A Proposed Central Asian Regional Hydroclimate Project to Support Sustainable Development Goals in the International Context

Life in Kyrgyzstan

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In

Climate Change in Central Asia:

From foundation in physical sciences to local scale effects and adaptation

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International GEWEX Project

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GEWEX
Global Energy and Water Exchanges
www.gewex.org

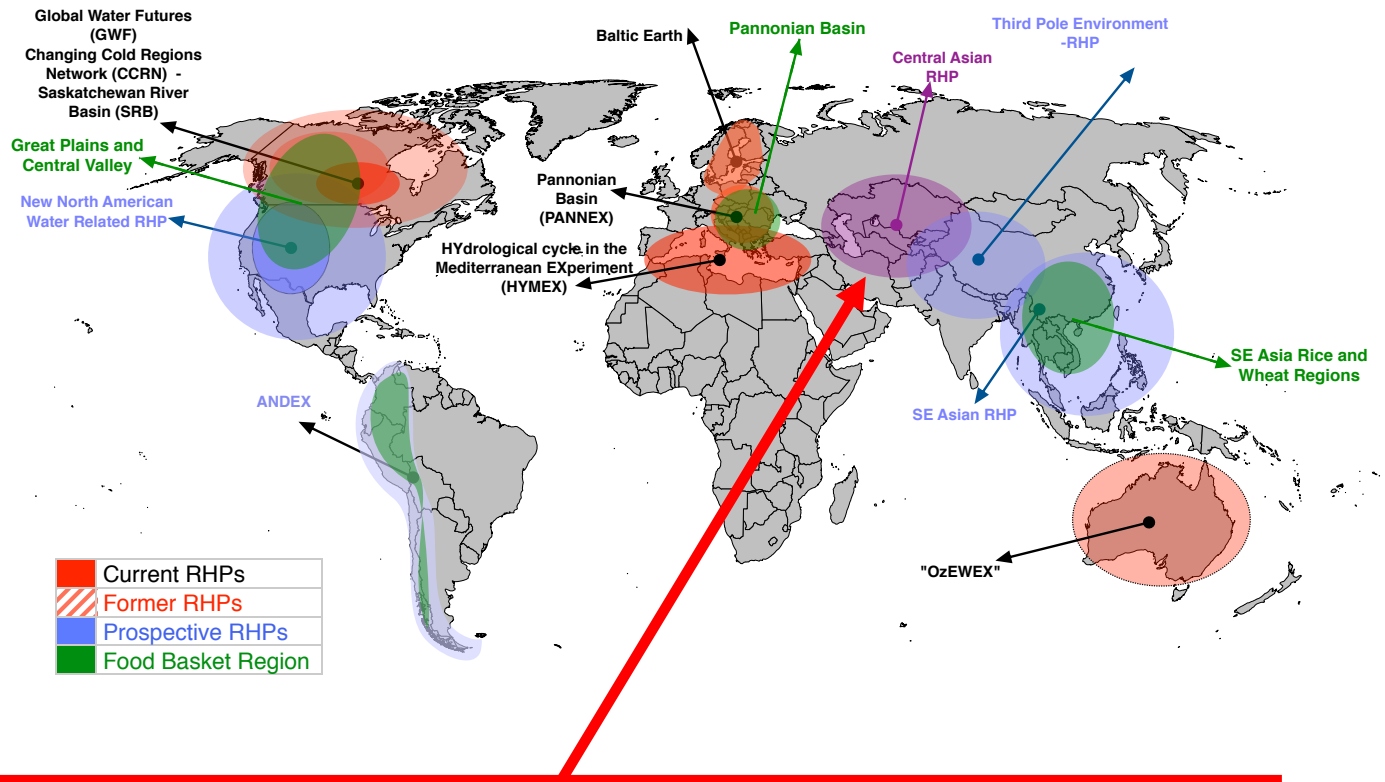
- A project of the World Climate Research Program (WCRP, www.wcrp-climate.org)
- Supports international research collaboration in the field of water, weather and climate
  - better utilize capacities and competencies
  - support the development of the resources and capabilities to enable state-of-the-art relevant climate research and observations that address regional to global challenges
- GEWEX supports:
  - UN sustainable development goals
  - Sendai Framework for Disaster Risk Reduction (www.unisdr.org/we/coordinate/sendai-framework)
  - United Nations Framework Convention on Climate Change (unfccc.int).

