

Scientific component of Berlin Process (CAWa Project)

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Schönbrodt-Stitt, Lars Gerlitz

CAWa Project coordination

EU strategy „Central Asia“ / German Water Initiative for Central Asia („Berlin Process“)

- ≈ Political institutional component: GIZ (‘Transboundary Water Management in Central Asia’ programme)
- ≈ Educational component: German-Kazakh University (DKU)
- ≈ Scientific component: CAWa Project
- Phase I-II (2008-2014): scientific data base, analysis and modeling
- Phase III (2015-2017): **Consolidation, Capacity Building, Transfer**
- Phase IV (2018-2019): Dissemination and Capacity building



Federal Foreign Office



The former German Foreign Minister Steinmeier opening the „Water Unites“ Conference in Berlin in April 2008.

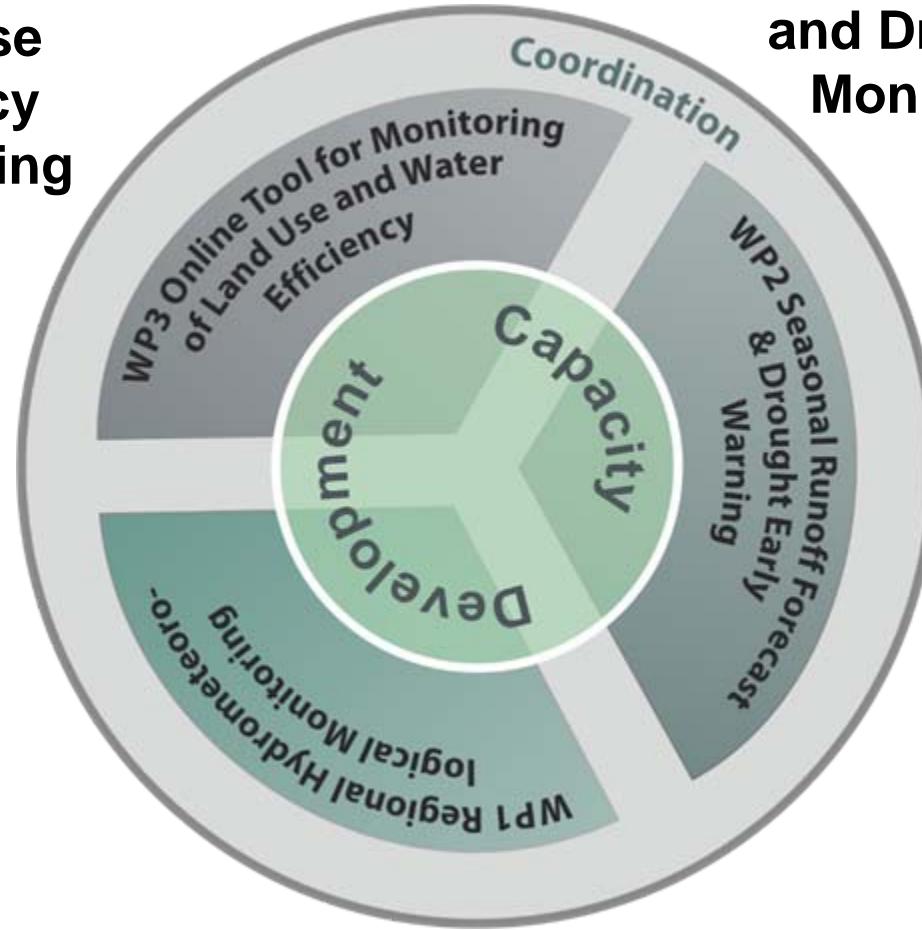
Topics and Partners



WP 1: Ground-based and space-based monitoring of water resources

WP 3: Space-based land and water use efficiency monitoring

