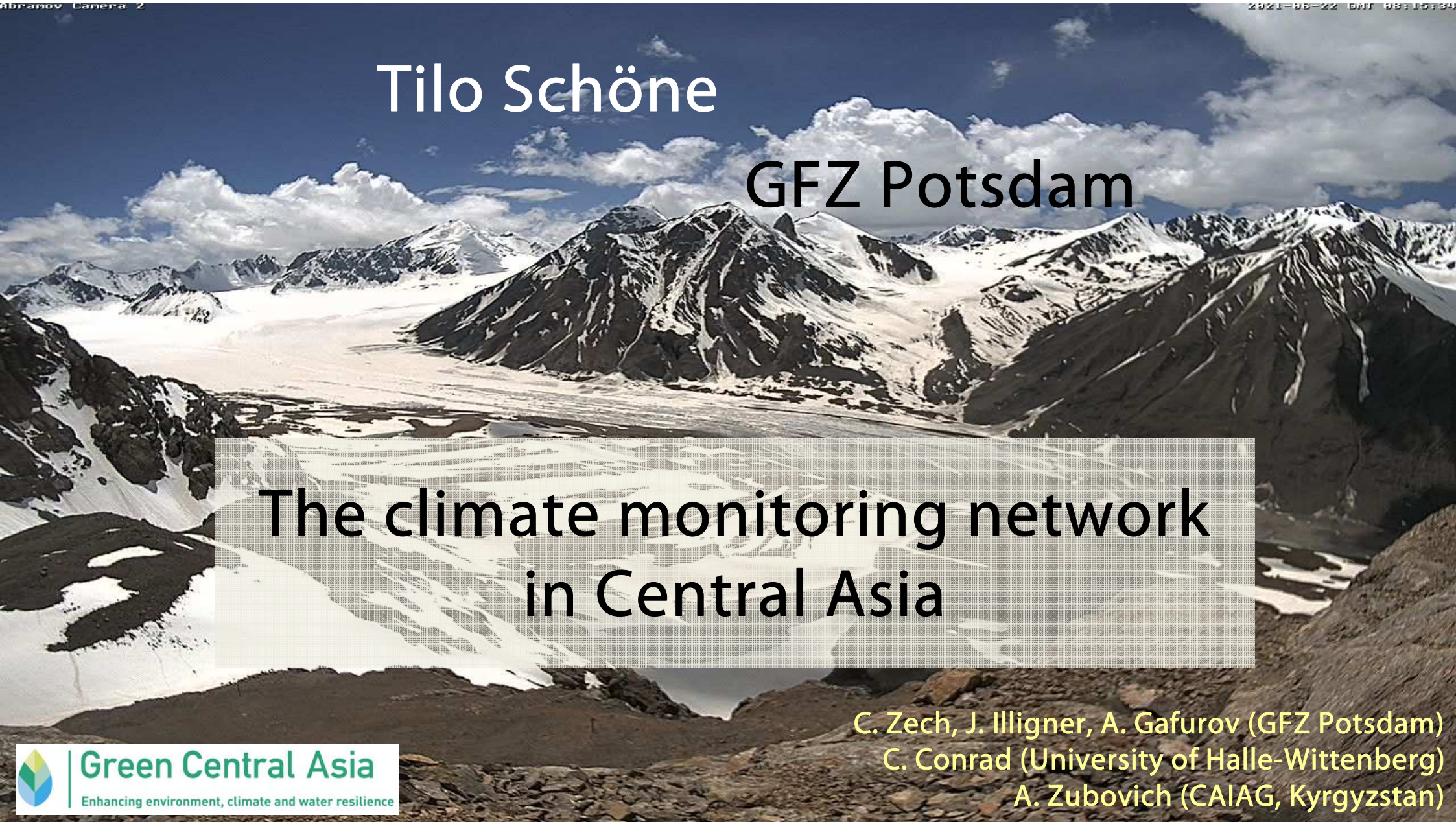


Tilo Schöne

GFZ Potsdam

The climate monitoring network in Central Asia

C. Zech, J. Illigner, A. Gafurov (GFZ Potsdam)
C. Conrad (University of Halle-Wittenberg)
A. Zubovich (CAIAG, Kyrgyzstan)

Green Central Asia
Enhancing environment, climate and water resilience

Water under climate change is a critical issue

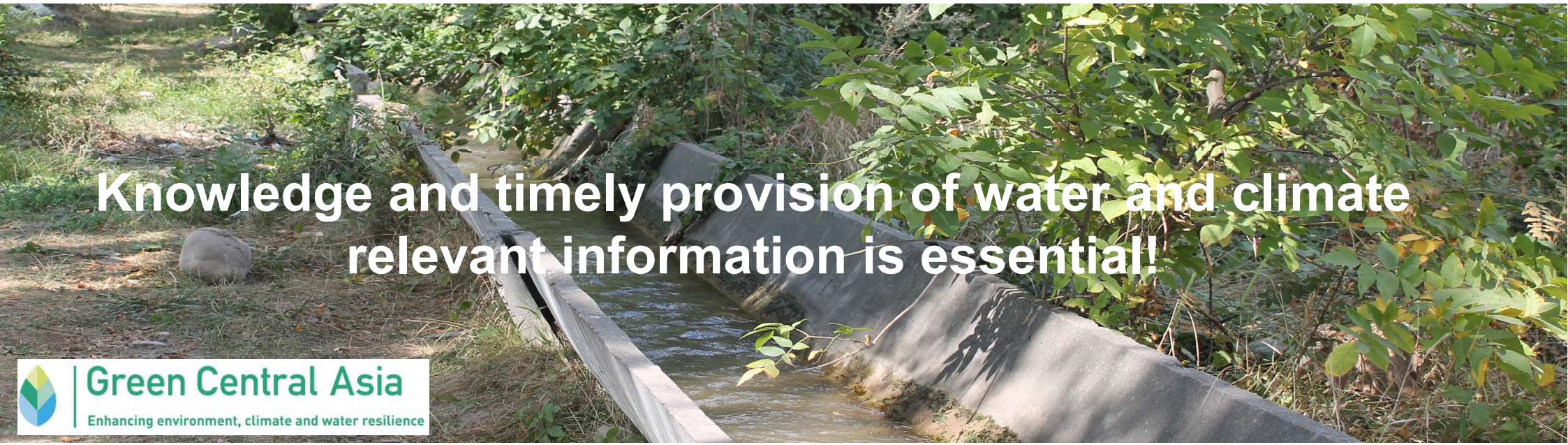
Major rivers in Central Asia are transboundary – **Amu/Syr Darya** cross five countries and Afghanistan

Political disputes between head water regions and low-lying countries (power versus irrigation scheme)

