3rd Period of Activities (2019-2024)

Regional Centre on Urban Water Management

Ali Chavoshian

chavoshian@gmail.com

United Nations
Educational, Scientific and
Cultural Organization

Regional Centre
on Urban Water Management
(under the auspices of UNESCO)

Agreement with UNESCO and GB Information

Establishment and Founding Director: 5th February 2002, Dr. Reza Ardakanian

1st Agreement, Signed by: Mr. Matsura 2002

First Period of Activities: 2002-2007

2nd Agreement, Signed by :Ms. Bokova, 2010

Second Period of Activities: 2010-2015

3rd Agreement, Signed by: Ms. Azoulay, 2018

Third Period of Activities: 2019-2024

*(*Sorted Chronologically)*

GB Member States in the First and Second Period of Activities

I.R. Iran Minister of Energy and GB Chair Since 2002	**Oman** Minister of Regional Municipalities and Water Resources - Since 2002	**Tajikistan** Minister of Economy and Land Improvement Since 2003	**Yemen** Minister of Water and Environment Since 2006
Bangladesh Minister of Water Resources Since 2002	**Syria** Minister of Housing and Construction Since 2002	**Germany** Minister of Education and Research Since 2004	**Bahrain** Minister of Electricity and Water Authority Since 2009
Kuwait Minister of Water and Energy Since 2002	**Egypt** Minister of Water Resources and Irrigation Since 2003	**Afghanistan** Minister of Energy and Water Since 2005	**Iraq** Minister of Water Resources Since 2009
Lebanon Minister of Energy and Water Since 2002	**Pakistan** Minister of Water and Power Since 2003	**India** Minister of Water Resources Since 2005	**Armenia** State Committee of Water System Since 2011

3rd Period of Activities (2019-2024)

United Nations Educational, Scientific and Cultural Organization

Regional Centre on Urban Water Management (under the auspices of UNESCO)

RCUWM-Tehran
Governing Board Members and Observers

Afghanistan
Ministry of Energy and Water

Armenia
Ministry of Territorial Administration and Infrastructure

Azerbaijan
Azersu OJSC

Bangladesh
Ministry of Water Resources

Egypt
Ministry of Water Resources and Irrigation

Germany
International Centre for Water Resources Global Change

India
Ministry of Water Resources and River Development and Ganga Rejuvenation

Iran
Ministry of Energy

Iraq
Ministry of Construction, Housing, Municipalities and Public Works

Kyrgyzstan
State Water Resources Agency

Lebanon
Ministry of Energy and Water

Oman
Ministry of Regional Municipalities and Water Resources

Pakistan
Ministry of Water Resources

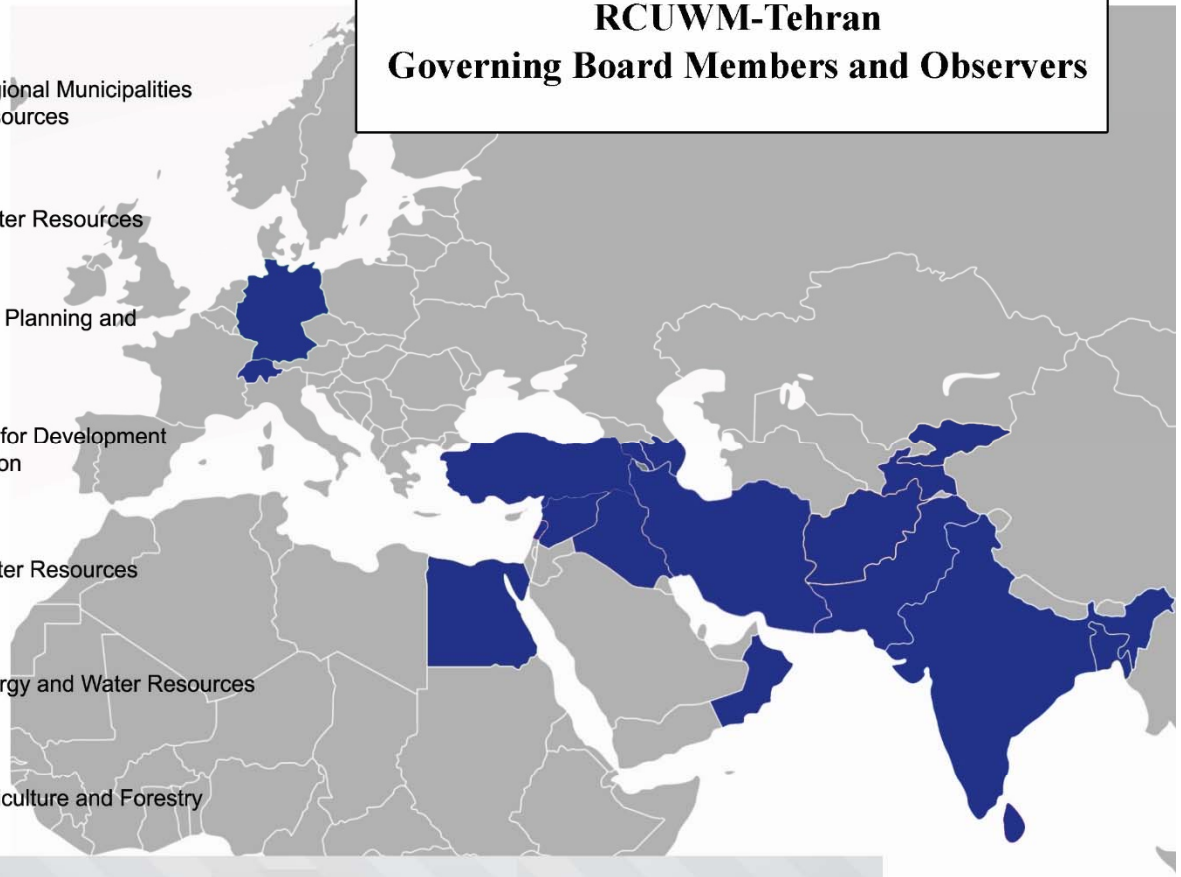
Sri Lanka
Ministry of City Planning and Water Supply

