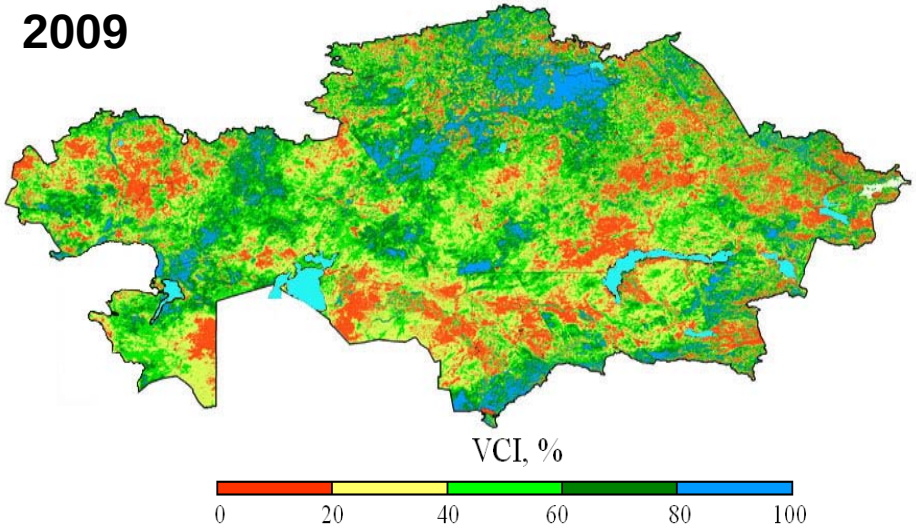
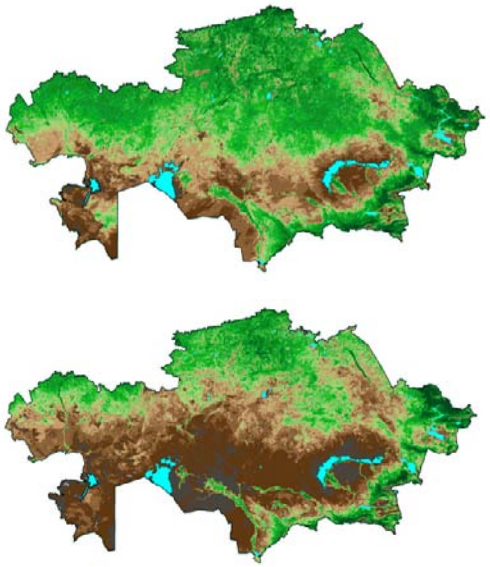




2002

Humidity year

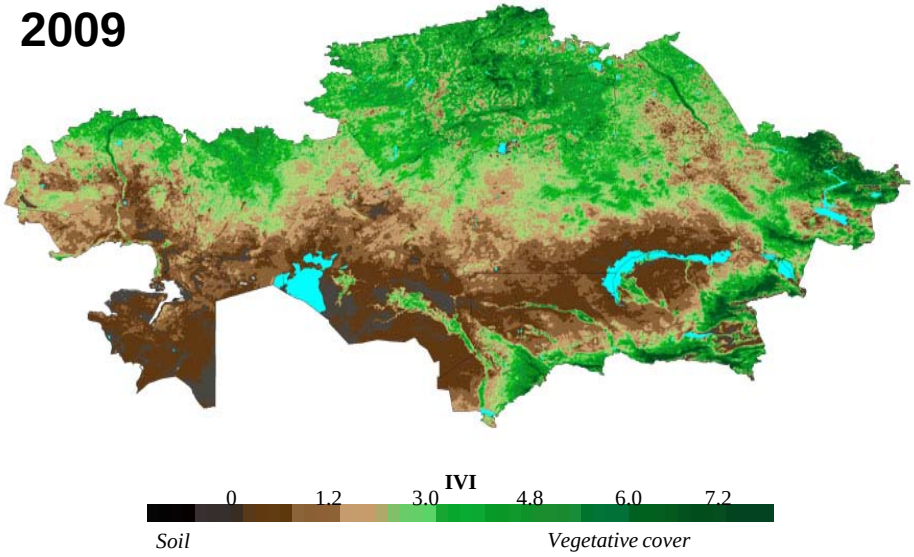
2006

Dry year

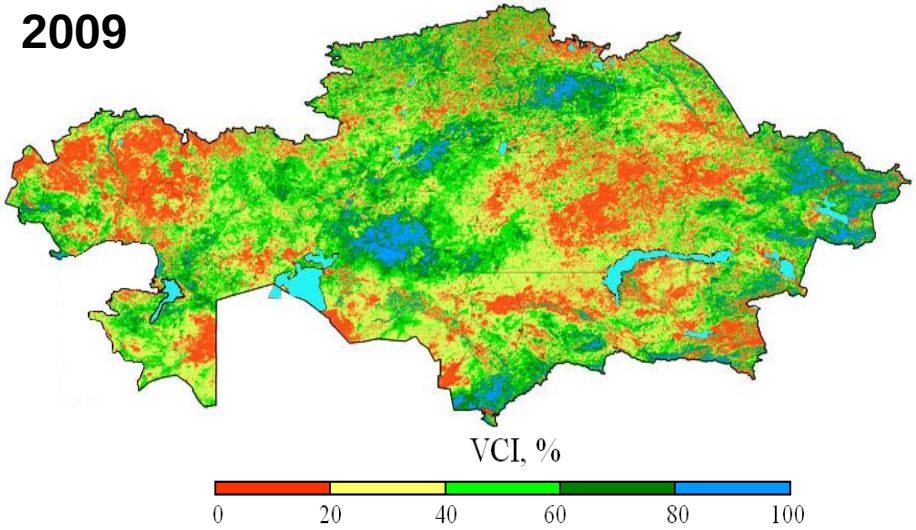
2 decade of June

Decade dynamics of vegetation indexes in Kazakhstan

2009



2009



2002

Humidity year

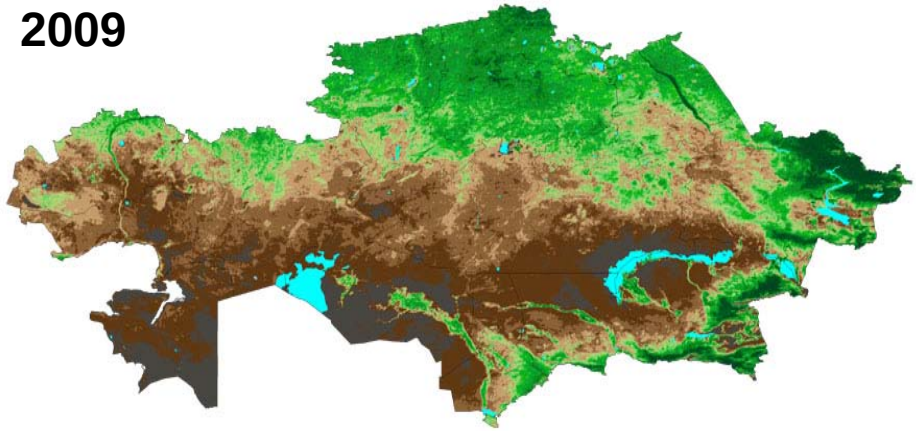
2006

Dry year

3 decade of June

Decade dynamics of vegetation indexes in Kazakhstan

2009



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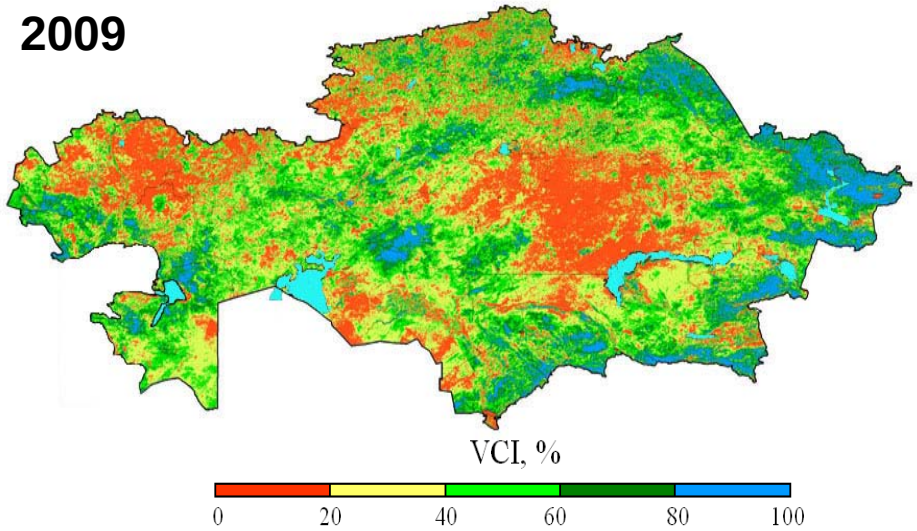