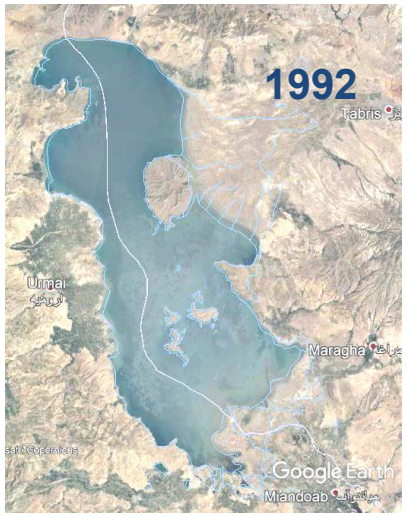
Not only river discharge is important - reservoirs and lakes have a great potential of storage

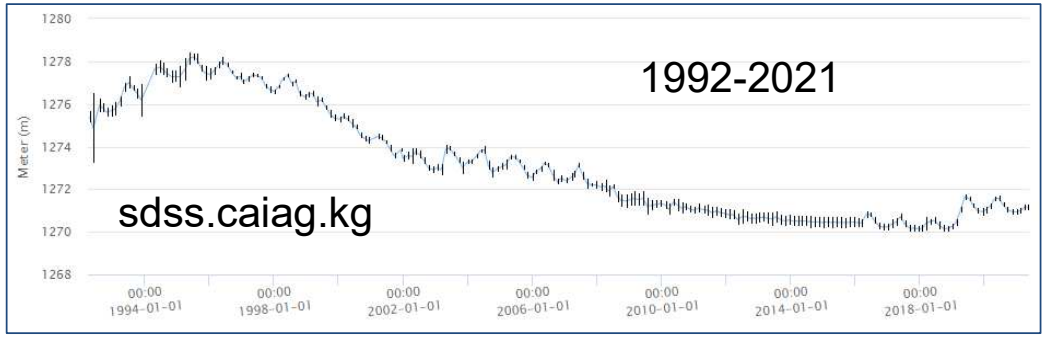
Climate warming may increase water availability on short- but decrease on long-term

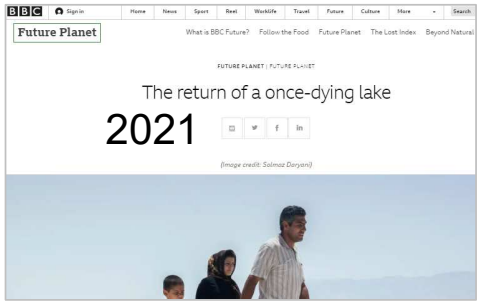
Difficult accessing trans-national water relevant information for cross-border operational purposes and scientific studies

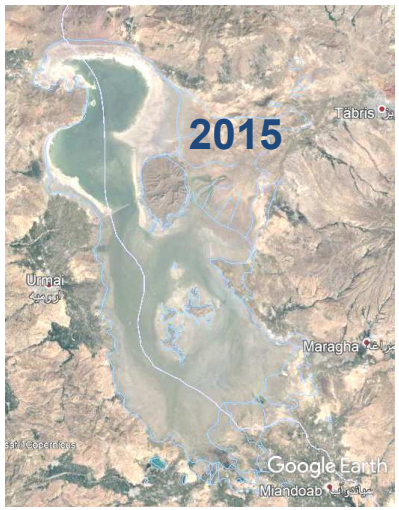


Water related problems are challenging



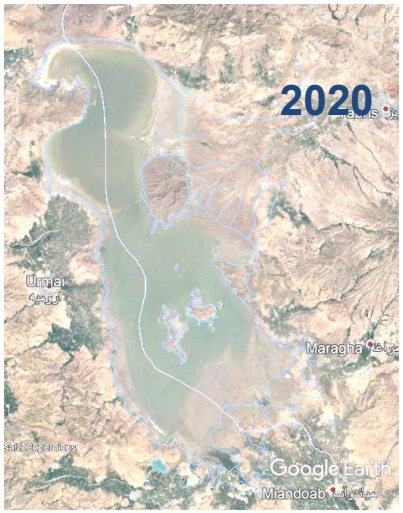






Lake Urmia

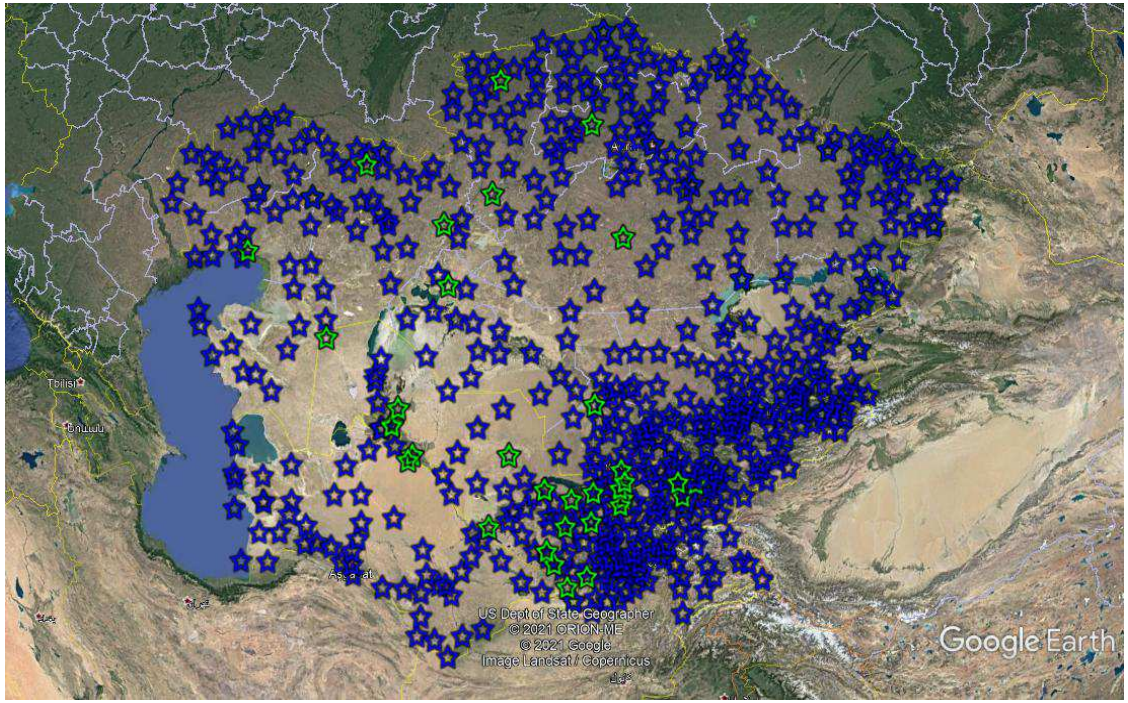
- Increase of salinity
- Problems with biodiversity
- Soil degradation
- Microclimatic changes
- Structural problems for the Urmia Causeway



Global Historical Climate Network Daily

Historical time series (>30a) of meteorological and hydrometeorological data are essential for climate studies

Decline in monitoring stations after end of Soviet Union



KNMI/WMO: climexp.knmi.nl

Station Distribution for Central Asian Countries
Total **590** / **64** after 1991 / **51** after 2000 / **NONE after 2006**