Switzerland
Swiss Agency for Development and Cooperation

Syria
Ministry of Water Resources

Tajikistan
Ministry of Energy and Water Resources

Turkey
Ministry of Agriculture and Forestry



UNDP WMO FAO UN-HABITAT WHO IsDB JCCME

United Nations
Educational, Scientific and
Cultural Organization

Regional Centre
on Urban Water Management
(under the auspices of UNESCO)

10th

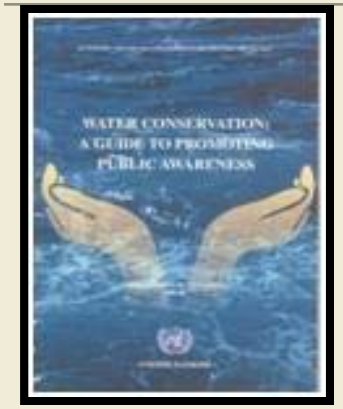
RCUWM-Tehran

Governing Board Meeting

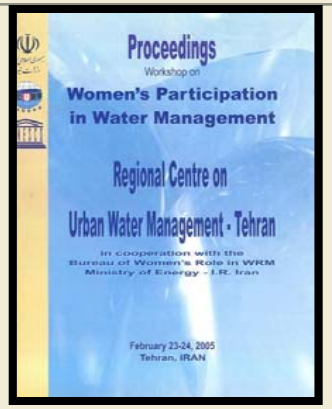
3 Pillars of Activities

Seven (7) Medium-Term Programmes

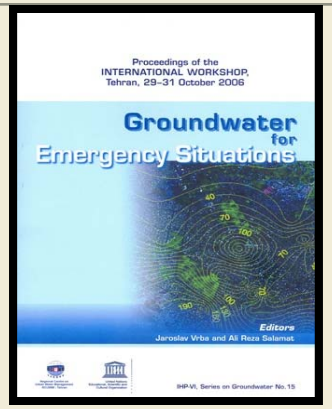
Highlighted Publications



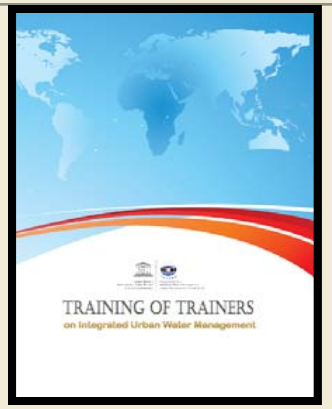
Farsi Edition of "Water Conservation: A Guide to Promoting Public Awareness



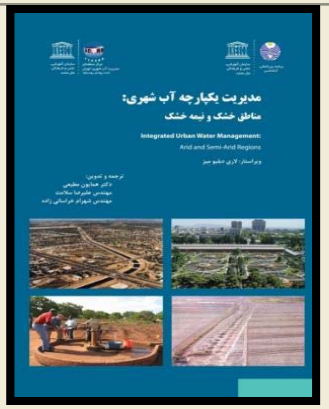
Proceedings of the Workshop on Women's Participation in Water Management



Proceedings of the International Workshop on Groundwater for Emergency Situations