2002

Humidity year

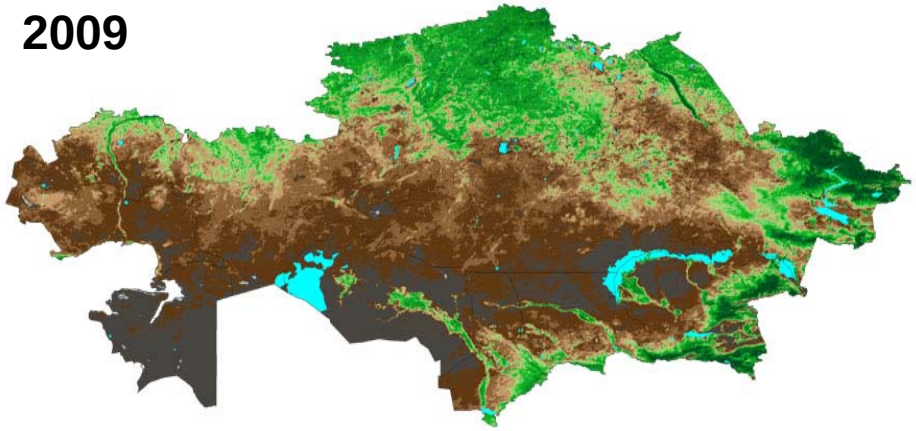
2006

Dry year

1 decade of July

Decade dynamics of vegetation indexes in Kazakhstan

2009



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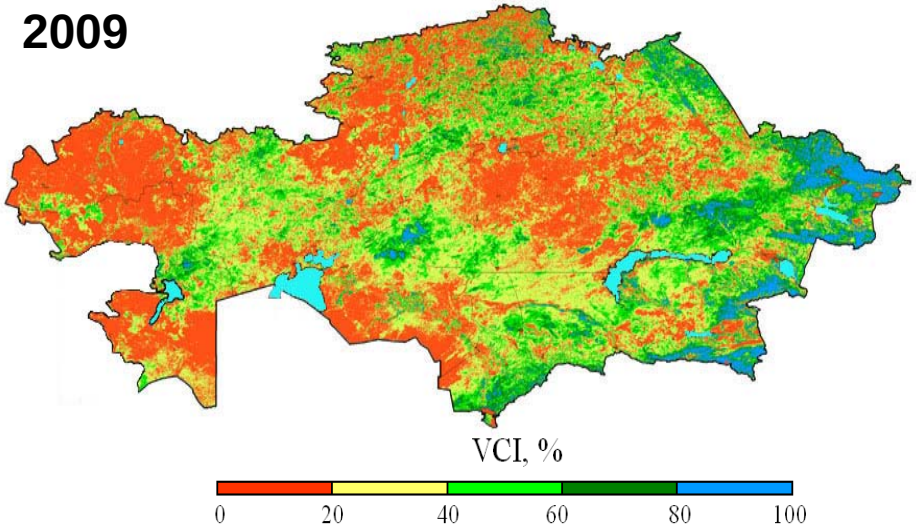


2002

Humidity year

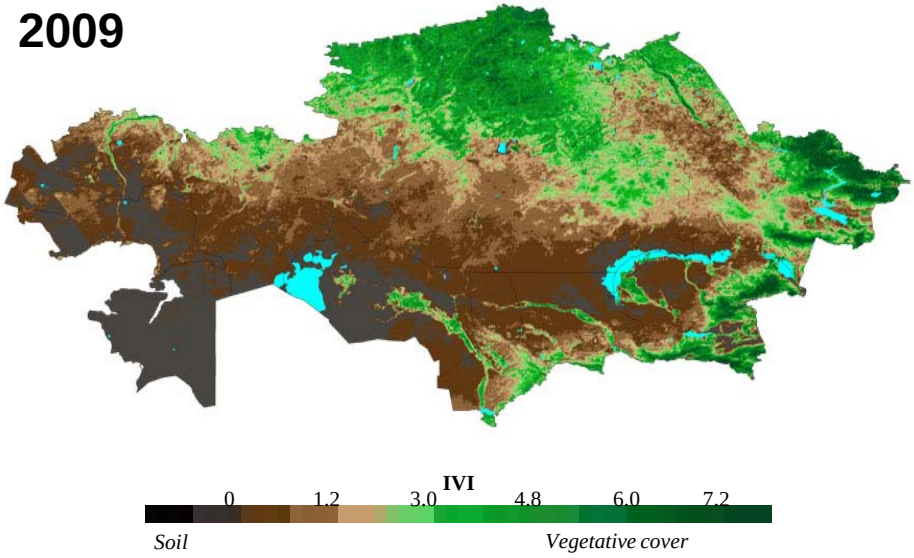
2006

Dry year

2 decade of July

Decade dynamics of vegetation indexes in Kazakhstan

2009



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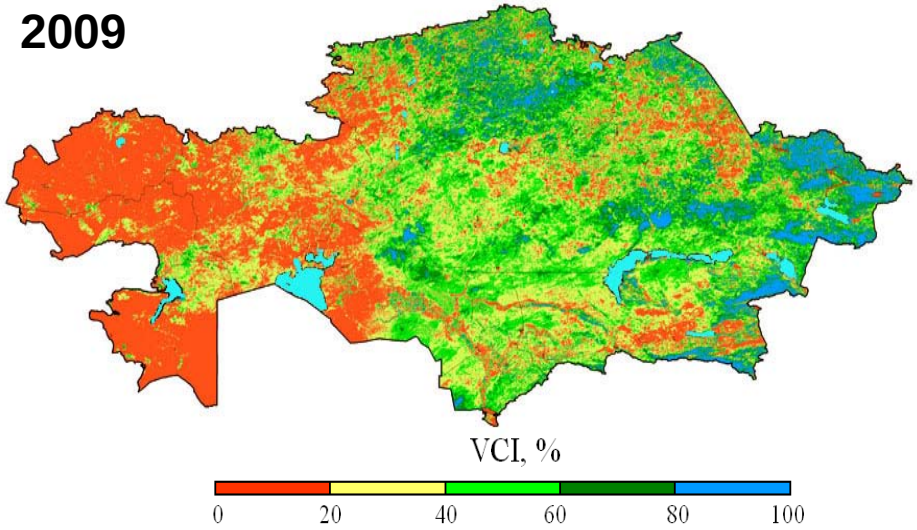