Green Central Asia
Enhancing environment, climate and water resilience

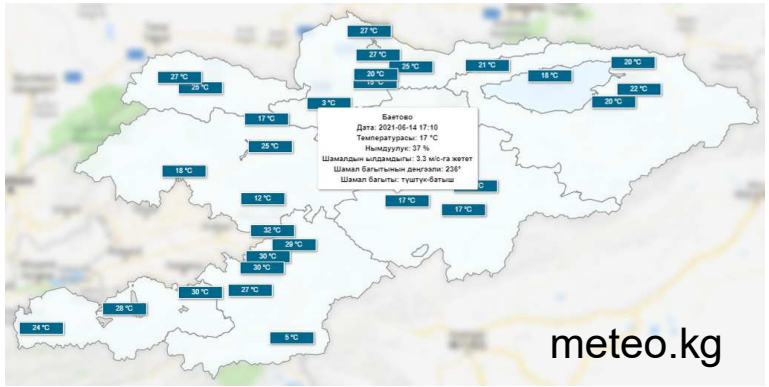
Meteorological & Climate Data

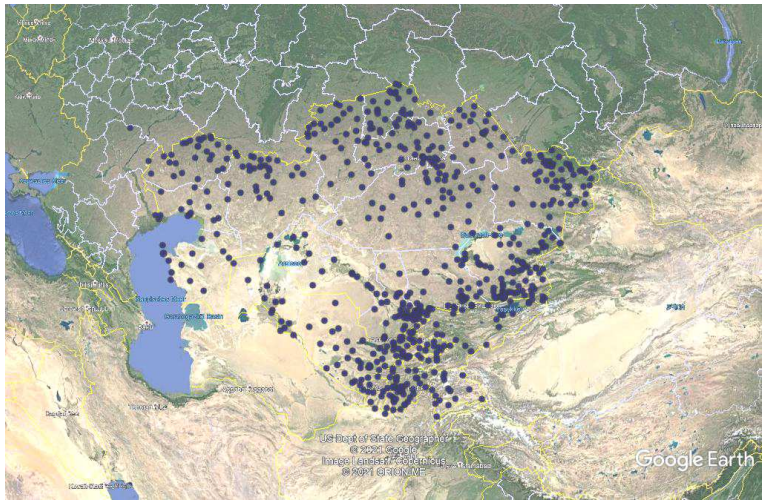
Historical time series (>30a) of meteorological and hydrometeorological data are essential for climate studies

Decline in monitoring stations after end of Soviet Union

Often, access to data is granted on private basis only or payment is required

World Bank funded several projects for improving meteorological monitoring, but data belong to national entities and are not necessarily become public research data





History of Green Central Asia – CAWa/CAWa-GREEN

The German Foreign Minister Steinmeier (Federal President since 2017) opening the „Water Unites" Conference in Berlin in April 2008.

CAWa

part of the **„Berlin Process"** (2008 – 2019)
embedded in the EU strategy for Central Asia

CAWa-GREEN

part of **Green Central Asia – Regional Initiative on climate and security in Central Asia and Afghanistan** (2020-2024)

Federal Foreign Office

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by giz

GFZ Helmholtz-Zentrum POTSDAM

Martin-Luther-Universität Halle-Wittenberg

PIK Potsdam Institute for Climate Impact Research

DKU Deutsch Kasachische Universität

Green Central Asia
Enhancing environment, climate and water resilience

Green Central Asia - Regional Initiative on climate and security in Central Asia and Afghanistan

Foreign Minister Maas and his counterparts from Central Asia and Afghanistan in Berlin, 28.01.2020, © Florian Gaertner/photothek.net

Goals:

1. Initiation of a dialogue on climate change and its risks for the Central Asian Region
2. Support to the regional rapprochement between the six countries KAZ, KGZ, TAJ, TKM, UZB and AFG

Contribution to implementing the new strategy *‚The EU and Central Asia: New Opportunities for a Stronger Partnership‘* adopted by the European Council on 17 June 2019:

➔ Strengthening the resilience of the States against internal and external risk factors like for instance climate and environment factors

➔ This political dialogue is based on scientific findings and will be followed up by public awareness and capacity building measures.

Green Central Asia
Enhancing environment, climate and water resilience

Transparent decision making support by operational quantification of water resources

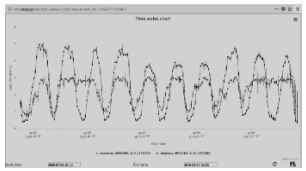
- **Assessment of water resources** based on remote sensing methods – using previously developed tools
- **Provision** of data sets reflecting the **current status of water** resources for decision-makers in Central Asia
- **Decision making support** for policy makers and for multi-stakeholders on **water availability** based on transparent data sources

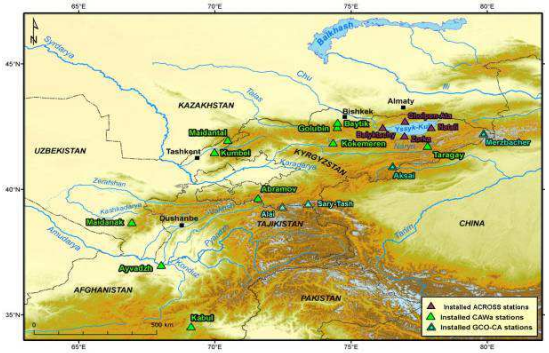
Operational at several Local Water Organizations and hydrometeorological services

Green Central Asia
Enhancing environment, climate and water resilience

The contributions of CAWA GREEN

Provision of meteorological and hydrological data





sdss.caiag.kg

Supporting national decision-makers in strengthening climate and water monitoring as the basis for the development of adaptation and mitigation strategies

Dialogue to improve national monitoring infrastructures to meet international standards

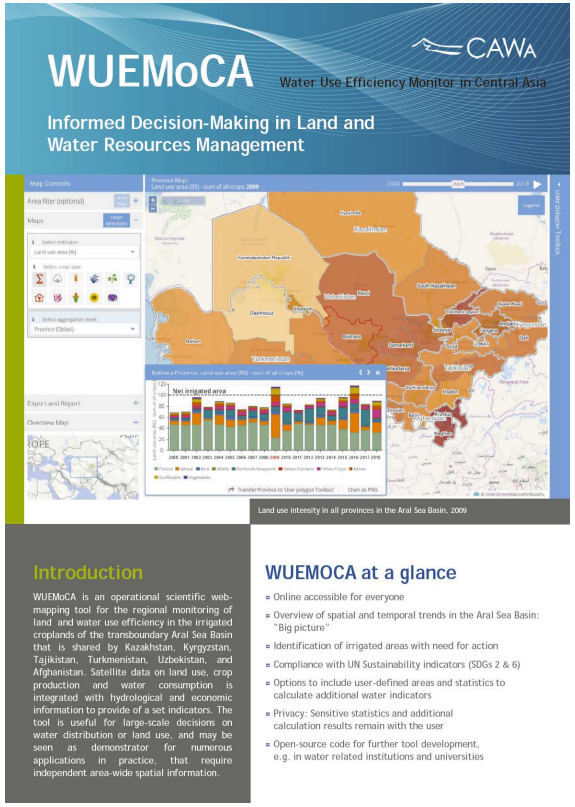
Providing an open platform for cross-border access to climate data