GEWEX Priority Areas

- Improved understanding of the impacts of climate variability and change on water availability and food security across mountain ranges and river basins
- Support research activities in a specific region, GEWEX has develops Regional Hydroclimate Projects (RHP)
  - led by and bring together scientists and stakeholders at every level *from within* a certain region
- GEWEX is active on every continent and covers a wide range of scientific networks and organizations
- The network of scientists and institutions in Central Asia is limited and we would like to better serve this region
- Central Asia is unique for its
  - water resources and conservation issues and vulnerability to climate change
  - weather and climate extremes
  - encompasses some of the highest mountain ranges in the world as well as the largest endorheic lake in the world (the Caspian Sea)

A proposal for Regional Hydroclimate Project for Central Asia

Initiate new and integrate ongoing climate and weather research activities in Central Asia



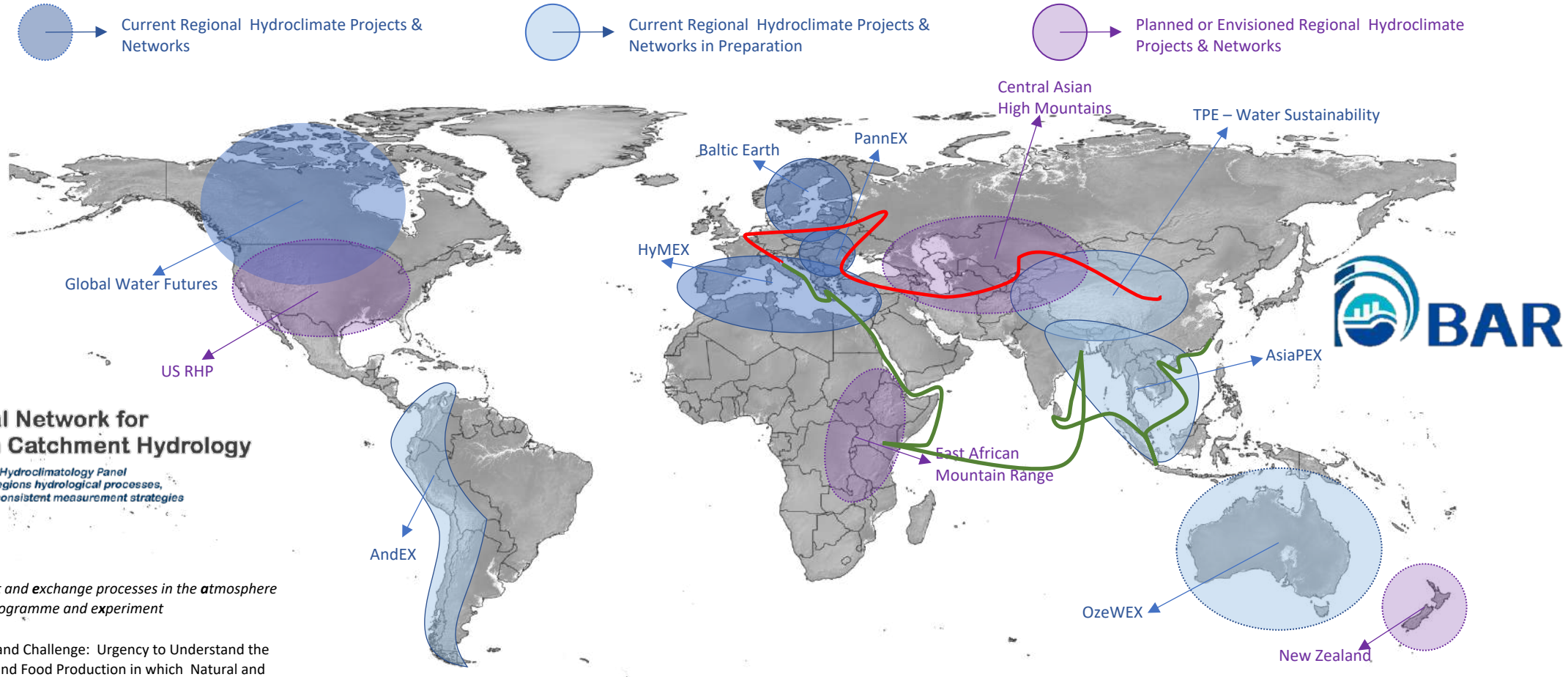
Understanding the impacts of climate variability and change on water availability and food security across mountain ranges and river basins of Central Asia