WP 2: Seasonal Runoff Forecast and Drought Monitoring



GFZ

Helmholtz Centre
POTSDAM



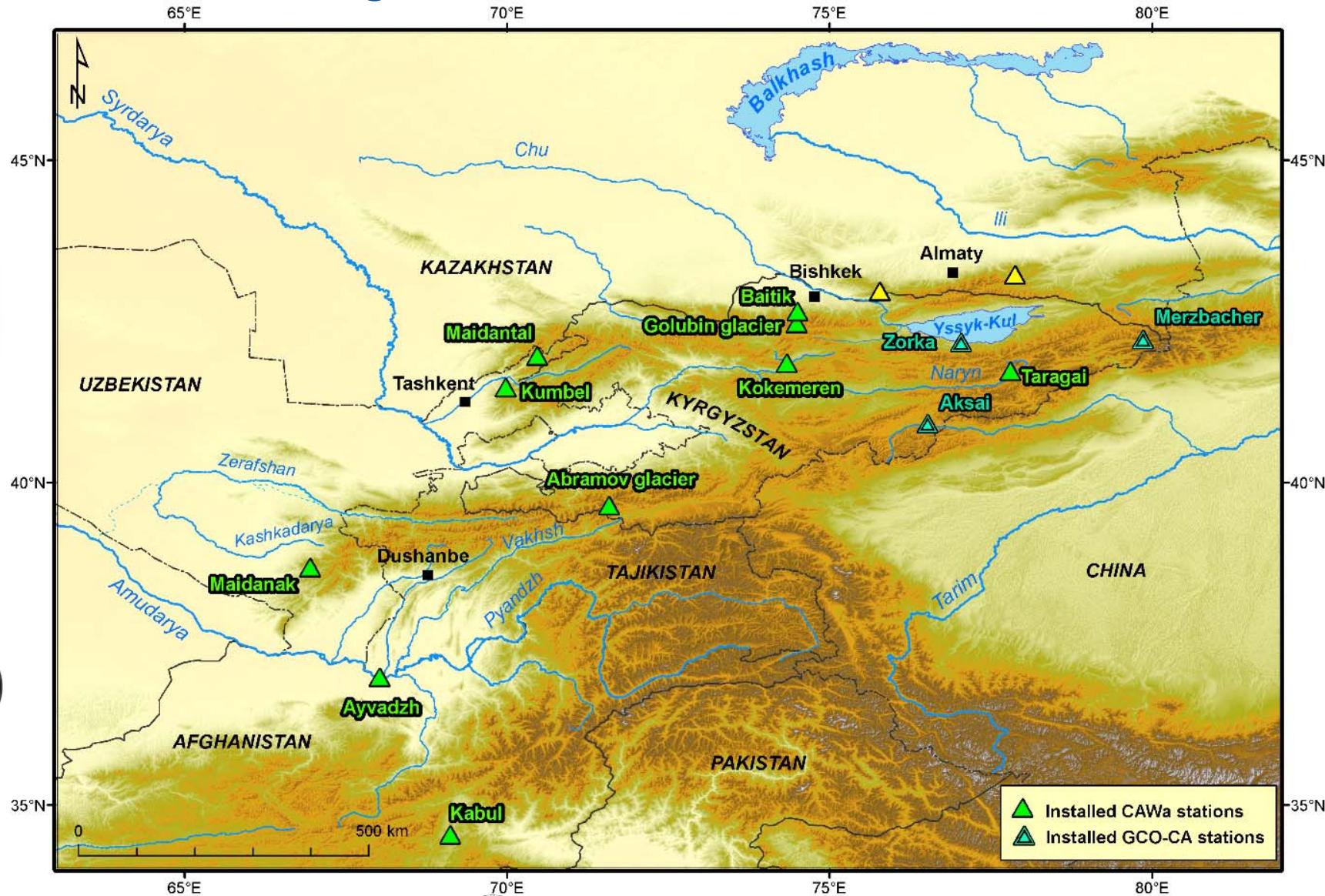
Қазақстан
Моделінің
Меморандумы



Work Package 1

REGIONAL HYDROMETEOROLOGICAL MONITORING

Monitoring network



Station Design

Maidantal / Uzbekistan



Ayvadzh / Tajikistan



Abramov Glacier / Kyrgyzstan



- Designed for operation in remote areas (ROMPS – Remotely Operated Multi-Parameter Stations)**
- Good performance even in high altitudes and under extreme climatic conditions**

- ✓ Automated
- ✓ High-tech low-maintenance components
- ✓ Independent power supply
- ✓ Power management
- ✓ Real-time data transmission
- ✓ Remote control
- ✓ Multi-sensor stations
- ✓ Complying with WMO recommendations

Taragay / Kyrgyzstan

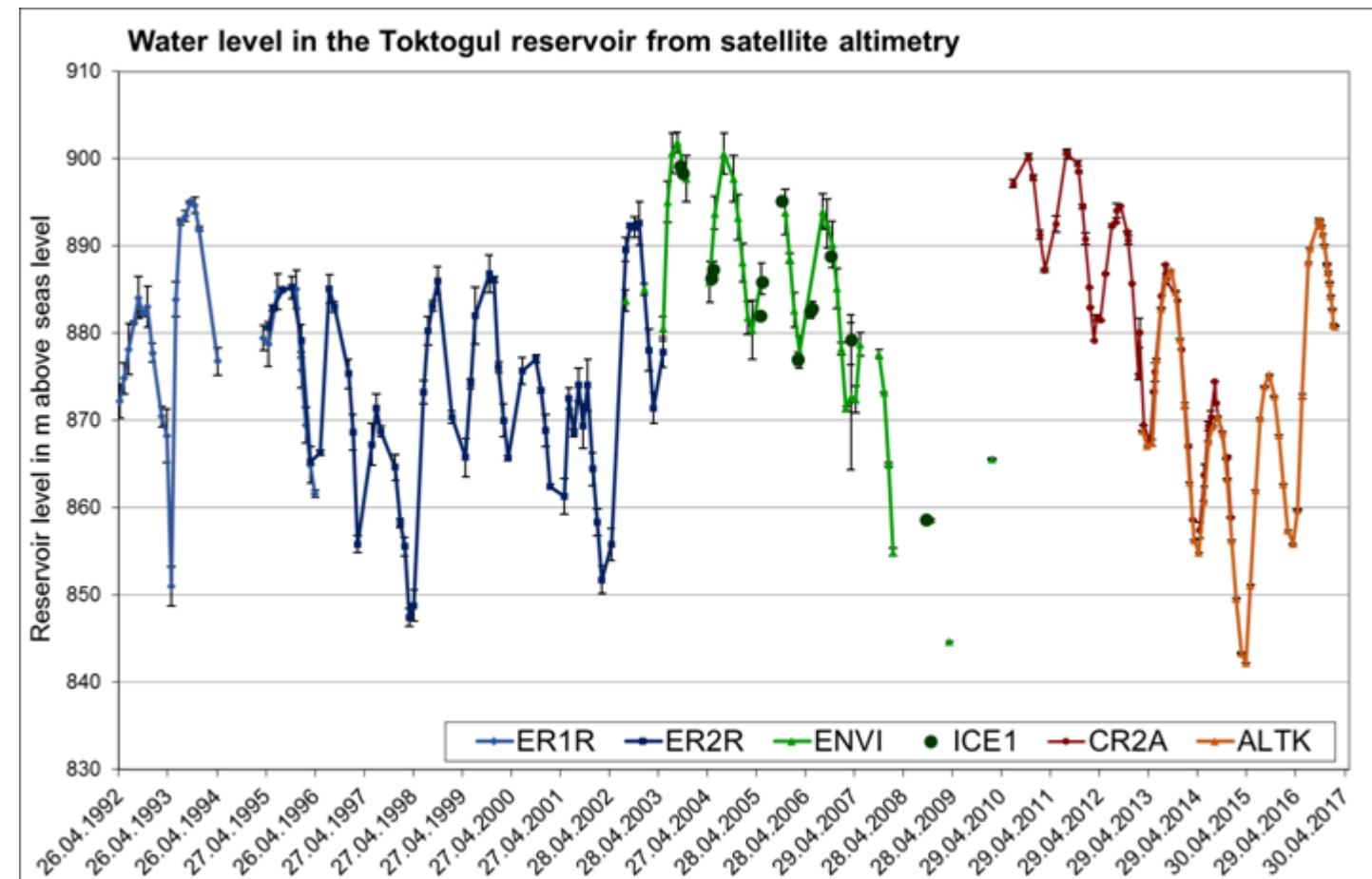
Space-based monitoring of reservoirs & lakes

Satellite altimetry

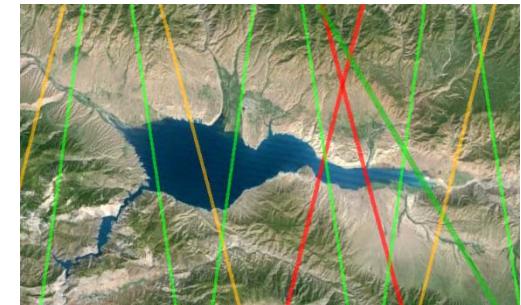
Laser and radar altimeters provide information on water levels in reservoirs and lakes