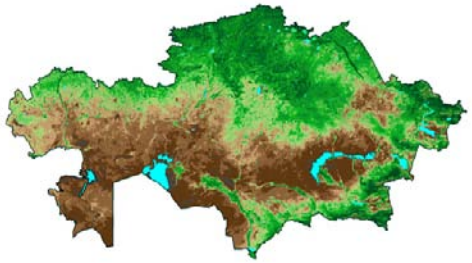

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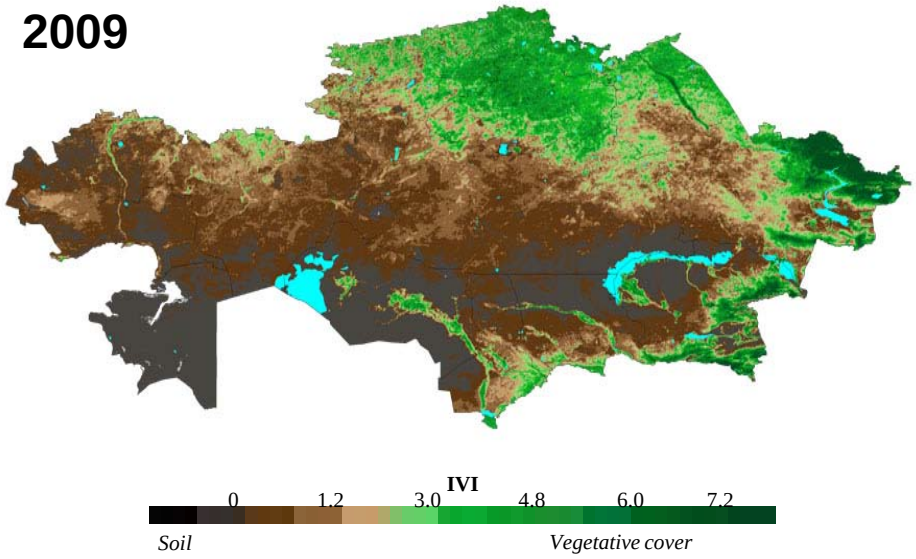
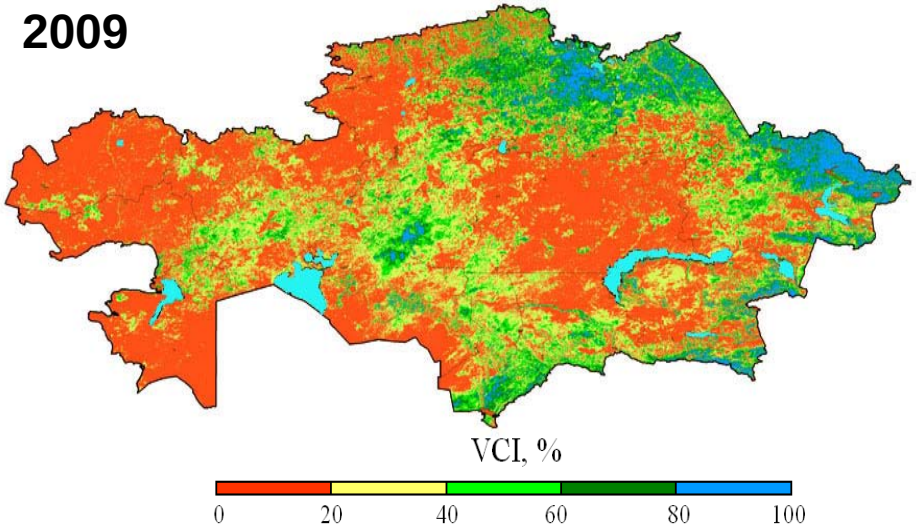
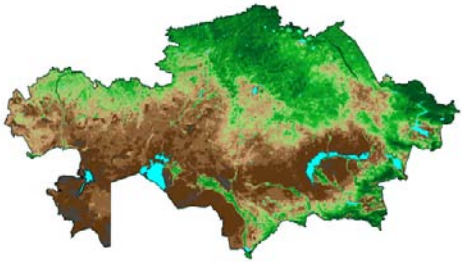


2009





2002

Humidity year

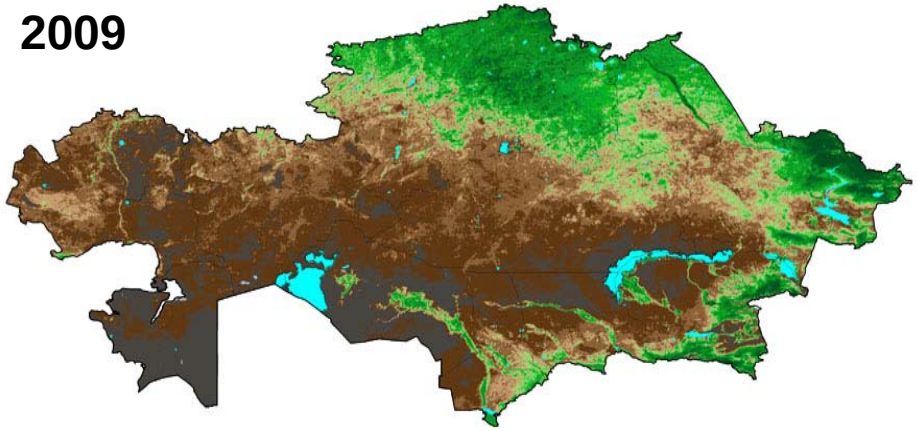
2006

Dry year

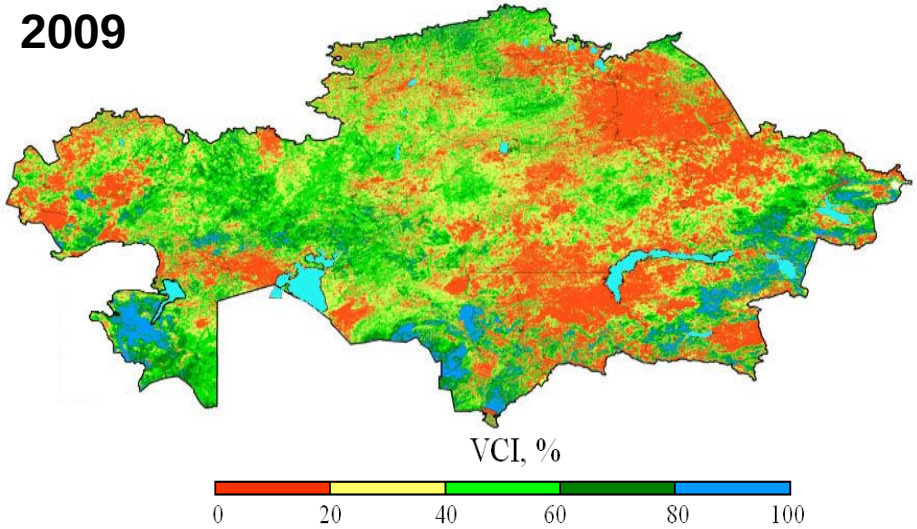
1 decade of August

Decade dynamics of vegetation indexes in Kazakhstan

2009



2009



2002

Humidity year

2006

Dry year

2 decade of August

Decade dynamics of vegetation indexes in Kazakhstan

The general scheme of space monitoring of a vegetation state

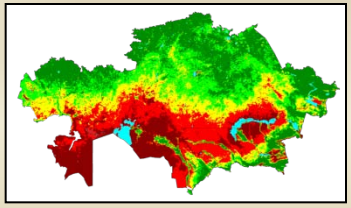
System of reception, data collection and archiving of satellite data

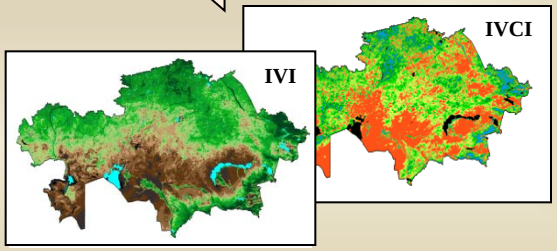
Archive of many years vegetation indexes