Continuous dissemination of reliable environmental data for decision making at all levels

Satellite monitoring decision making in the agricultural land and water system

- **Policy in the Central Asian Countries** is strongly interested sustainable food production and food security
- Among others, **alternative land use options** are required and locations for the efficient implementation **rehabilitation measures of irrigation and drainage infrastructure** need to be identified
- This holds also for the policy task of **adaptation to climate change**
- At the same time they have to solve the **problem of international water distribution** and many other questions that are related to the so-called **water-energy-food nexus**

=> **Water use efficiency** is a key indicator



www.wuemoca.net

Green Central Asia
Enhancing environment, climate and water resilience

The contributions of CAWA GREEN

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

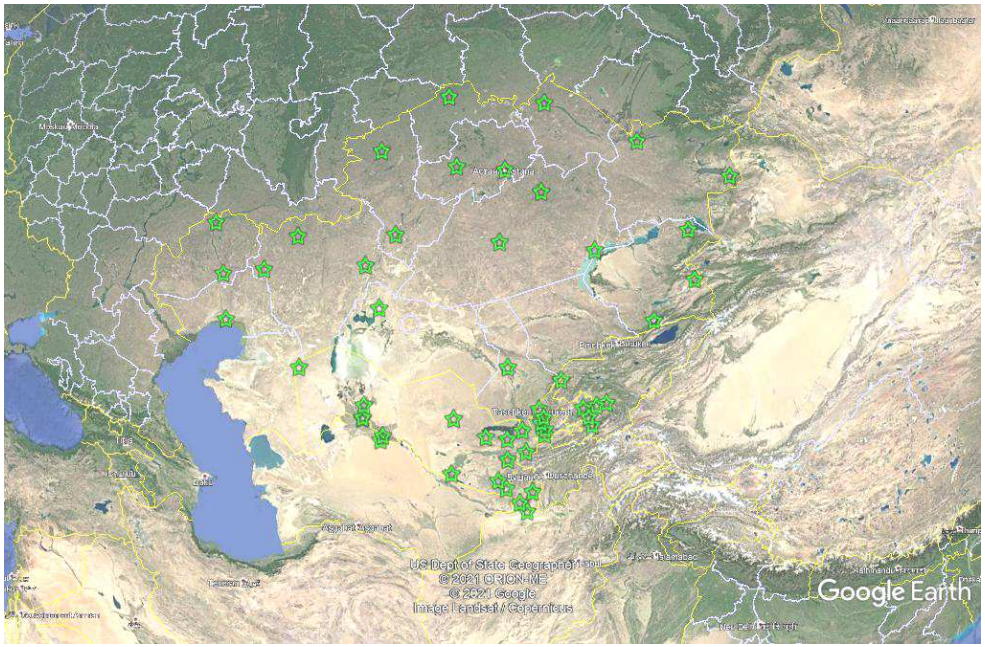
Operational tools

- MODSNOW
- SDSS
- WUEMoCA

The contributions of CAWA GREEN

Green Central Asia
Enhancing environment, climate and water resilience

Green Central Asia Monitoring Network



KNMI/WMO repository ends **2006**

Supporting national decision-makers in strengthening climate and water monitoring as the basis for the development of adaptation and mitigation strategies

Dialogue to improve national monitoring infrastructures to meet international standards

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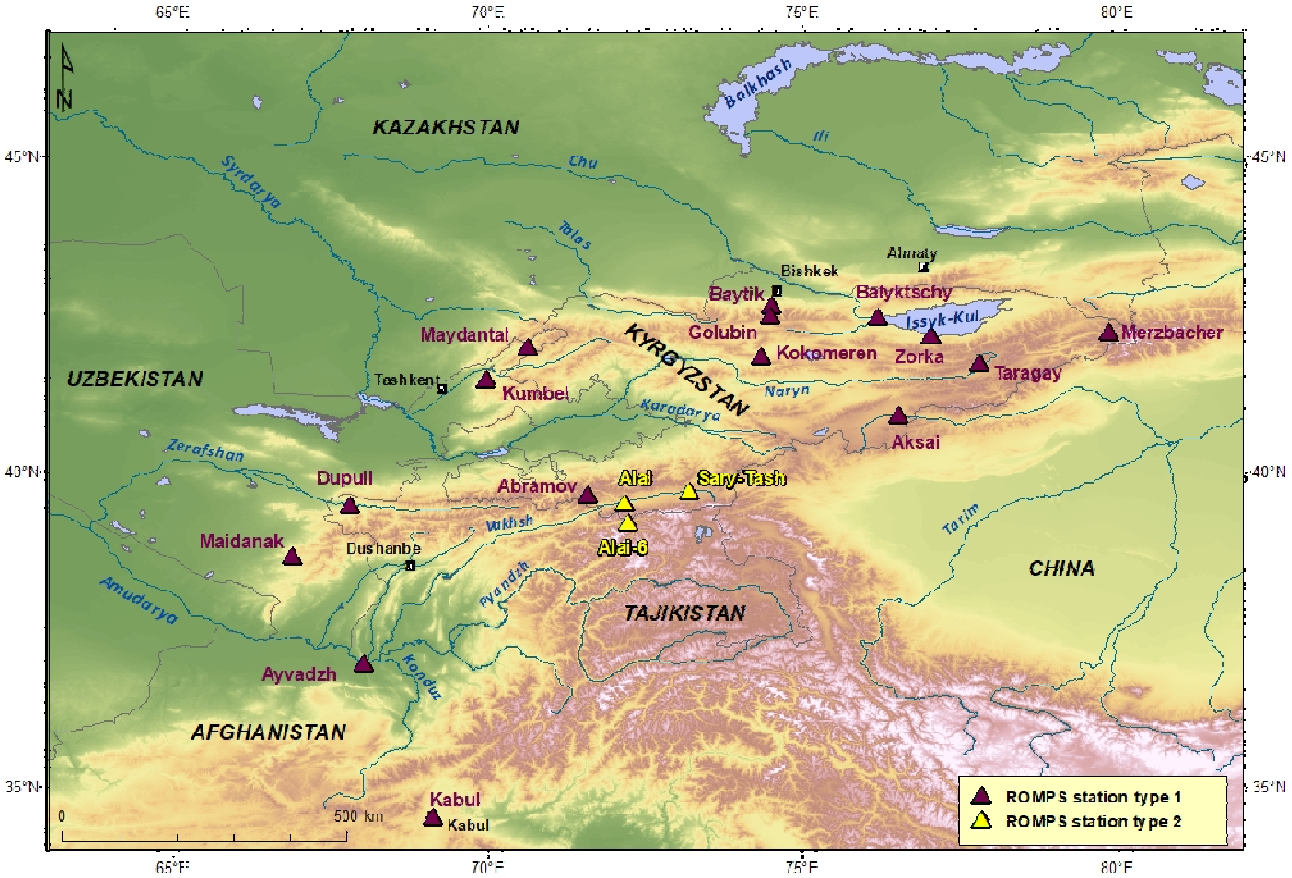
Continuous dissemination of **reliable environmental data** for decision making at all levels