- Research needs:
- *2. Observational synthesis:*
  - *Coordinated multi-scale field and remote sensing campaigns to quantify cross-scale controls on regional hydroclimatic processes*
  - *Understanding of key processes and compilation of data to test model hypotheses*
- *3. Modeling synthesis:*
  - *Controlled comparison of different modeling approaches*
  - *Improved model physics parameterization development for integrated water cycle projections*
- *1. Capacity Development*
  - *Observational Network*
  - *Human Capacity*
  - *Technological Capacity*
  - *International Connectivity*

GEWEX Activities in High Mountain Regions

- Regional Hydroclimate Projects (RHPs) & Networks
  - *Modeling, Observations, Predictions and Projections, Impacts studies etc.*
- Crosscutting Activities
  - *TeamX (new), Mounterrain (new), INTENSE, Near 0°C Precipitation, INARCH*
- Global Observational Data Sets Assessments and Analyses <-> e.g. with International Precipitation Working Group
- Process Studies -> "PROES" – Process Evaluation Studies
- Regional Observational Campaigns (short and long term) -> e.g. LIAISE

HTTP://WWW.GEWEX.ORG



GEWEX INARCH

The International Network for Alpine Research Catchment Hydrology

A cross-cut project of the GEWEX Hydroclimatology Panel to better understand alpine cold regions hydrological processes, improve their prediction and find consistent measurement strategies

TEAMx

Multi-scale transport and exchange processes in the atmosphere over mountains – programme and experiment

BAR

Water for the Food Baskets Grand Challenge: Urgency to Understand the New State of the Water Cycle and Food Production in which Natural and Anthropogenic Processes Interact

GEWEX GWF ANDEX HyMeX PannEX Baltic Earth AsiaPEX OzEWEX TPE THIRD POLE ENVIRONMENT WCRP World Climate Research Programme

What is in it for the region?

- Access to top tier international network of climate, weather and hydrological scientists
- Access to state-of-the-art modeling and their communities (e.g. high res. 1 km Convection Permitting Modeling)
- Capacity development: human resources, hardware and software etc.
- Increased regional capacity to provide improved climate information
- Large scale regional collaborative efforts, international -> shared knowledge and data
- The effort should lead to a regional led and run Regional Hydroclimate Project

WCRP
World Climate Research Programme

Central Asia – IPCC's "Data Poor Region"