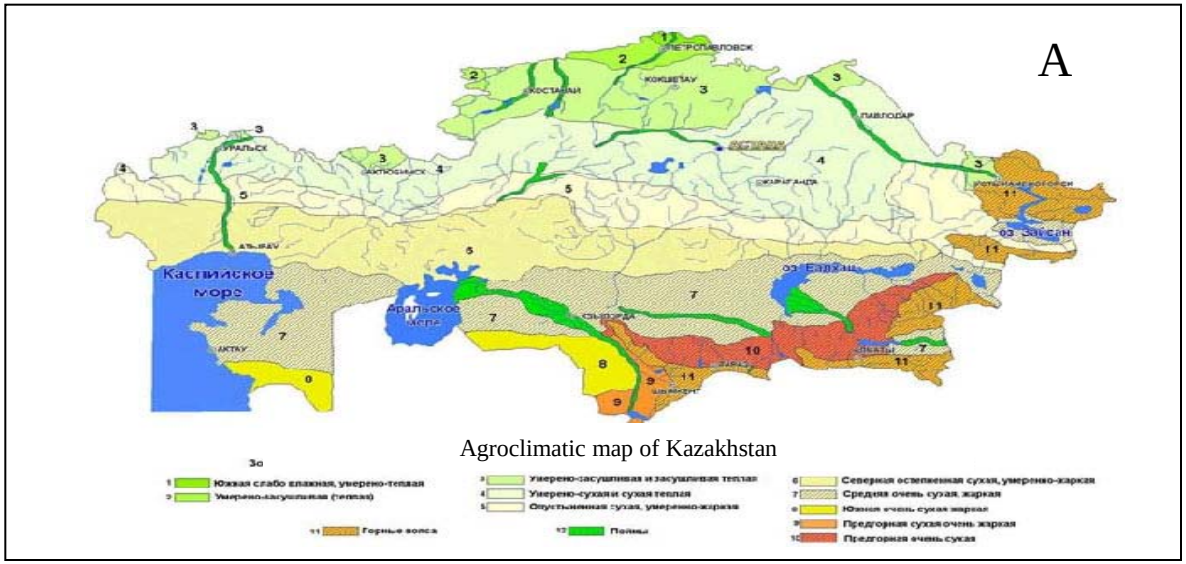
Thematic decoding

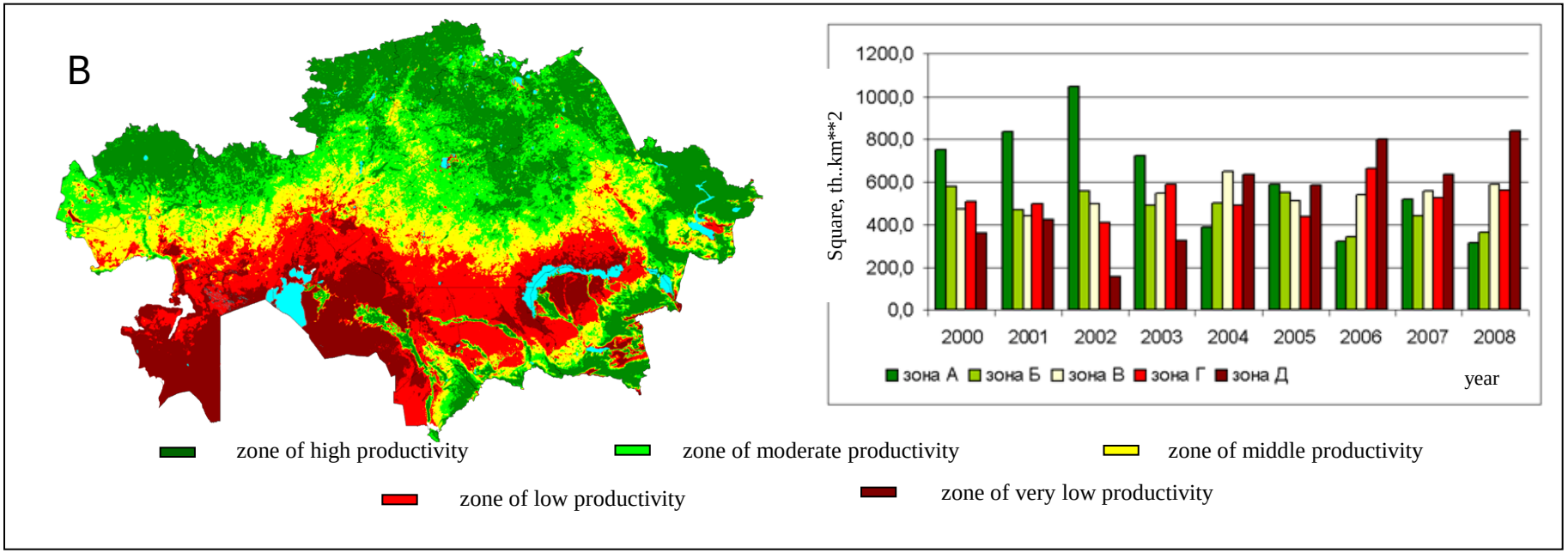
Zoning of territory

The analysis of vegetation indexes sets

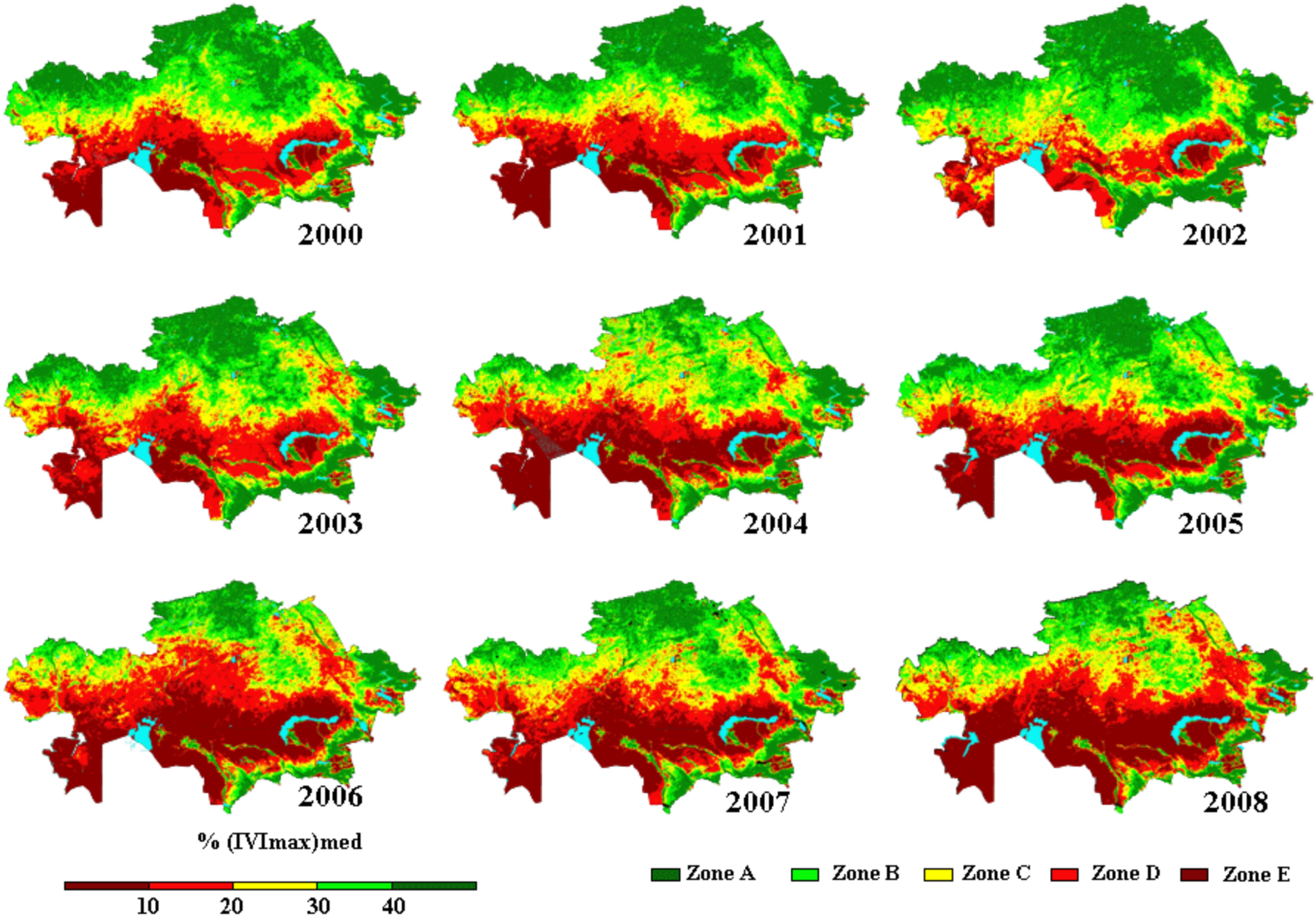




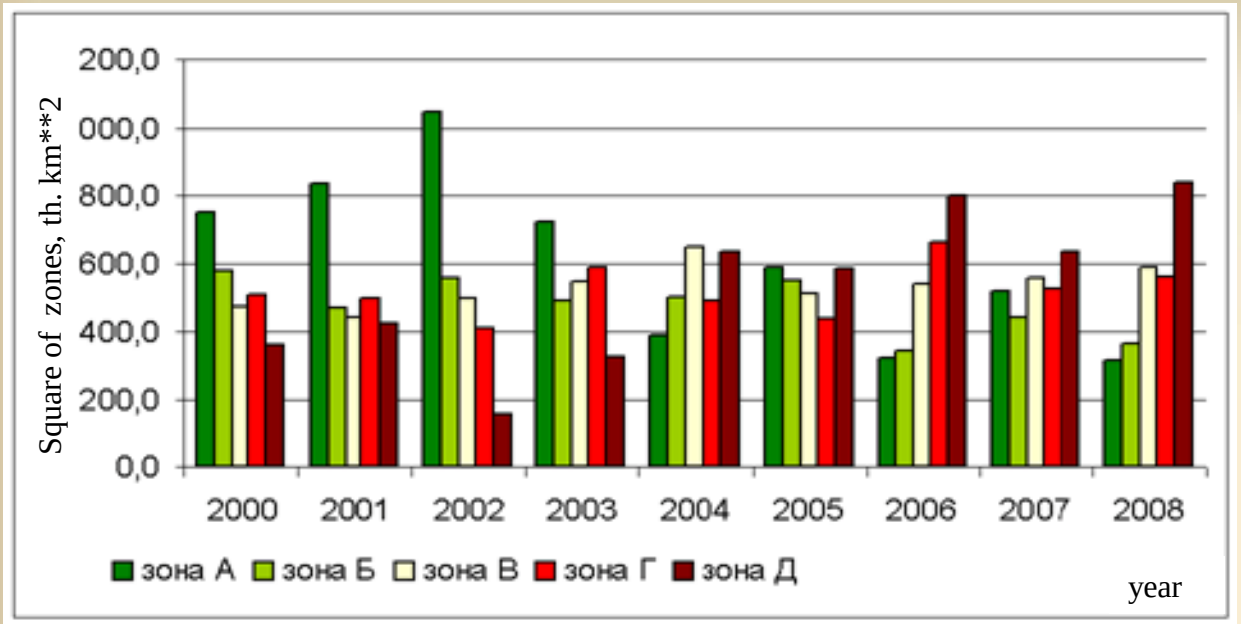


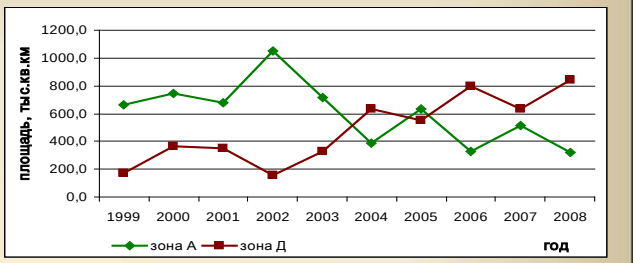


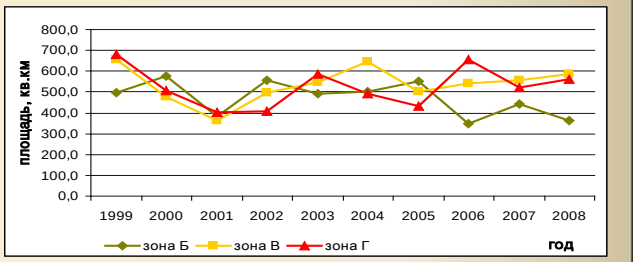
Kazakhstan zoning on base of ground (A) and remote sensing data (B)



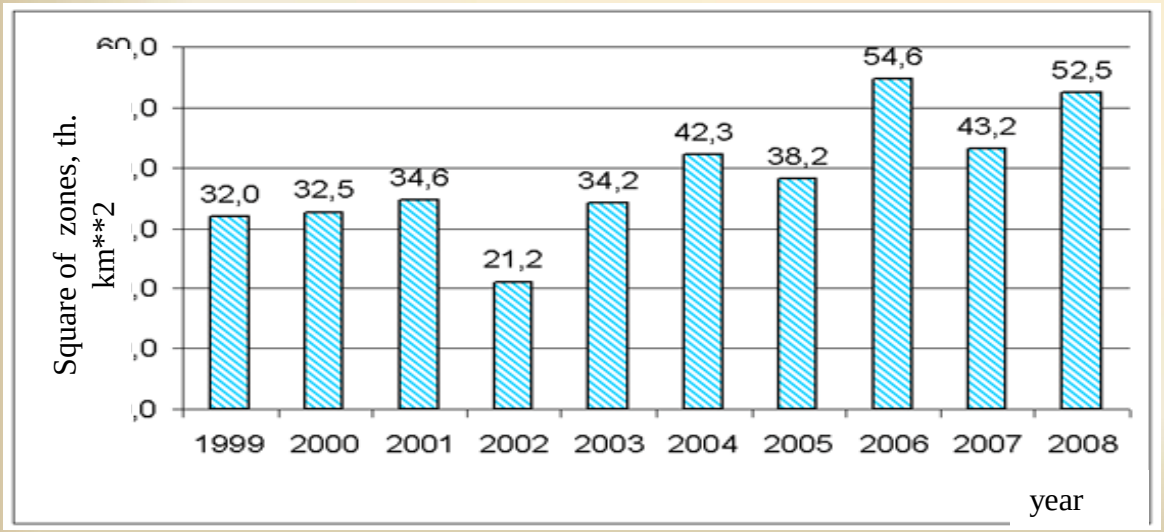
Zones of various productivity of vegetation in Kazakhstan (2000-2008)