Data available since early 1990ies with a temporal resolution of 10 to 35 days

Potential applications:
operational tool for Hydromet services,
BWOs, Ministries of Water,
Agriculture,
Energy,



Operational satellite altimeter tracks over the Toktogul



Station data

http://sdss.caiag.kg/sdss/index.php

sdss.caiag.kg/sdss/index.php?page=measure_page

Suchen

SDSS Sensor Data Storage System

Login
Password

Enter
Registration

Overview map Measurement Help

Filters

-- Metedata --

Station Parameter Device

Station List

Site	Name	Data group	Country
abra	Abramov glacier	congpsspos, hymetd	
ala6	Alty-Mazar	congpsspos, meteod	
alai	Alai-main	congpsspos, meteod	
asai	Aksai	congpsspos, hymetd	
ayva	Aivadj	congpsspos, hymetd	
bik0	Bishkek-0	congpsspos, gpsmet	
golu	Golubin glacier	congpsspos, hymetd, snow	
hm01	Baitik	congpsspos, hymetd, snow	
kabu	Kabul	congpsspos, hymetd	
keki	Kokomeren	congpsspos, hymetd, rq24	
kmbl	Kumbel	congpsspos, hymetd, snow	
midn	Maidanak	congpsspos, hymetd	

Data group set Metedata

Measurement parameter Clear

Station Clear

Device Clear

Time Series List

	Descriptor	Station	Height	Unit	Start time	End time
<input type="checkbox"/>	AirTC	asai	2	°C	2012-07-04 15:20:00	2017-05 06:40:00
<input type="checkbox"/>	AirTC	madk	2	°C	2012-11-05 14:20:00	2017-05 06:40:00
<input type="checkbox"/>	AirTC	zoka	0	°C	2016-09-10 10:50:00	2017-05 06:35:00

Export Specification Meta Info Control

Data export

Time series:
Number of measurements:

Start date End date

Download as CSV file Download as XML file

Time series chart - Mozilla Firefox

sdss.caiag.kg/sdss/chart_window_1.php?measurement_ids=[1]

Time series chart

Celsius degrees (°C)

00:00 2014-09-01 00:00 2015-05-01 00:00 2016-01-01 00:00 2016-09-01 00:00 2017-05-01

00:00 2014-09-01 00:00 2015-05-01 00:00 2016-01-01 00:00 2016-09-01 00:00 2017-05-01

Date/Time

Start date 2014-07-07 00:03 End date 2017-05-31 15:23

Highcharts.com

CAIAG Helmholtz-Zentrum POTS DAM GFZ CAWA

Database access via
<http://sdss.caiag.kg/>

20.11.2017

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Work Package 2

SEASONAL RUNOFF FORECAST AND DROUGHT MONITORING

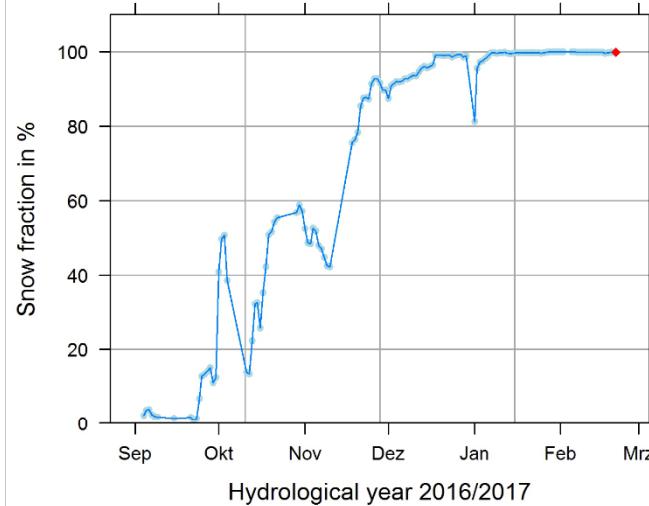


Snow Cover Monitoring

Near real time snow cover monitoring

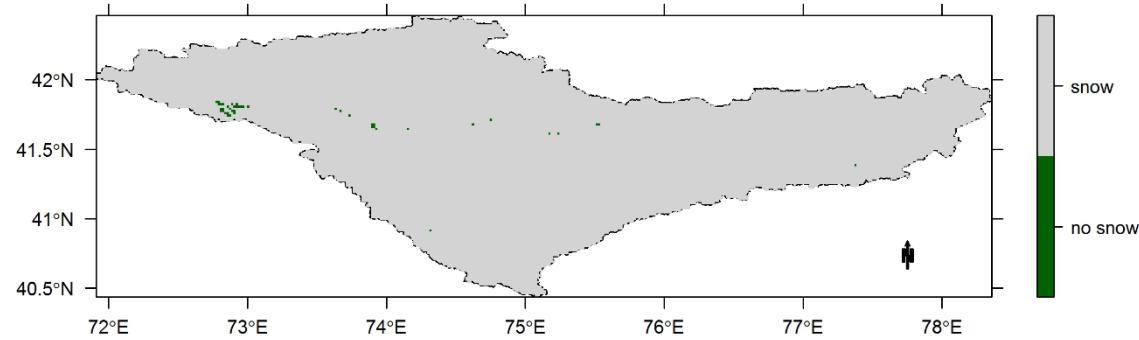
- MODSNOW tool developed by A. Gafurov at GFZ
- using freely available MODIS snow data
- automatic processing of satellite data
- elimination of cloud cover
- snow cover statistics for defined river basins
- daily updates of snow cover maps
- installed at Hydromet services in KAZ, KGZ, UZB, TKM and CAIAG

Snow cover distribution and statistics for the Naryn basin (2017-02-21)



Elevation zone [m]	Snow cover [%]
- 1000	88.69
1001 - 1500	98.47
1501 - 2000	99.90
2001 - 2500	99.99
2501 - 3000	99.96
3001 - 3500	99.96
3501 - 4000	99.97
4001 - 4500	100.00
4501 - 5000	100.00