Also - within WCRP and GEWEX an underrepresented and studied area

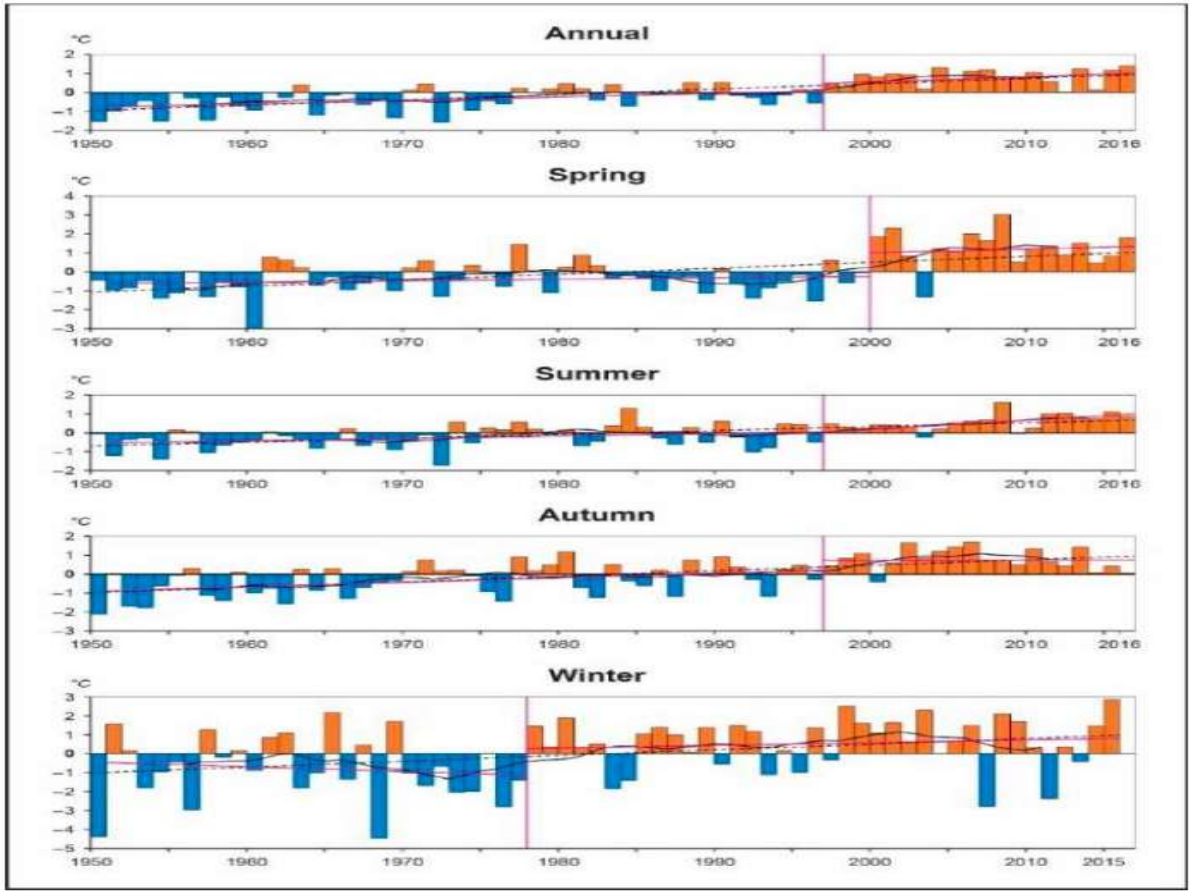
A Test Bed for Economically Efficient Adaptation?

Major Climate Issues

- Melting glaciers that are the foundation of the regions water resources
- Glaciers are primarily located in 2 0f the 5 countries: Kyrgyzstan & Tajikistan
- Extremely high summer temperatures and getting hotter
- Very vulnerable agricultural systems
  - Uzbekistan & Kazakhstan in particular
- Vulnerable habitats and critical ecosystems
  - Traditional pastoral lifestyles
  - Big cat conservation – especially snow leopard