Change of the areas of various productivity zones in Kazakhstan (2000-2008)



Increase of the areas of zones with low vegetation productivity (2000-2008)

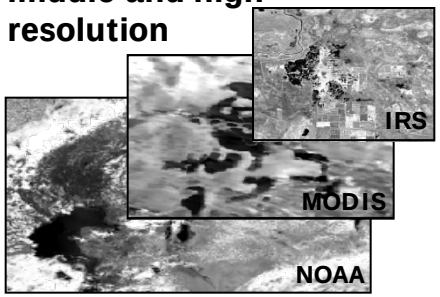
Estimation of cropland productivity

Cropland area in Kazakhstan

Year	1990	1995	1998	1999	2000	2001	2002
Cropland, mln.ha	23.4	18.9	13.5	11.4	12.4	13.2	14.0

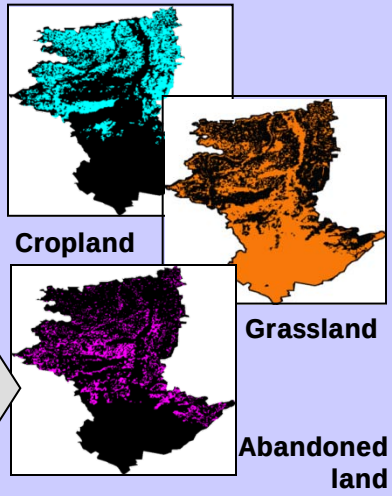
Year	2003	2004	2005	2006	2007	2008
Cropland, mln.ha	17.4	18.0	18.4	18.4	18.9	20.1

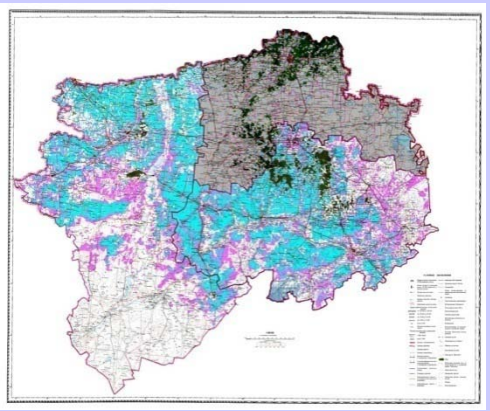
Space images of low, middle and high resolution