Snow cover distribution in the Naryn basin

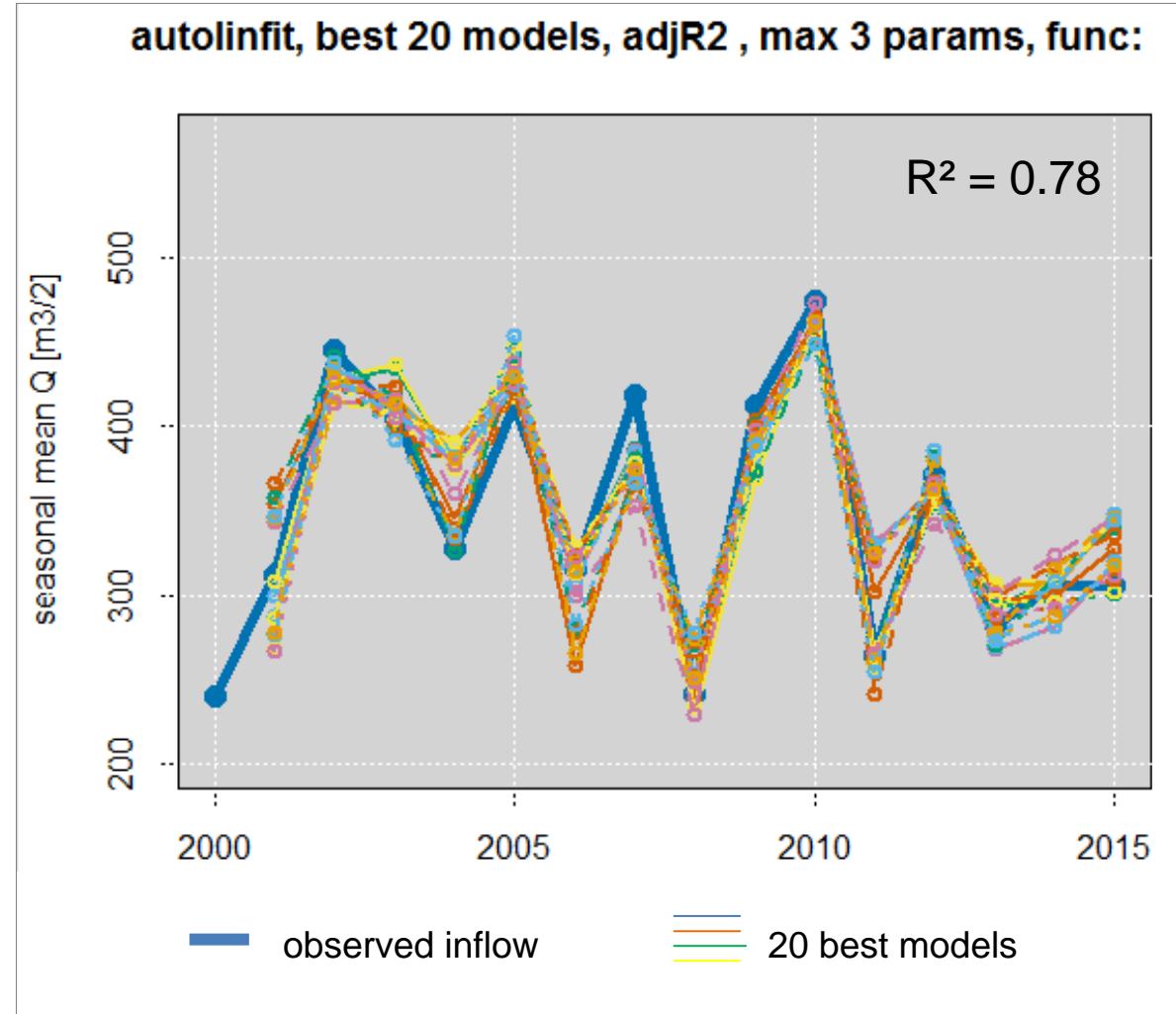


Implemented Forecast Models

Status of model implementation at Hydromets

	River basins
KAZ	Sharyn Shelek Oba Ulba
KGZ	Naryn Upper Chu Talas Ala-Archa
TAJ	
TKM	Murgap Upper Amudarya
UZB	Inflows to Charvak r. Andizhan r.

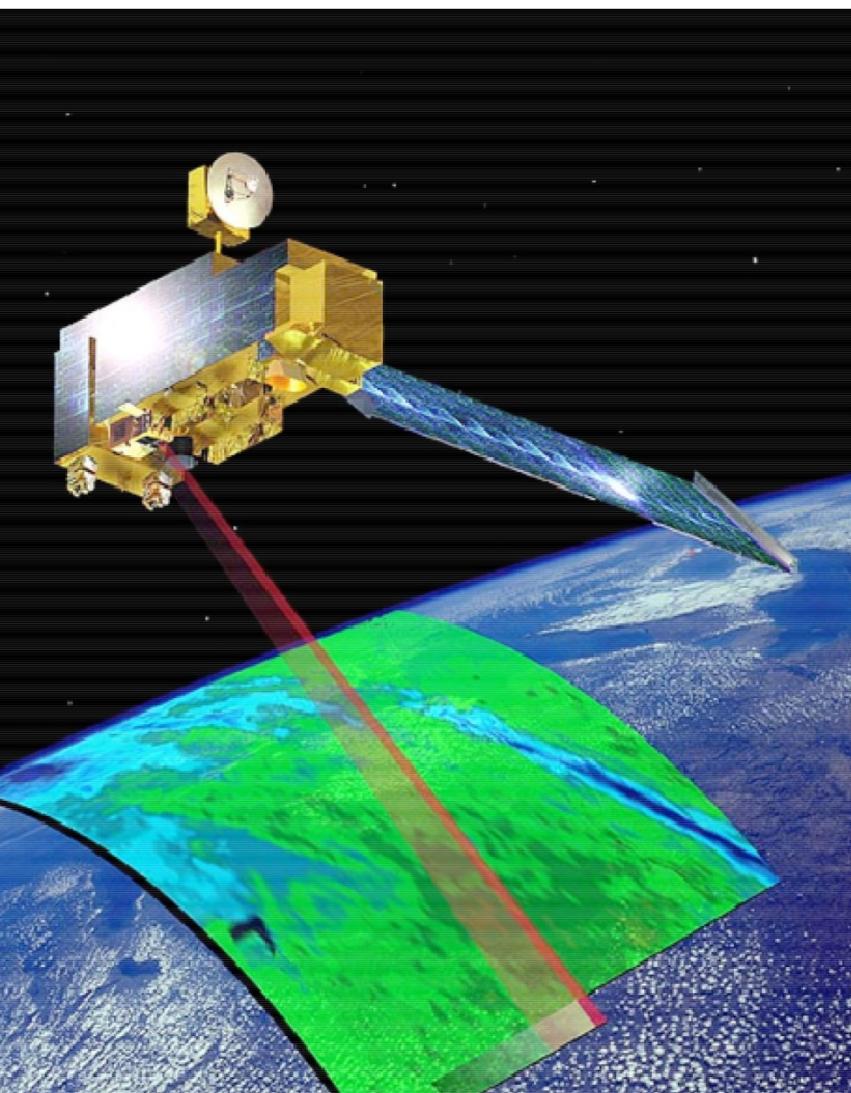
Example: Modeled mean seasonal inflow to Charvak reservoir (Gavrilenko, 2016, based on Apel et al., 2016)