Aim of "Berlin Process" and "Green Central Asia" is to provide open access environmental data

Green Central Asia
Enhancing environment, climate and water resilience

Green Central Asia Monitoring Network



▲ Kandahar

Objective: Two monitoring stations per CA country and Afghanistan

Currently we installed 19 stations

Tadjikistan (1 destroyed)

AFG/Kandahar added (10/2020)

Two station near Aral Lake will be added July/August 2021

Green Central Asia
Enhancing environment, climate and water resilience

Remotely Operated Multi-Parameter Stations

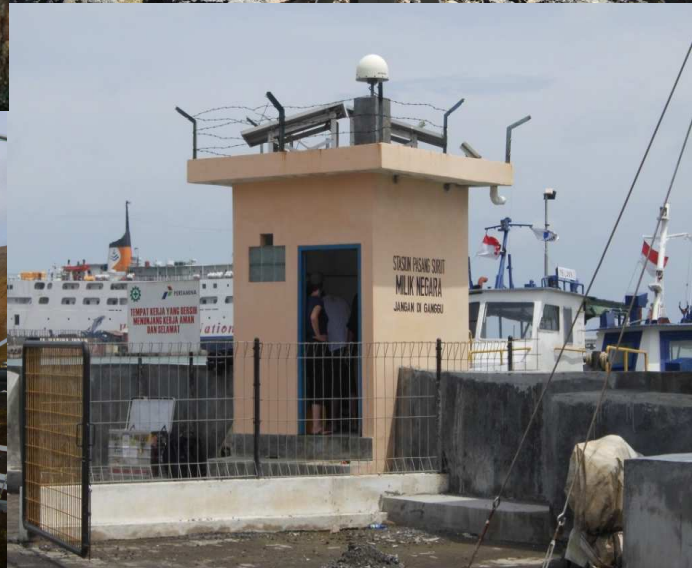
- Designed for operation in remote areas
- Good performance even in high altitudes and under extreme climatic conditions

- ✓ 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

ROMPS Installations

Remotely Operated Multi-Parameter Stations



ROMPS - Hydrometeorological Stations

Meteorological sensors:

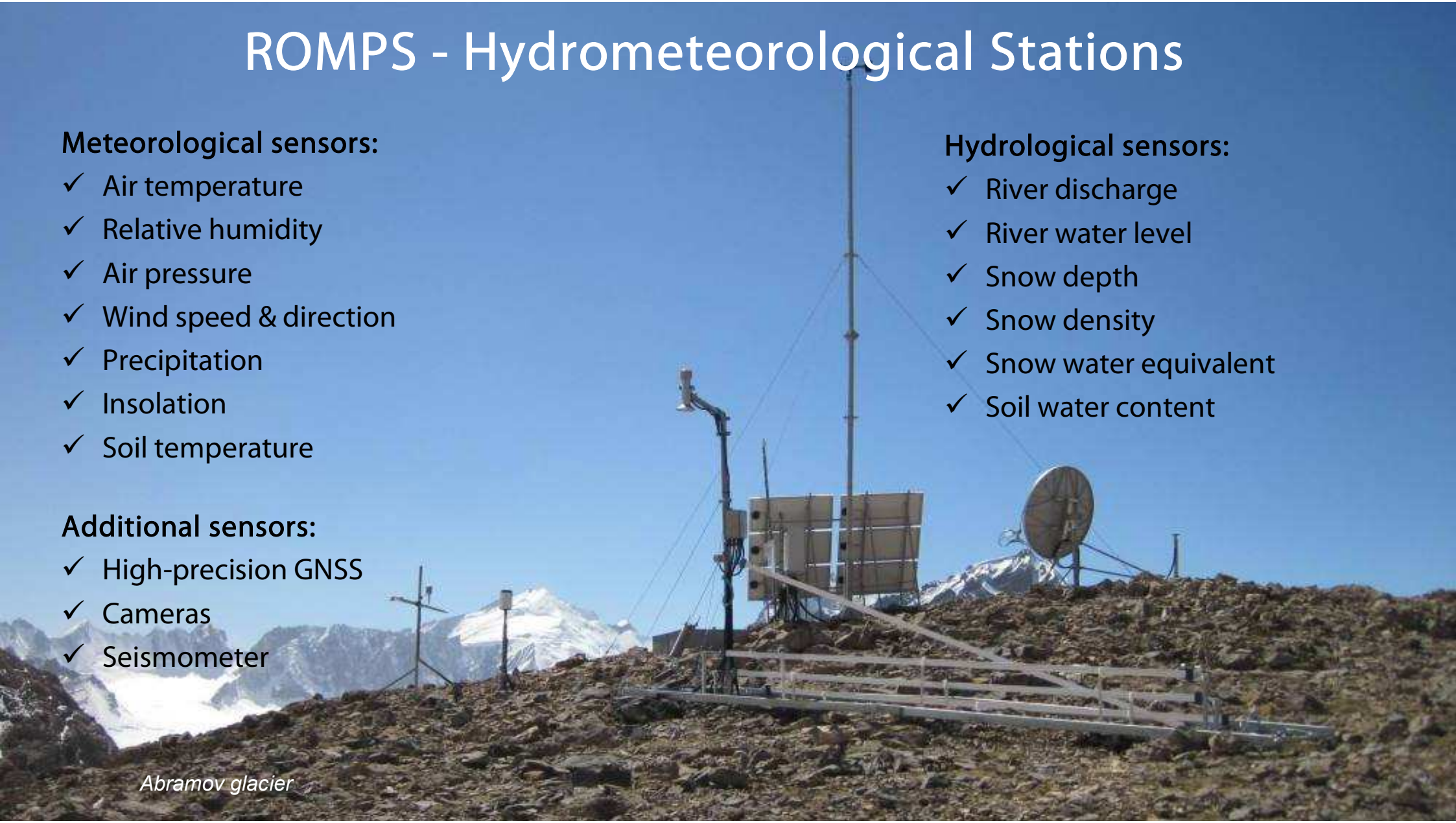
- ✓ Air temperature
- ✓ Relative humidity
- ✓ Air pressure
- ✓ Wind speed & direction
- ✓ Precipitation
- ✓ Insolation
- ✓ Soil temperature

Additional sensors:

- ✓ High-precision GNSS
- ✓ Cameras
- ✓ Seismometer

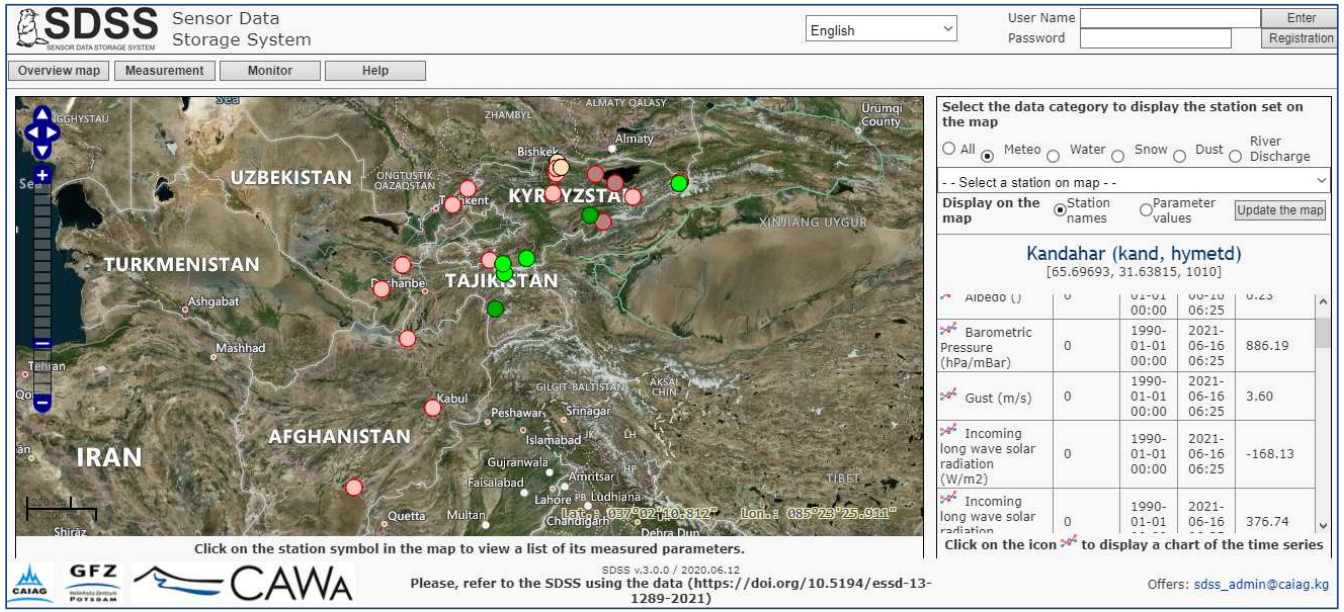
Hydrological sensors:

- ✓ River discharge
- ✓ River water level
- ✓ Snow depth
- ✓ Snow density
- ✓ Snow water equivalent
- ✓ Soil water content



Abramov glacier

GCA: Timely and unrestricted access to data



Web Interface: http://sdss.caiag.kg

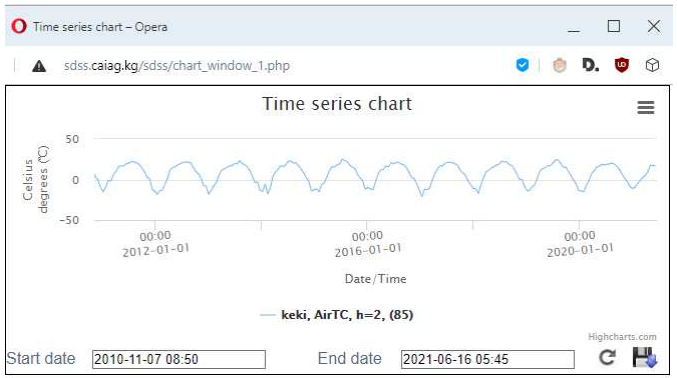
Without registration

Display, Monitor, Download data with a few clicks only

Different languages (English, Deutsch, русский)

Hosted in the region (@**CAIAG**, Bishkek, Kyrgyzstan)

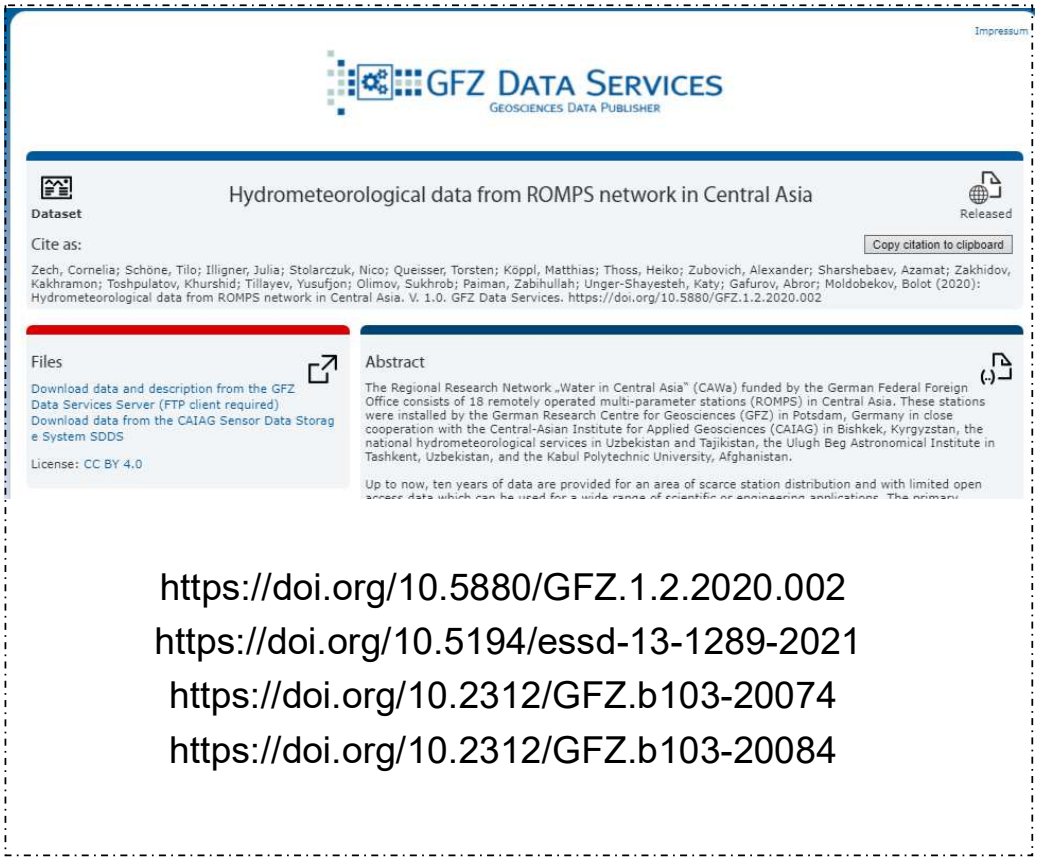
First click ⇒



⇐ Second click for download

Green Central Asia
Enhancing environment, climate and water resilience

GCA: Timely and unrestricted access to data



https://doi.org/10.5880/GFZ.1.2.2020.002
https://doi.org/10.5194/essd-13-1289-2021
https://doi.org/10.2312/GFZ.b103-20074
https://doi.org/10.2312/GFZ.b103-20084

Data Sampling:

Meteorological data 5 min interval
Snow information 15 min
River discharge (5…15) min

Data Distribution:

Data transmission (mostly daytime) to the data centre: Hourly

Monthly and annual compilations are stored at GFZ's data publication service

Data Documentation:

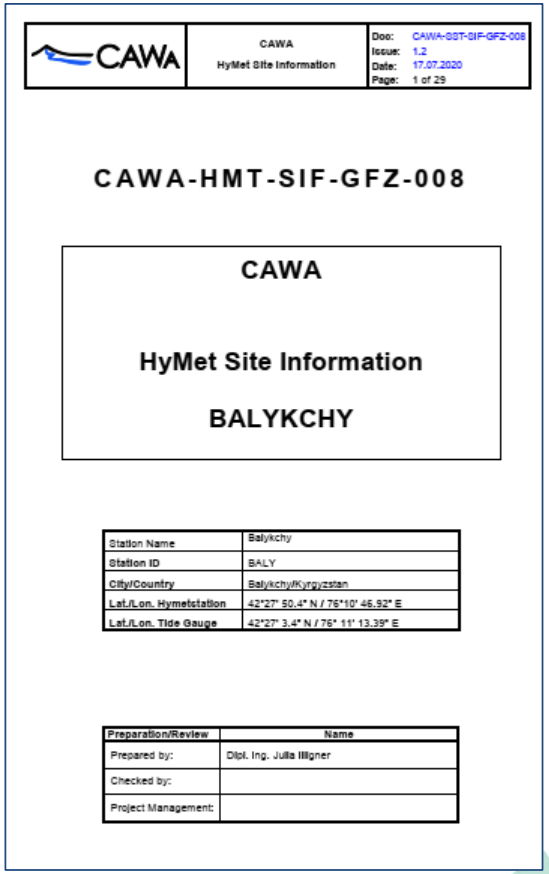
ftp://datapub.gfz-potsdam.de/
download/10.5880.GFZ.1.2.2020.002_CAWa/

ROMPS Documentation

HM01_HMT-SED-GFZ

Station exposure for a site contains specific information about sensor installation (e.g., sketch map, depth or height above ground, station history) and local orographic conditions

Partner organizations have a comprehensive "**Site Information**" documentation with all technical details

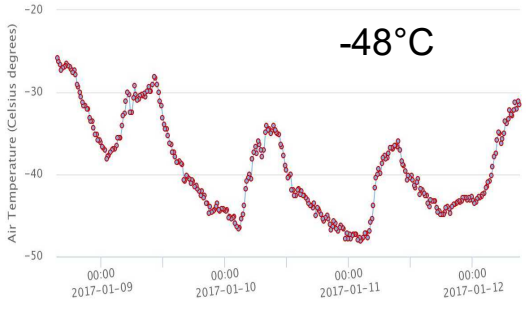


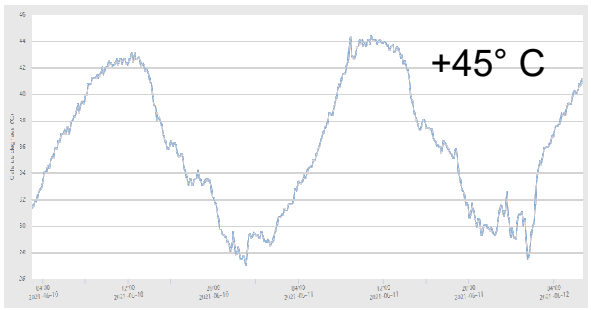
Green Central Asia
Enhancing environment, climate and water resilience

Documentation is time consuming, but necessary - also often an excuse for not sharing data

Summary about collected data

16	ROMPS meteorological and hydrometeorological stations
3	Meteorological compact sensors stations
3	River Discharge Systems (RQ24)
7	Snow Sensor units (5x Snow Pack Analyzer, 2x Ultra Sonic Height Sensors)
2	Camera Systems (Abramov and Golubin Glacier) in cooperation with UniFribourg/WGMS
3	Broadband seismometers (global GEOFON network)