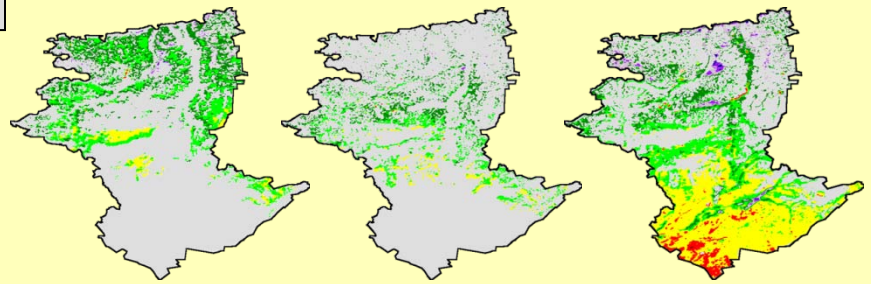
Ranging of agricultural fields

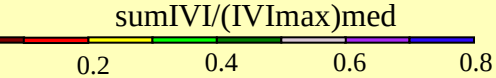
Masks of different practice lands



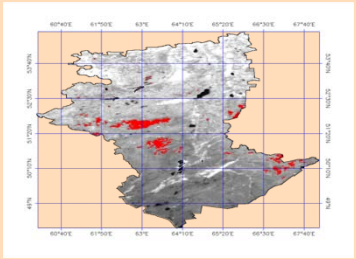


Ranging of different land use practice on base of vegetation productivity

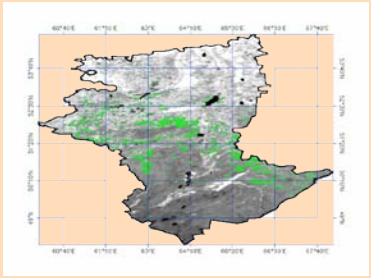




Recommendation for land use practice

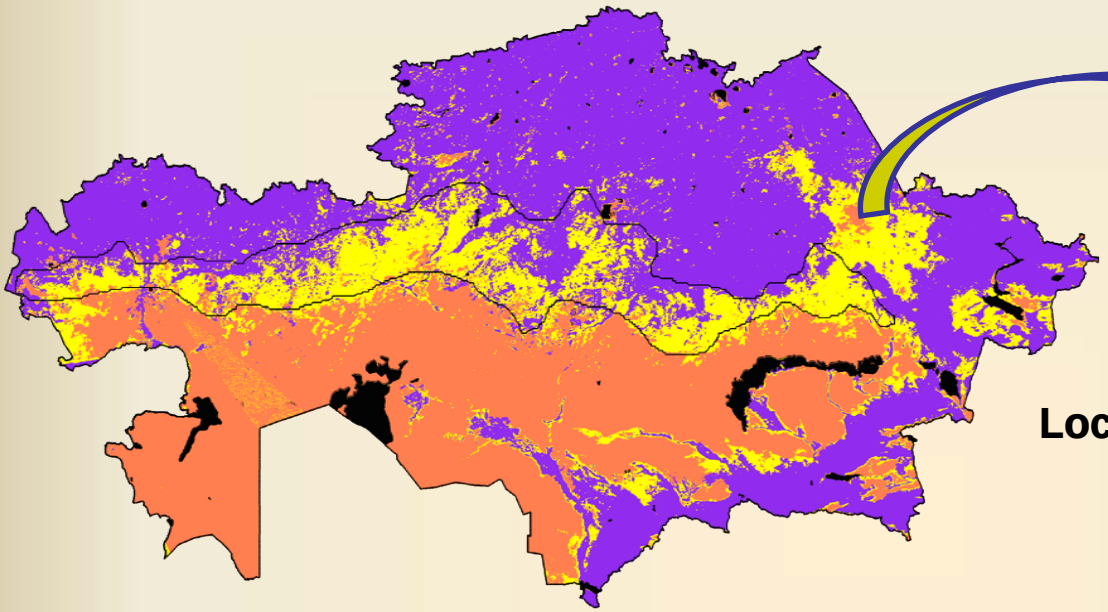


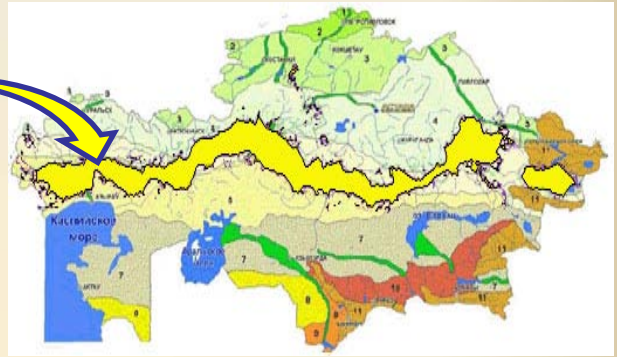
Low productivity, Cropland



High productivity, Abandoned land

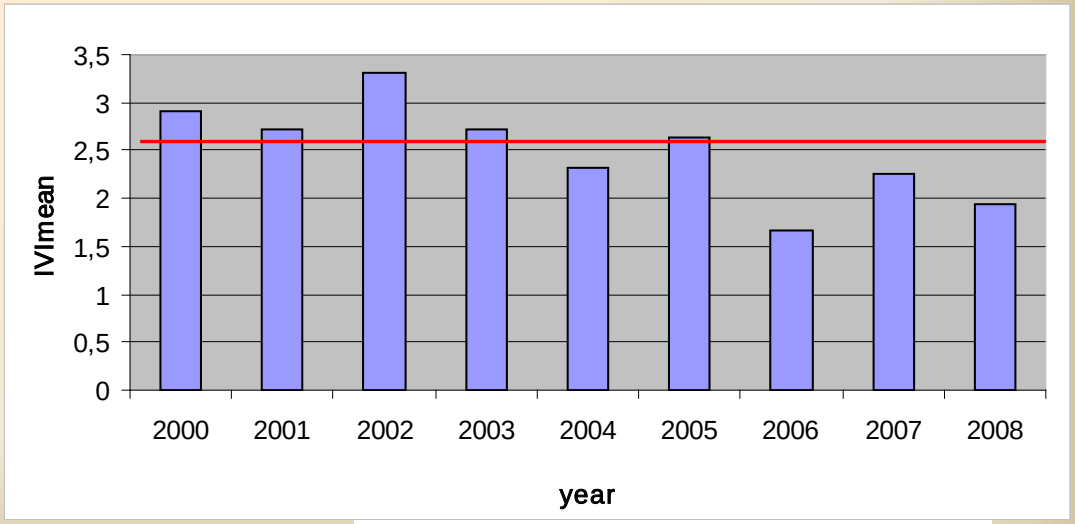
Detection of territories with low productivity of vegetation