Work package 3

LAND USE MONITORING





AQUA (EOS PM-1) satellite
<https://podaac.jpl.nasa.gov>

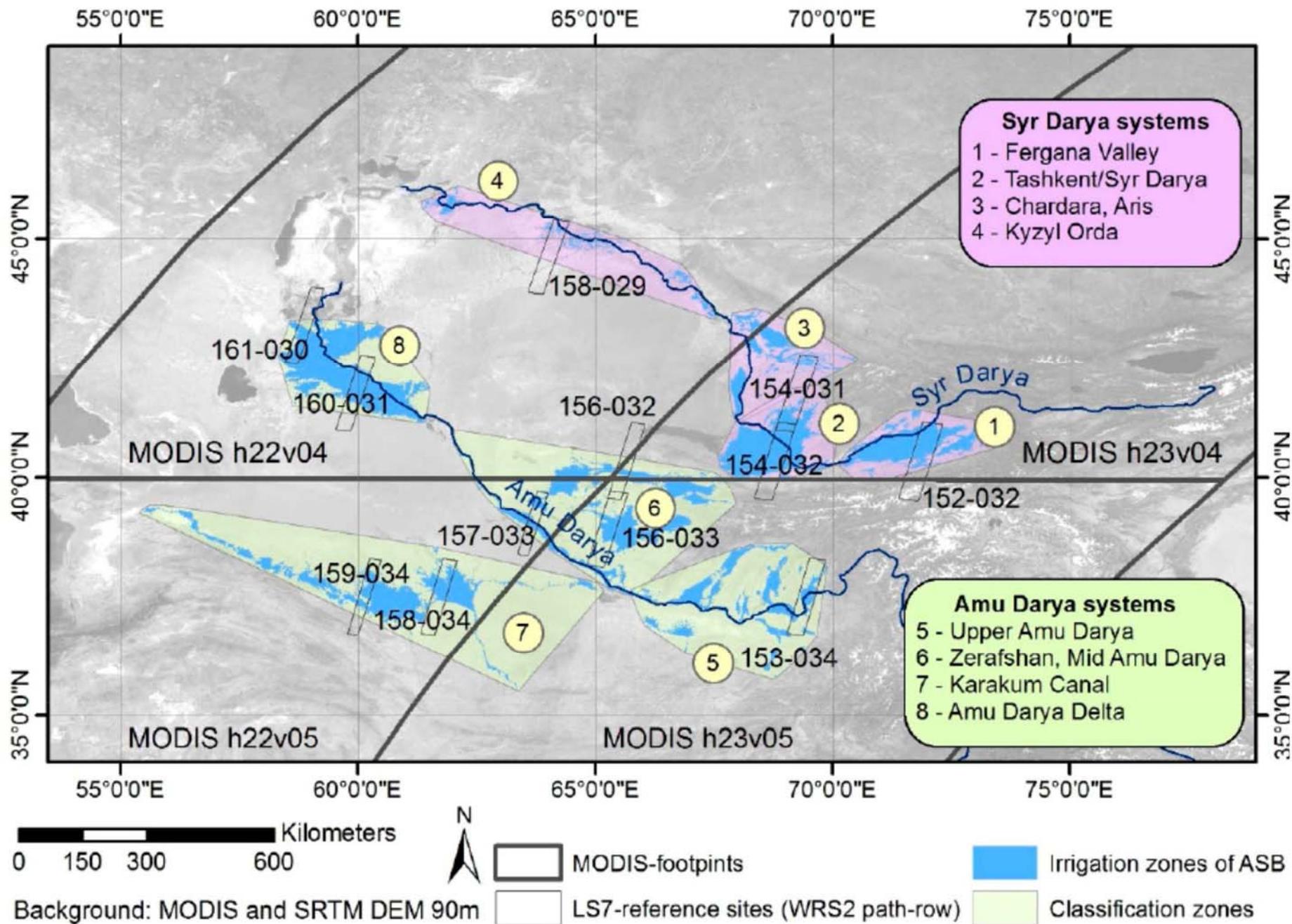
Moderate Resolution Imaging Spectroradiometer

- Launch in December 1999 - TERRA (EOS AM) and in May 2002 – AQUA (EOS PM-2)
- Continuous monitoring of the Earth's water cycle and the environment
- Swath 2330 km by 10 km
- Spatial resolution: 250 m (bands 1–2; e.g., land cover) 500 m (bands 3–7) 1000 m (bands 8–36, e.g., atmospheric water vapour and surface temperature)