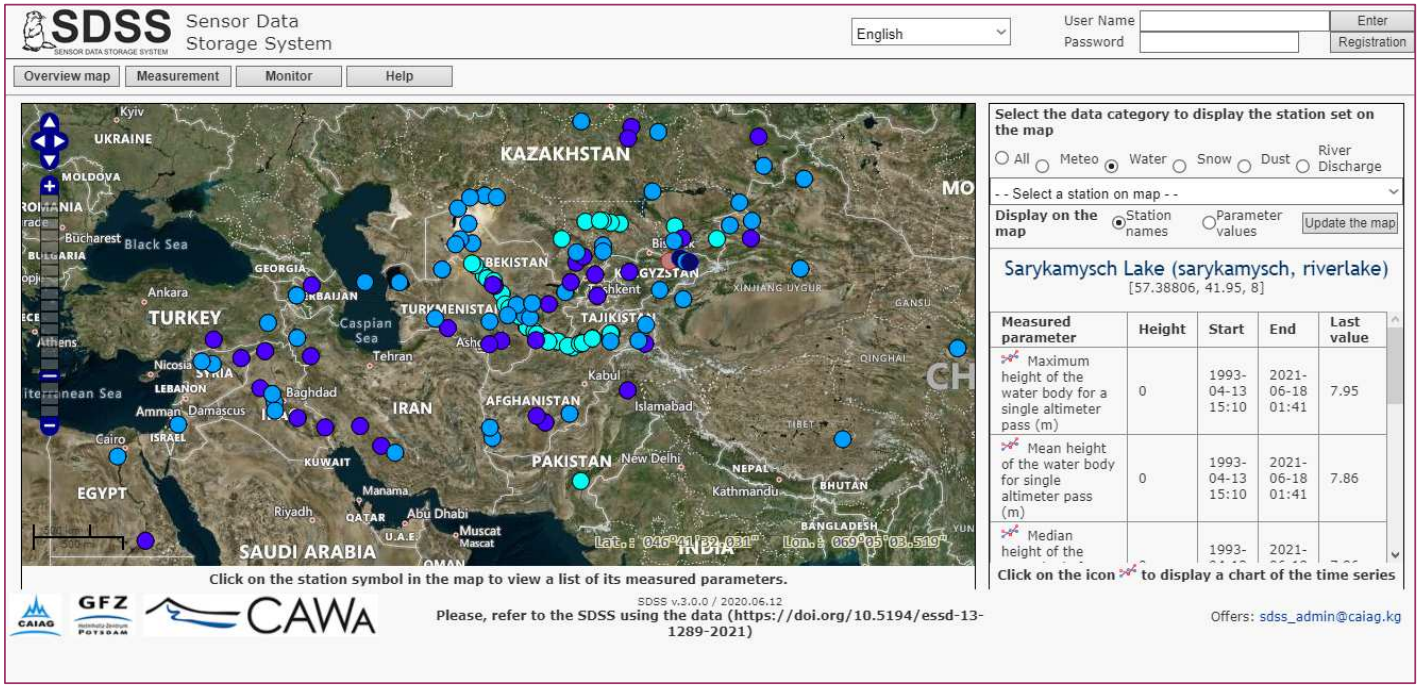


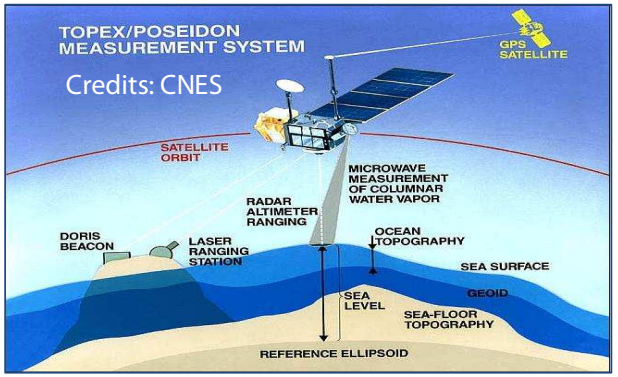


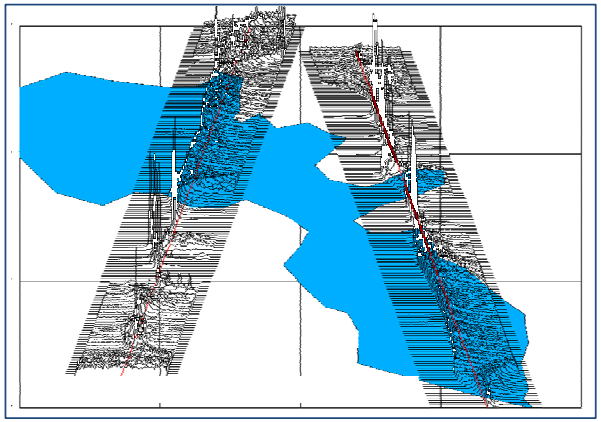
Green Central Asia

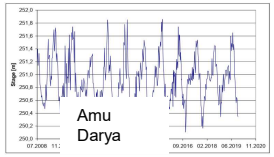
Enhancing environment, climate and water resilience

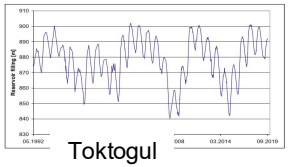
Water Resource Monitoring from Space







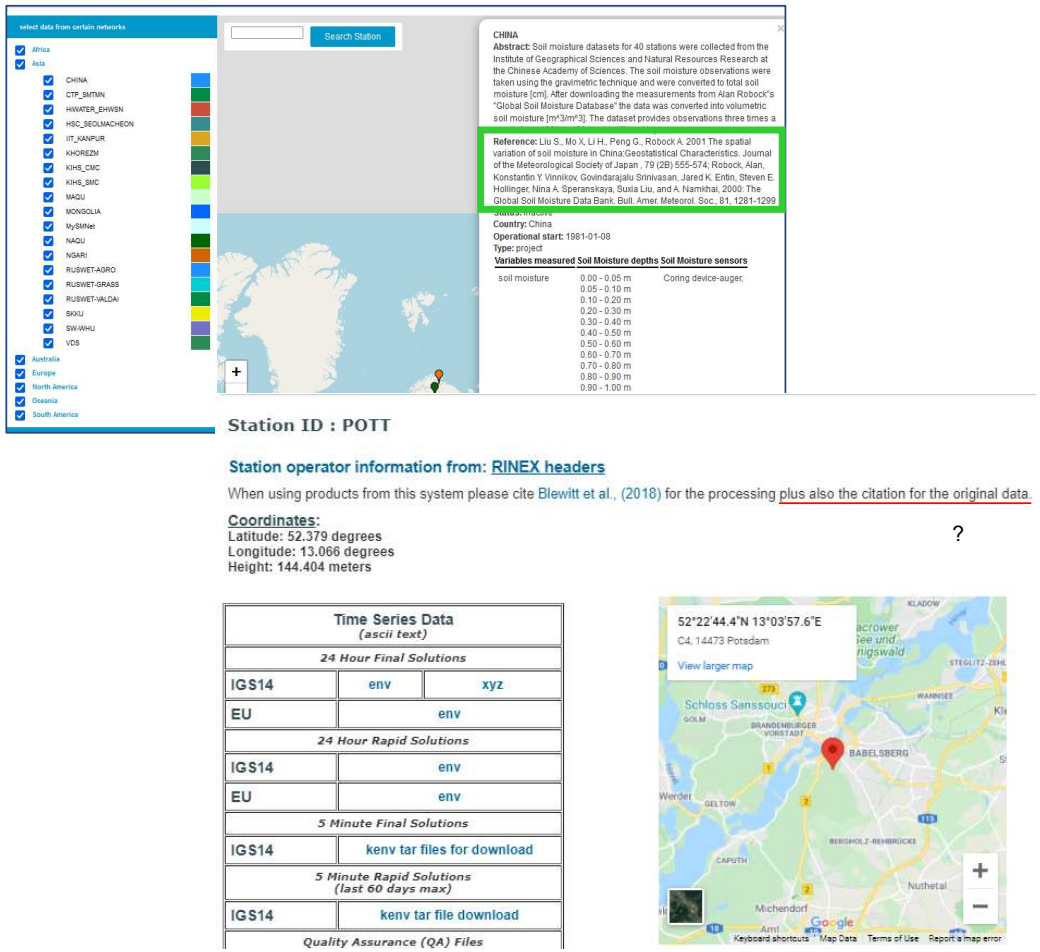

Amu Darya


Toktogul

- Radar Altimetry orbits Earth since 1992
- Suitable for (well located) water bodies
- Provide Height and Volume changes
- Technological developments will allow from 2022 onward monitoring rivers (~100m) and water bodies 250x250m

Green Central Asia
Enhancing environment, climate and water resilience

(possible) barriers for sharing data



- ? ⇒ Loosing control over "my" data
- ? ⇒ Someone could find errors in data and "blame" the originator
- Acknowledgement difficulties
  - Missing Digital Object Identifiers (DOI) *"What is it and how can I get one"*
  - Data Centres collecting / grapping data and re-share under their Web services DOI ('Product' but not 'contributing data' is acknowledged)
- Meta data documentation and maintenance is time consuming
- Value for data provider is not always clear and may give impression of a negative cost benefit *"I have the work load, other publish"*
- <u>Web Services should take up responsibility helping providers getting DOIs</u>

Thank you !

Our work would not be a success without contributions and assistance by our partners in Central Asia and Afghanistan!

Agency for Hydrometeorology, Committee of Environmental Protection under the Government of the Republic of Tajikistan, Dushanbe, Tajikistan
Centre of Hydrometeorological Service (Uzhydromet), Tashkent, Uzbekistan
Kabul Polytechnic University, Kabul, Afghanistan
Kandahar University, Kandahar, Afghanistan
Ulugh Beg Astronomical Institute (UBAI) of the Uzbek Academy of Sciences, Tashkent, Uzbekistan