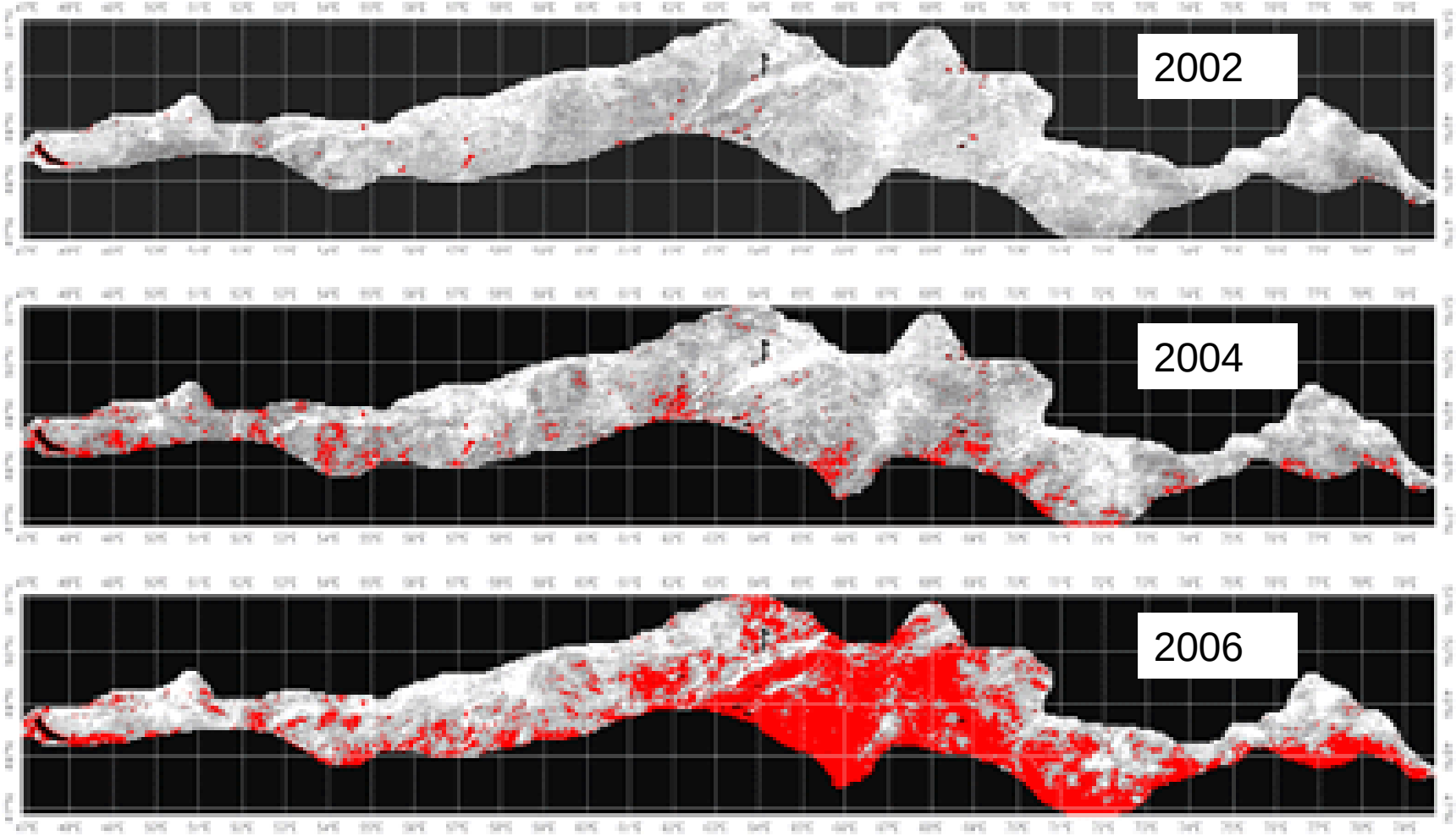




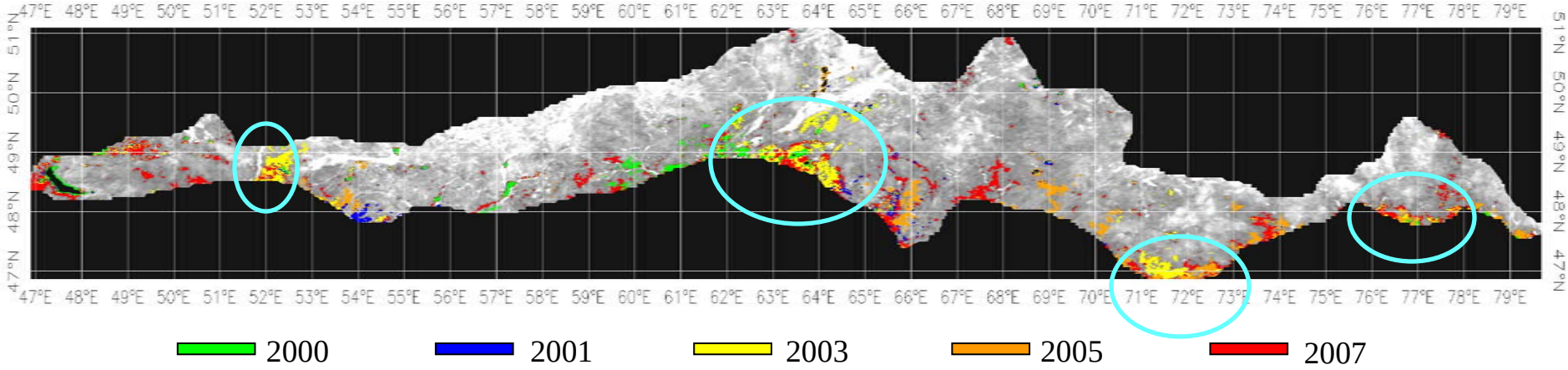
Location of a "desert - semidesert" transitive area

Long-term dynamics of values of IVI averaged on the area of a transitive zone

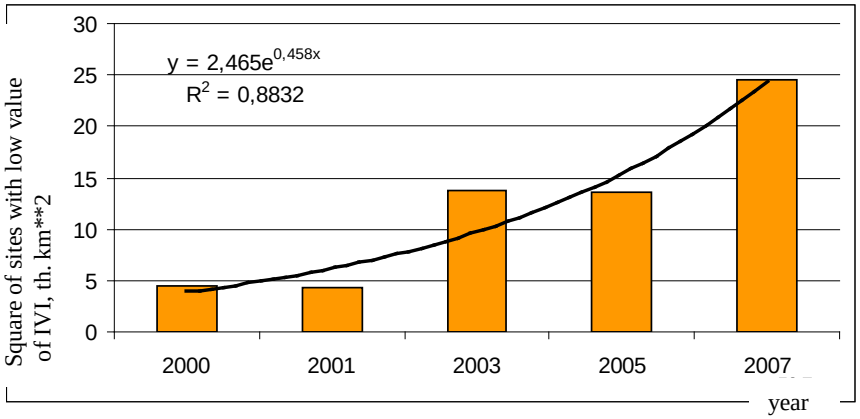




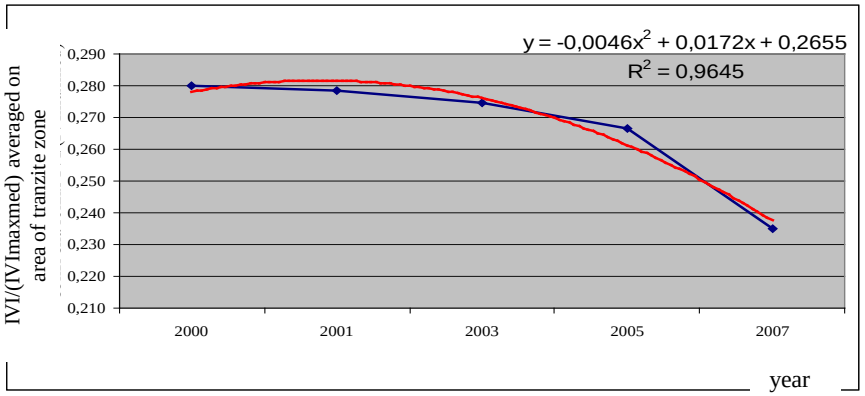
Location of territories with low $IVI / (IVI_{max})_{med}$ for years with extreme weather conditions



Localization of territories with low $IVI/(IVI_{max})_{med}$ for years with typical weather conditions



Change of the squareas occupied territories with low $IVI / (IVI_{max})_{med}$ (0 - 0.15) for years with typical weather conditions

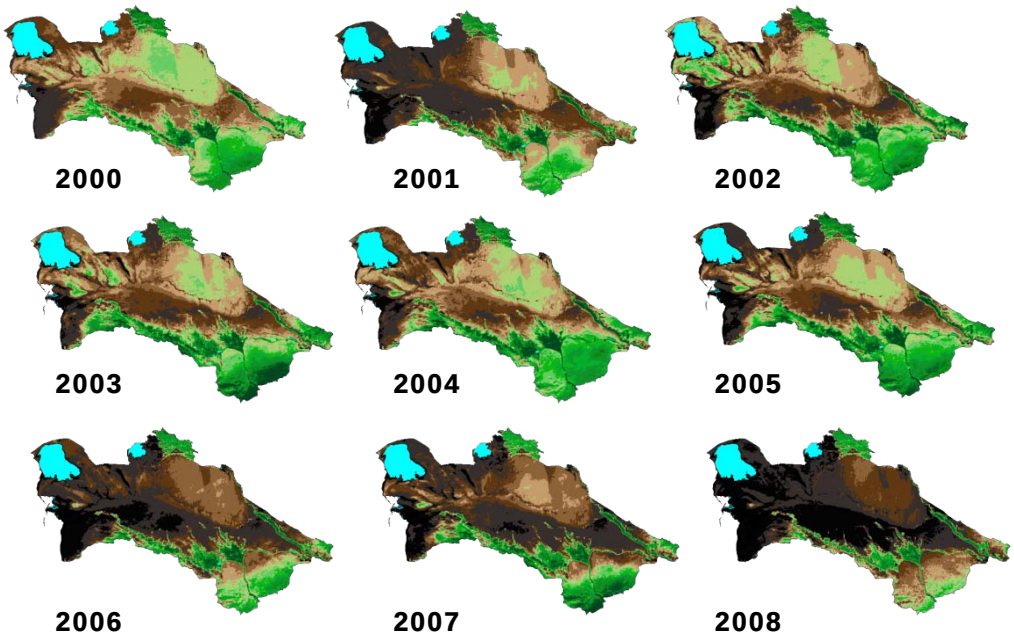


Change of $IVI/(IVI_{max})_{med}$ averaged on the square of a transit zone for years with typical weather conditions

Estimation of seasonal dynamics of desert pastures productivity in Turkmenistan using NOAA/AVHRR data