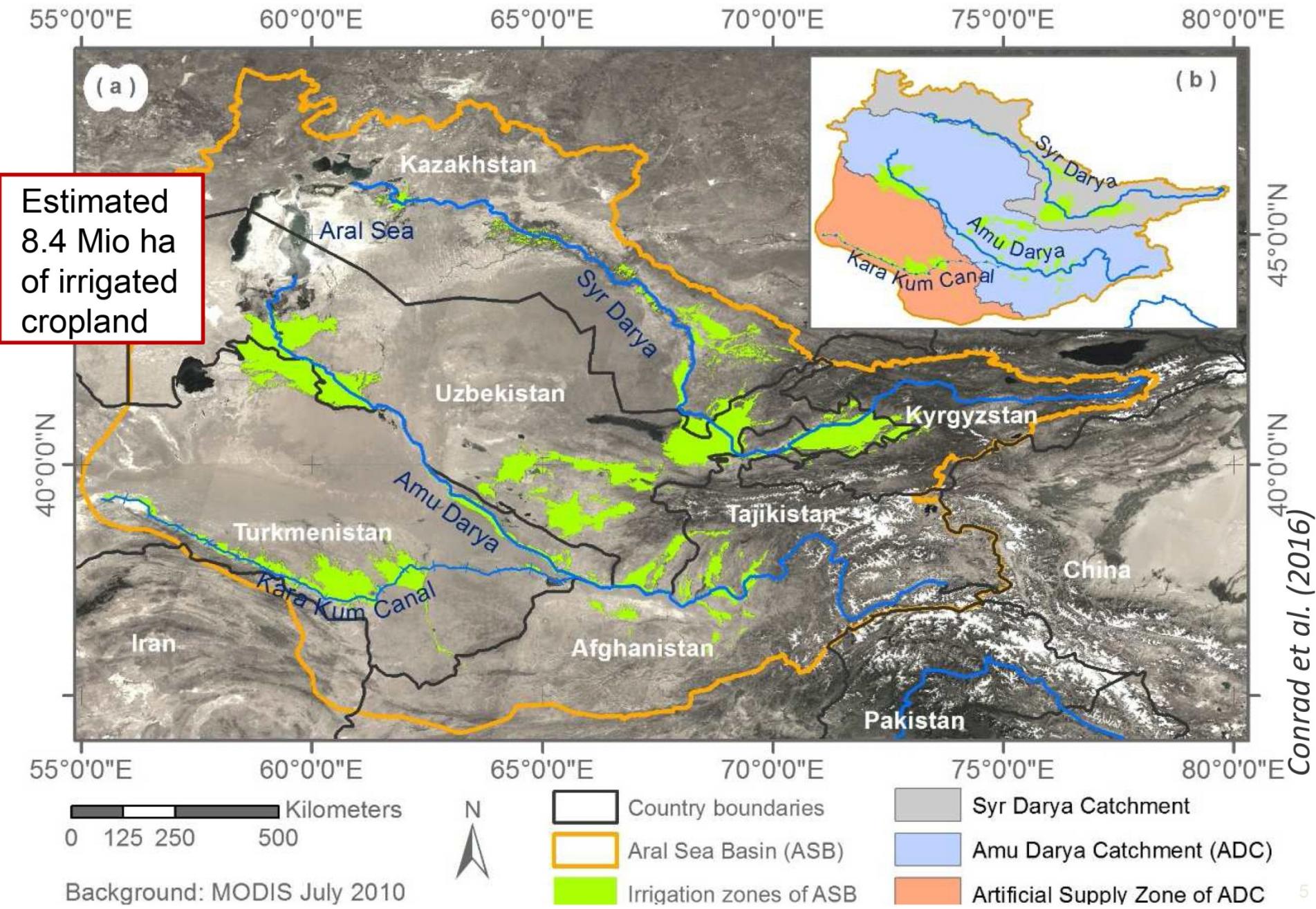
<http://aqua.nasa.gov/>

<http://modis.gsfc.nasa.gov/>

<http://terra.nasa.gov/>



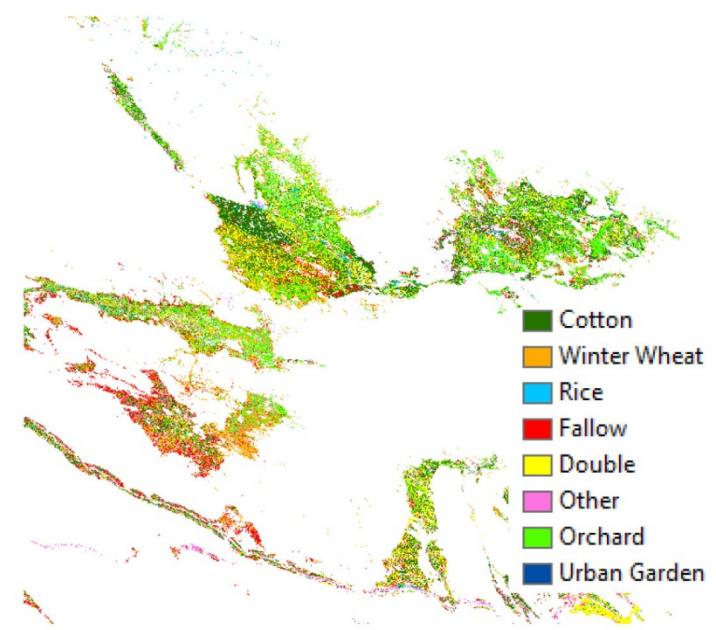
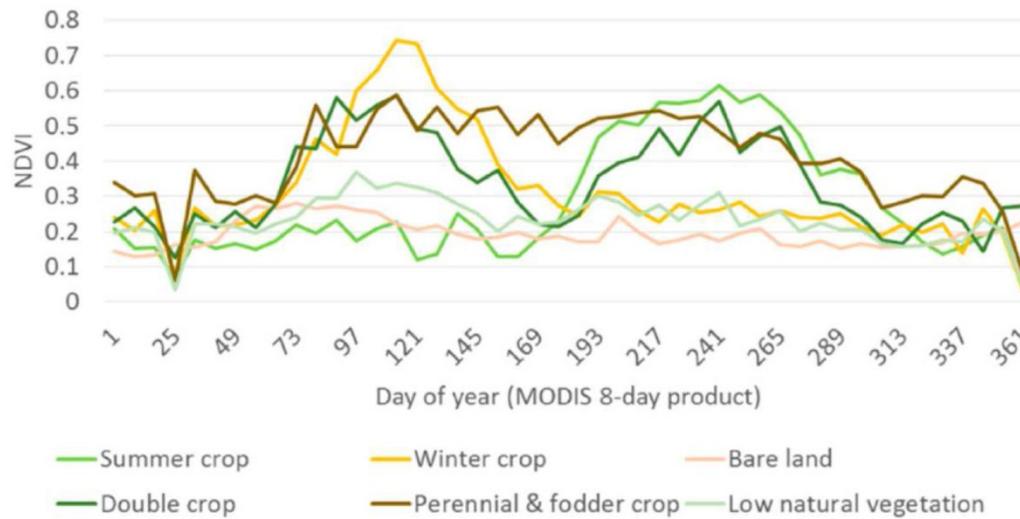
Land Use Monitoring