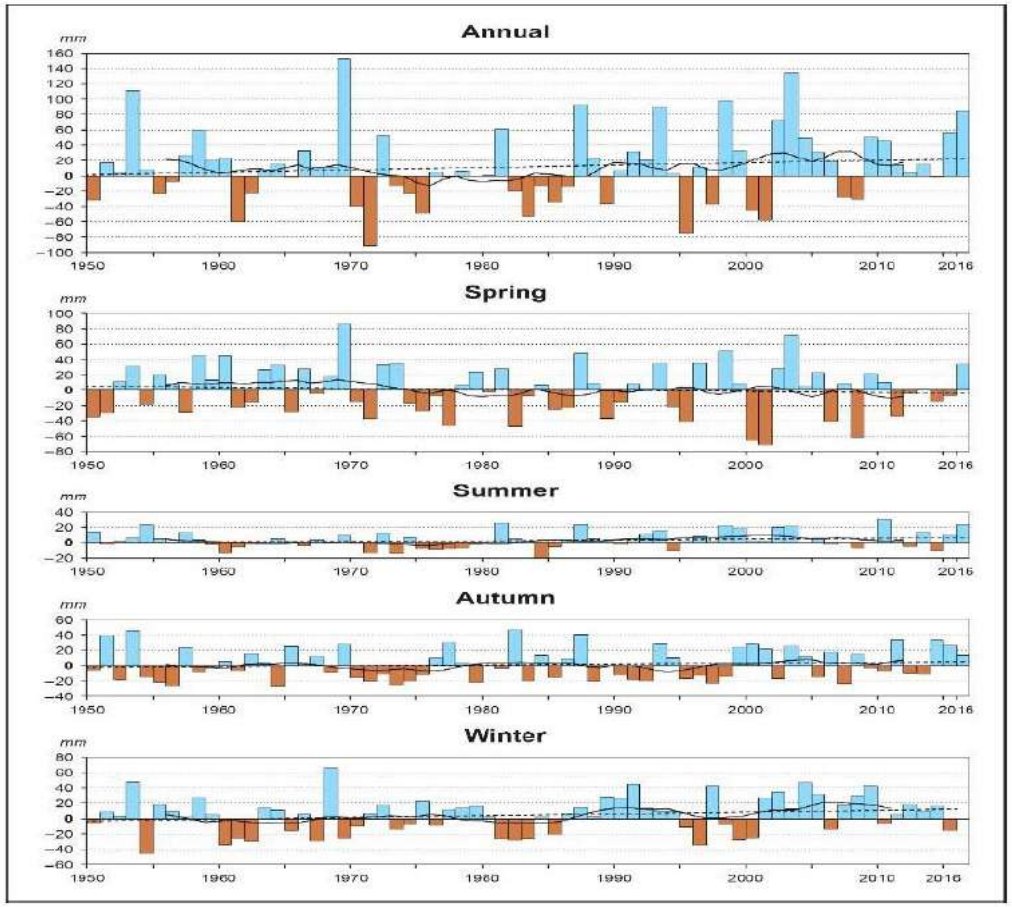
Seasonal & Annual Temperature Anomaly Time Series 1950 - 2016

(Haag Et Al. 2019)