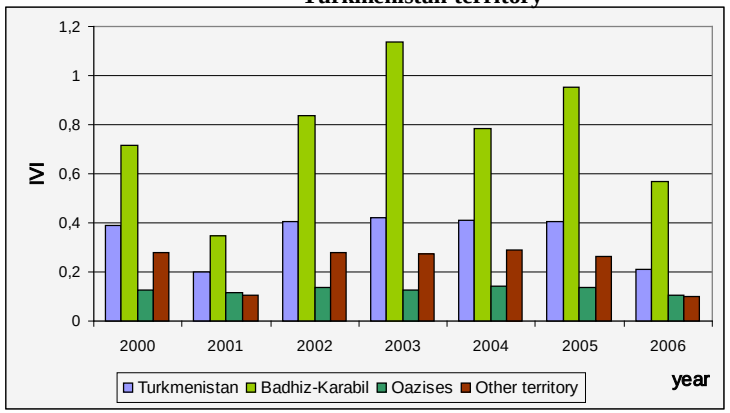
USA-ISRAEL CDR PROGRAM – project No. TA-MOU-03-CA23-034

(coordinator Dr. L.Orlovsky)

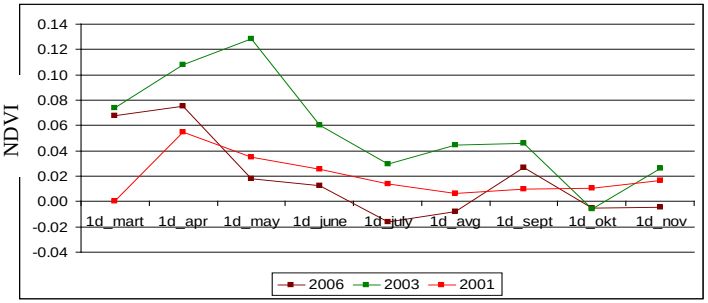


Dynamics of IVI change in Turkmenistan

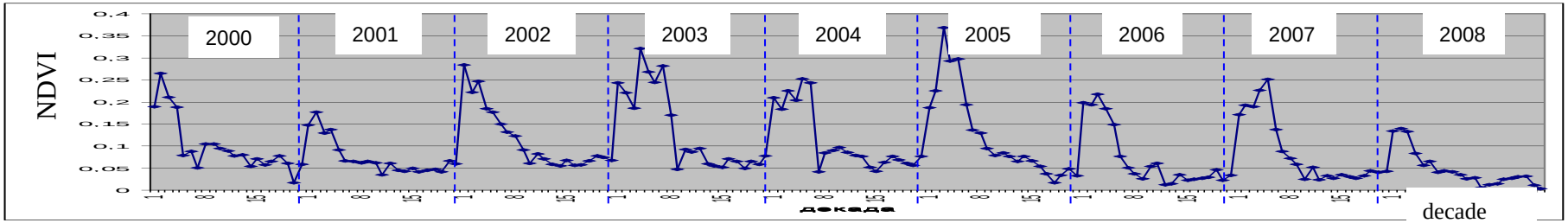
Long-time dynamics of IVI for different parts of Turkmenistan territory



Ten-day NDVI distribution for years with different weather conditions



Many year dynamics of ten-day NDVI

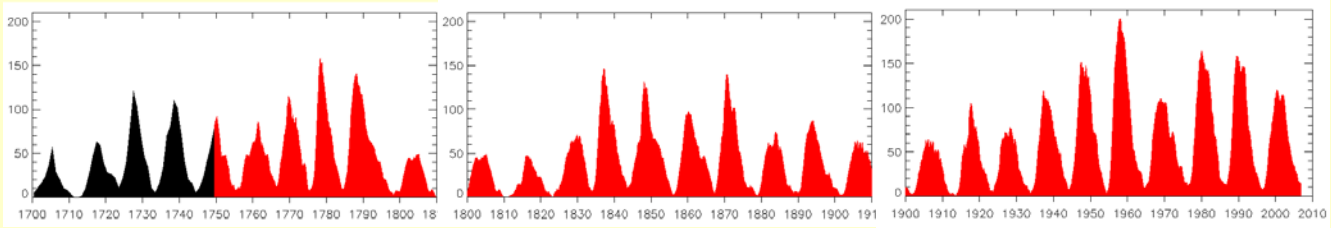


Spot creation of the Sun

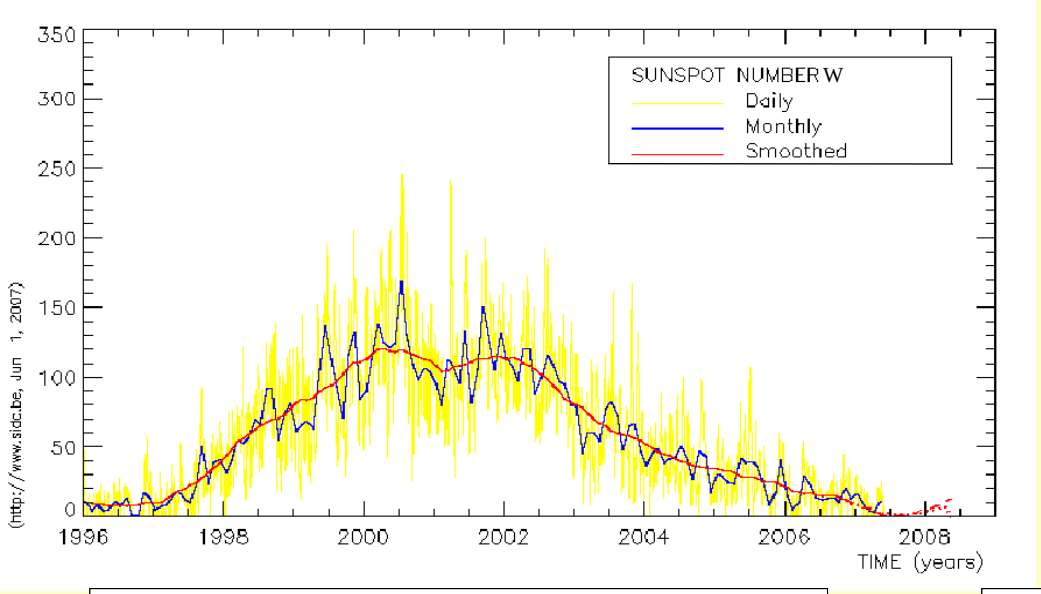
W=k(f + 10g)

f – quantity of all separate spots detected on the Sun disk

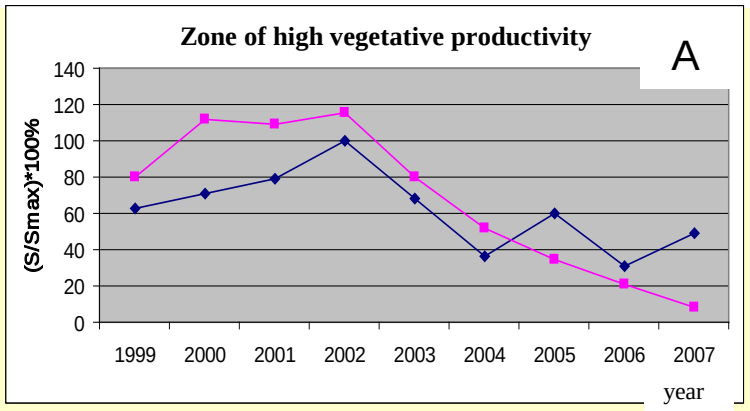
g – number of created groups of spots

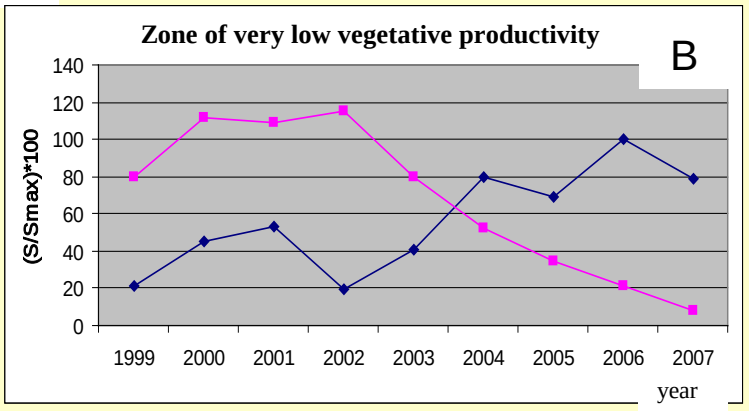


http://www.sidc.be



Distributions of Wolf numbers and relative squares (S/Smax) for zones with different vegetative productivity





Wolf number

(S/Smax)*100%

THANK YOU
FOR ATTENTION