Geodatabase

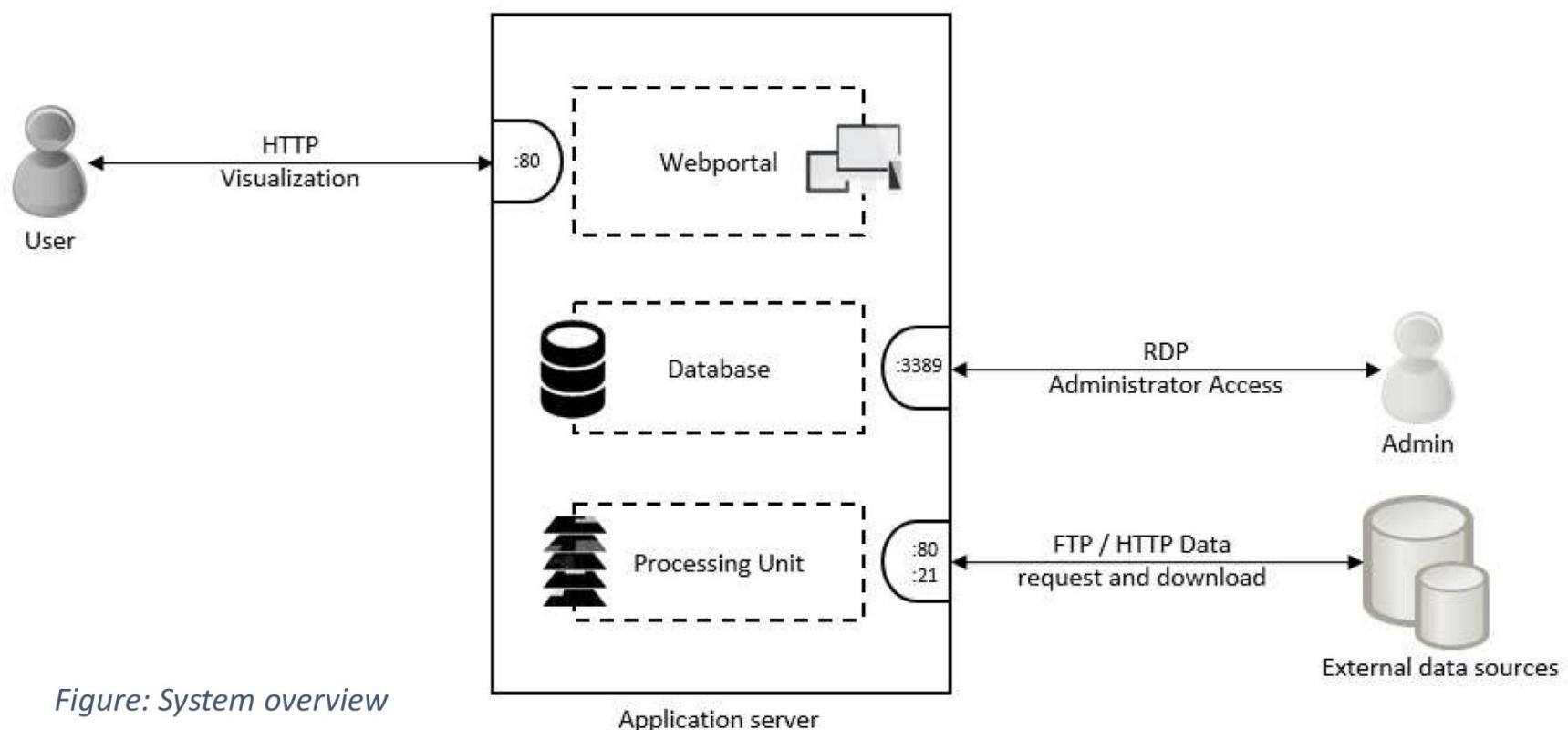
- 250m MODIS (MOD9Q1 v6) data, 8-day aggregates of spatial information
MODIS tiles: h22v04, h23v04, h22v05, h23v05
- Normalized Differentiated Vegetation Index (NDVI)
- Ground truth data on crop distribution and phenological properties
- Vector data on the administrative and water distribution levels

Conrad et al. (2016)



WUEMoCA - Water Use Efficiency Monitor in Central Asia

- Automated monitoring and visualization instrument addressing sustainable land management, and decision making and program planning processes



WUEMoCA (Beta Version) – Demonstration Tool

Schönbrodt-Stitt et al. (2017; submitted)

The screenshot displays the WUEMoCA (Beta Version) web application interface, which is a freely accessible interactive web mapping tool for the regional monitoring of irrigated cropland in the Aral Sea Basin. The interface includes a map of the region, a legend, and various data layers and indicators.

Map Controls:

- Area filter (optional):** Includes dropdown menus for Country (Uzbekistan), Province (Fergana), District (Select district), or WUA (all WUAs of Fergana). A "reset filter" button is also present. (1)
- Crop yield (t/ha):** Selected in the indicator dropdown. (2)
- Download WUA map or table:** Option under Export and Report. (3)

Information Panel:

WUEMoCA stands for Water Use Efficiency Monitor in Central Asia. It is a freely accessible interactive web mapping tool for the regional monitoring of irrigated cropland in the Aral Sea Basin. Information is largely based on optical Remote Sensing data (MODIS, Moderate Resolution Imaging Spectroradiometer) from 2000 to 2016. Results are summarized at different administrative and hydrographic levels and provided as maps, diagrams, and tables.

With the designed system of indicators and methods, WUEMoCA aims to contribute to the current data basis at

Map Layers:

- Irrigated area:** Checked in the legend. (4)
- WUA Map: Cotton in t/ha:** Checked in the legend. (4)
- Legend:** Shows color scale for Cotton in t/ha: high (dark green), medium (medium green), low (light green). (5)

Map View:

The main map shows the Aral Sea Basin with various districts and irrigation systems. A specific map view is highlighted with a callout: **Ijxon Sobirjon WUA - Cotton in t/ha**. (7)

Data Visualizations:

A bar chart titled "Actual crop production per unit of harvested area" shows Cotton in t/ha from 2000 to 2016. (8)

Year	Cotton in t/ha
2000	~4.2
2001	~4.2
2002	~4.2
2003	~4.2
2004	~4.2
2005	~4.2
2006	~3.2
2007	~3.2
2008	~2.8
2009	~3.2
2010	~2.8
2011	~3.0
2012	~4.2
2013	~3.2
2014	~3.8
2015	~3.8
2016	~3.2

3D View:

A 3D perspective view of the terrain and irrigation systems. (9)

Bottom Navigation:

Includes links for "Switch on Aerial map" and "Generate Report".