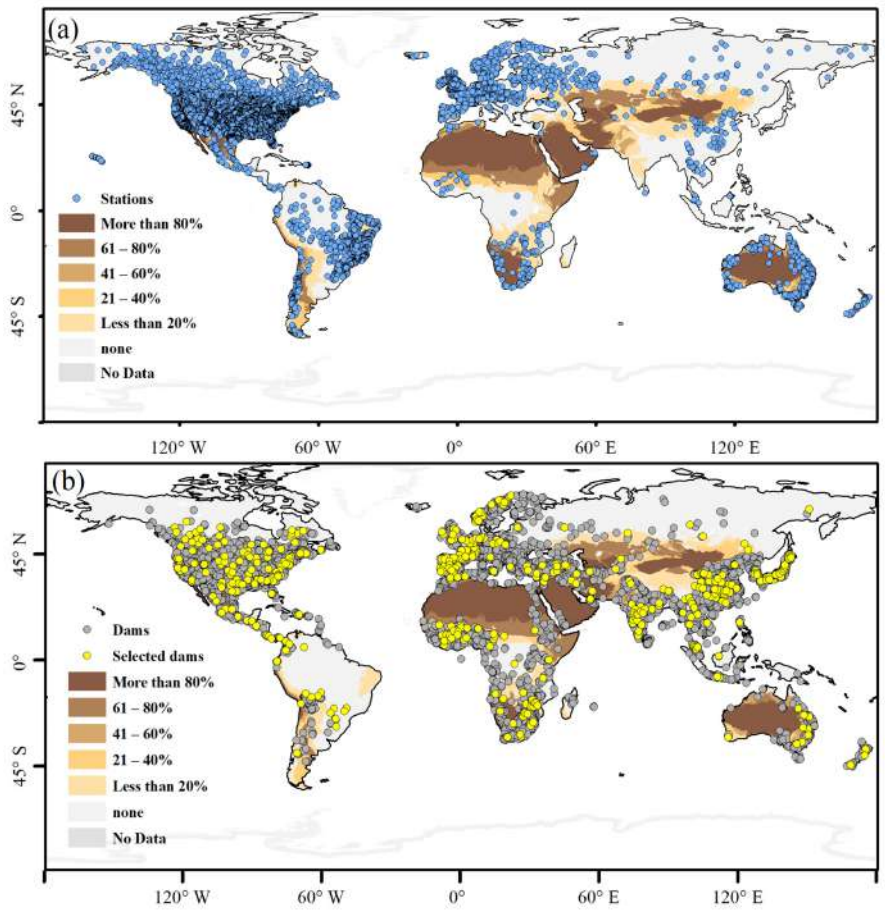


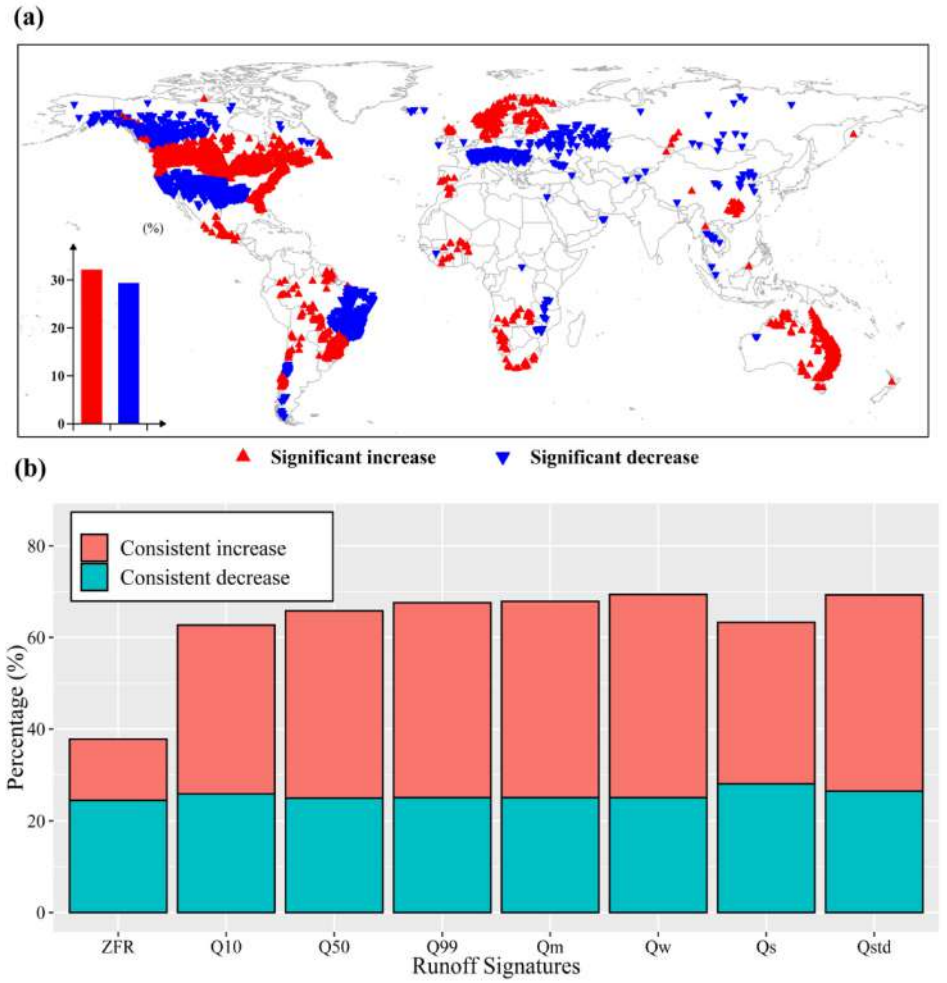
Seasonal & Annual Precipitation Anomaly Time Series 1950 - 2016

(Haag Et Al. 2019)