Bottom Footer:

www.wuemoca.net (Tashkent, UZ)

Work package 4

CAPACITY BUILDING

Capacity Building

Trainings

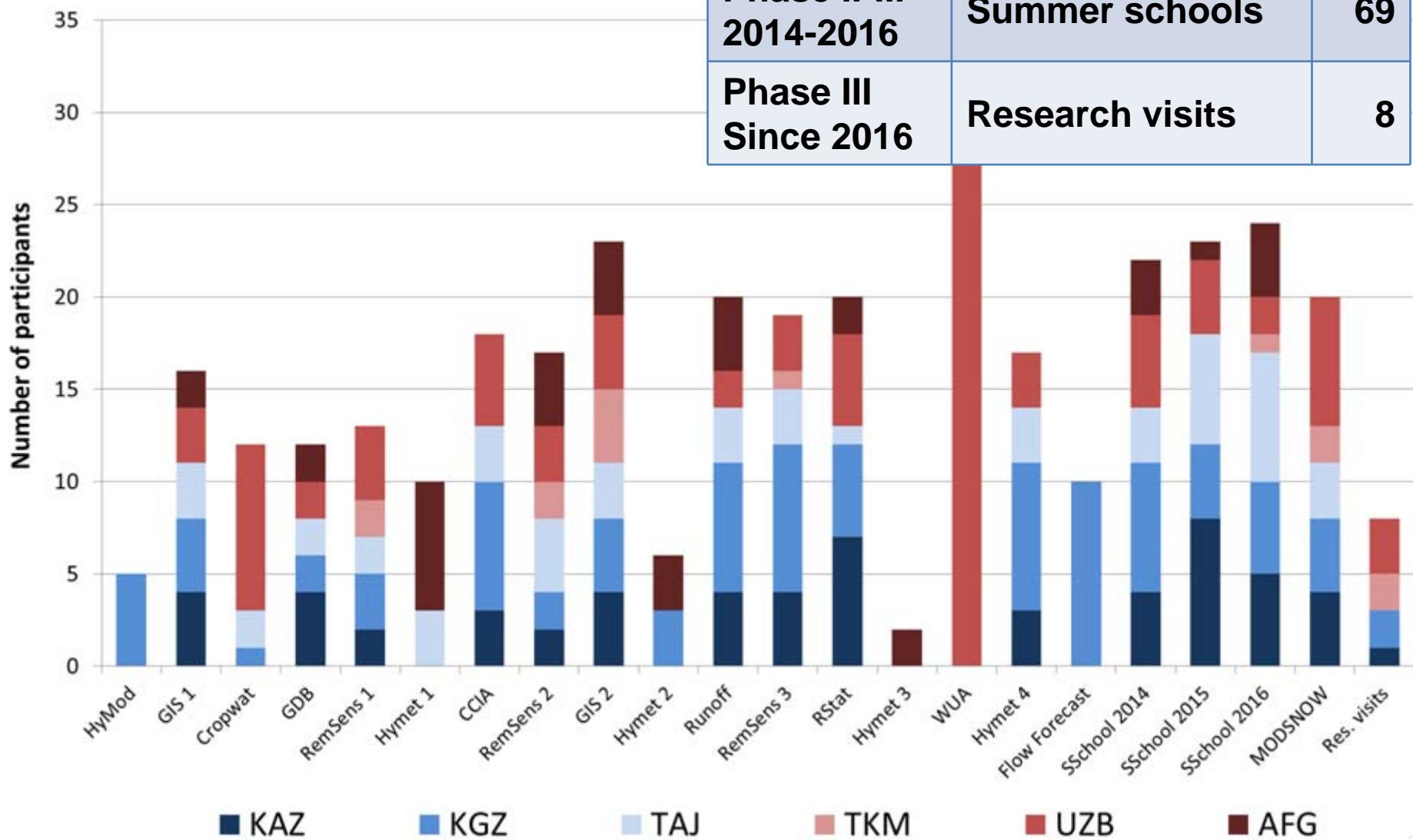
- Short-term vocational trainings for professionals in project specific technologies and methods
- Research stays at German partner institutions
- Annual Regional Summer School at the German-Kazakh University in Almaty
- Supervision of master and PhD theses

Operational tools

- MODSNOW
- WUEMoCA
- SDSS



Capacity Building





Contact

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Central Asian Journal for Water Research

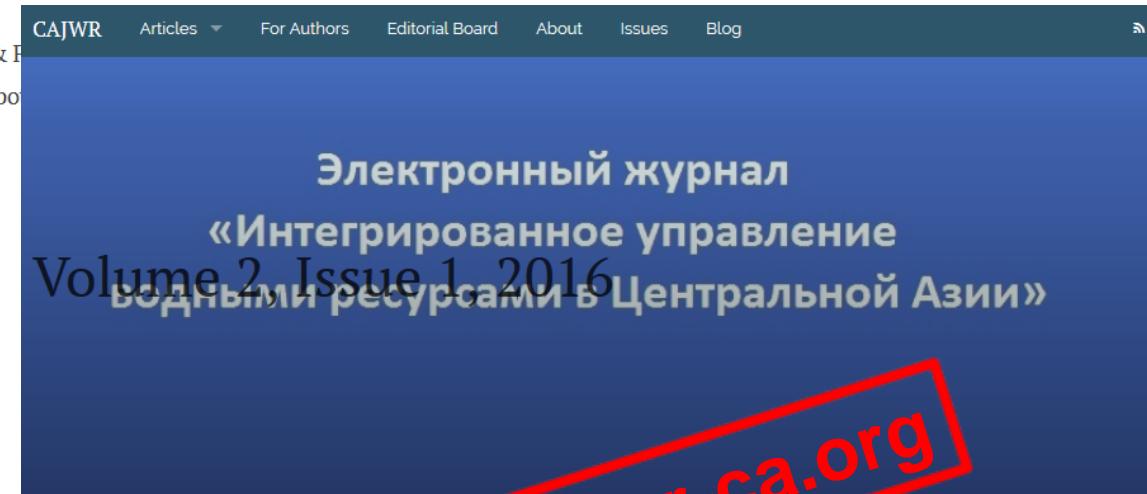


- launched in 2015
- electronic bi-lingual open access journal
- peer-review by international and regional scientists

We are pleased to announce that Zero & First Issues of the e-journal are available online in both English and Russian.

Mission:

- promote exchange between Central Asian scientists and practitioners
- bridge the gap between the regional and international scientific community



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Эффективность работы водохозяйственных организаций в бассейне Сырдарьи
Аблураисуп Каюмов

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Руководство по оценке изменения климата и

Technical Notes
Совершенствование нормативно-методических документов в области обеспечения

Book Reviews
Рецензия на книгу: «Новое измерение и инструменты оценки для мониторинга и управления земельными