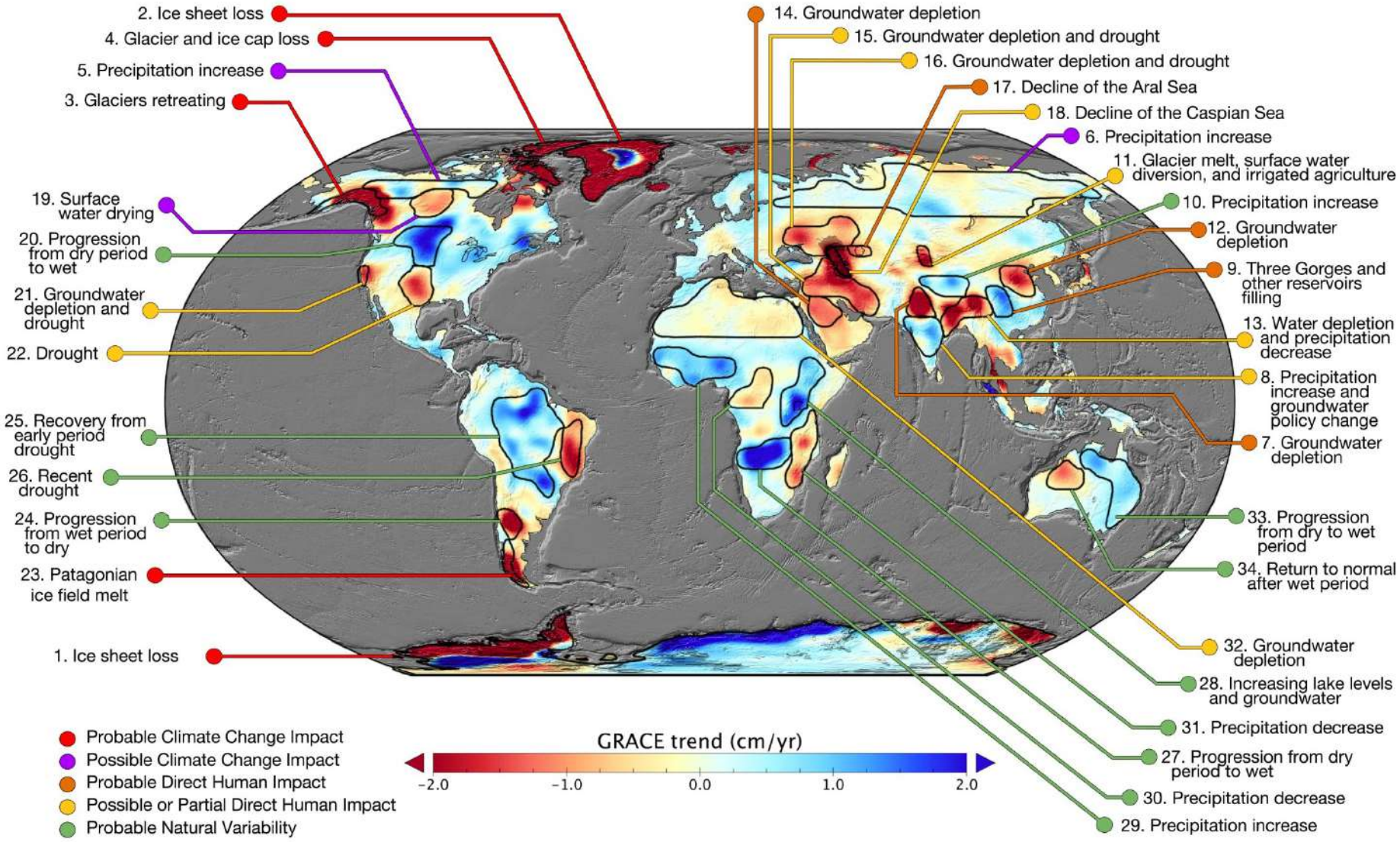


Global Runoff Observations in Managed and Unmanaged Basins





Emerging Trends in Global Freshwater Availability



Rodell, M., J.S. Famiglietti, D.N. Wiese, J.T. Reager, H.K. Beaudoing, F.W. Landerer, and M.-H. Lo (2018), Emerging trends in global freshwater availability, *Nature,* 557, 651-659.

Initial Efforts

- Survey of climate science/change needs in Central Asia – Spring & Summer 2021
- Online workshop based on the survey – October 2021
  - Collect more information on critical agricultural parameters that can be tied to climare scenarios – eg. Soil & water stresses
- Participation in CARIN (Central Asia Regional Information Network) workshops

Climate Adaptation

- Costs will potentially be enormous
- Need innovative economic analysis to guide investments
- RHP research needs to directly support regional adaptation needs

For More Information

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