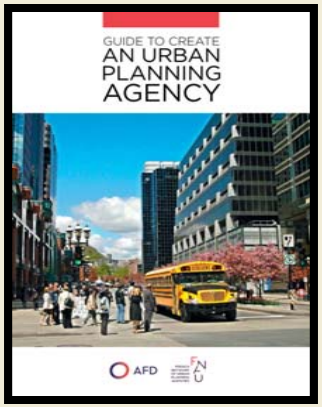
Training of Trainers manual on Integrated Urban Water Management



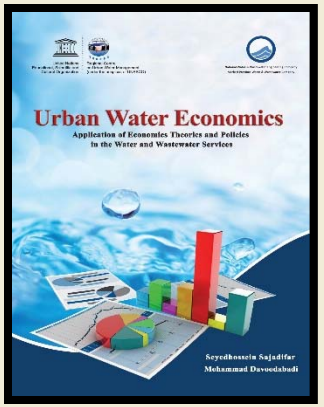
Translating UNESCO publication on Urban Water Management: Arid and semi-arid Regions

Urban River Restoration

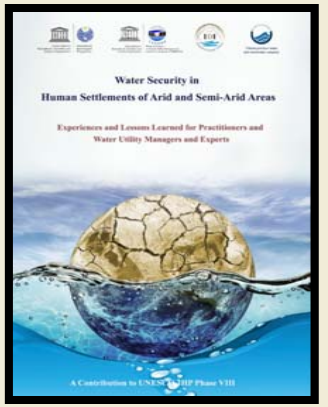
Adapting Urban Water Systems to Climate Change



Guide to Create An Urban Planning Agency



Urban Water Economics Application of economic theories and policies in the water and sewage sector



Water Security in Human Settlements

	ry
	d Remote Sensing (CHRS), University of
	e, Japan
	nany
8	International Centr
9	IHE Delft Institute
10	International Centr
11	International Comm
12	International Cente
13	International Socie
14	International Knov Activities (IKCES
15	International Wate
21	Organization of Islamic Cooperation (OIC)

Project Proposals

Potential Project Proposals

- This booklet includes few project proposals for the future mutual cooperation. A few blank pages are also available at the end of this booklet for any possible suggestions from your side.
- You may show interest in being involved in any of the proposals. The proposals shall be considered for the short term (2019-2021) or long term period (2019-2024) of RCUWM's work plan.
- The Centre welcomes any kind of involvement (participation/contribution/partnership) for successful implementation of desired proposals.

For furthering the issue of proposals, kindly introduce a focal person by providing the following information:

Full Name:

Affiliation/Position:

Tel:

Email:

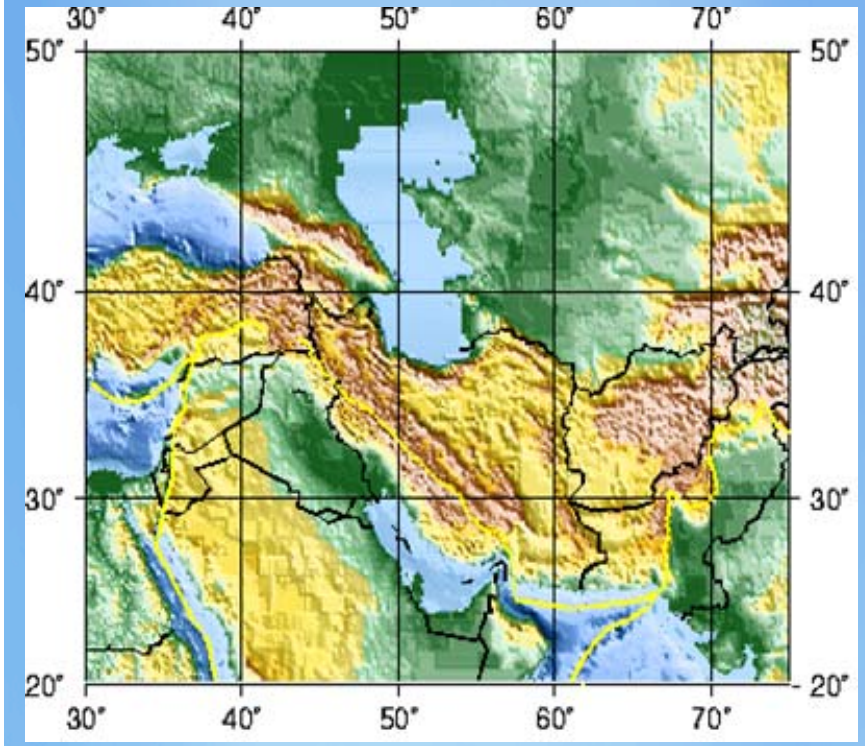
Signature: .....

Date: 5th December 2019

RS & GIS in Action

- **Modeling Runoff Generation in Arid and Semi-arid Areas**

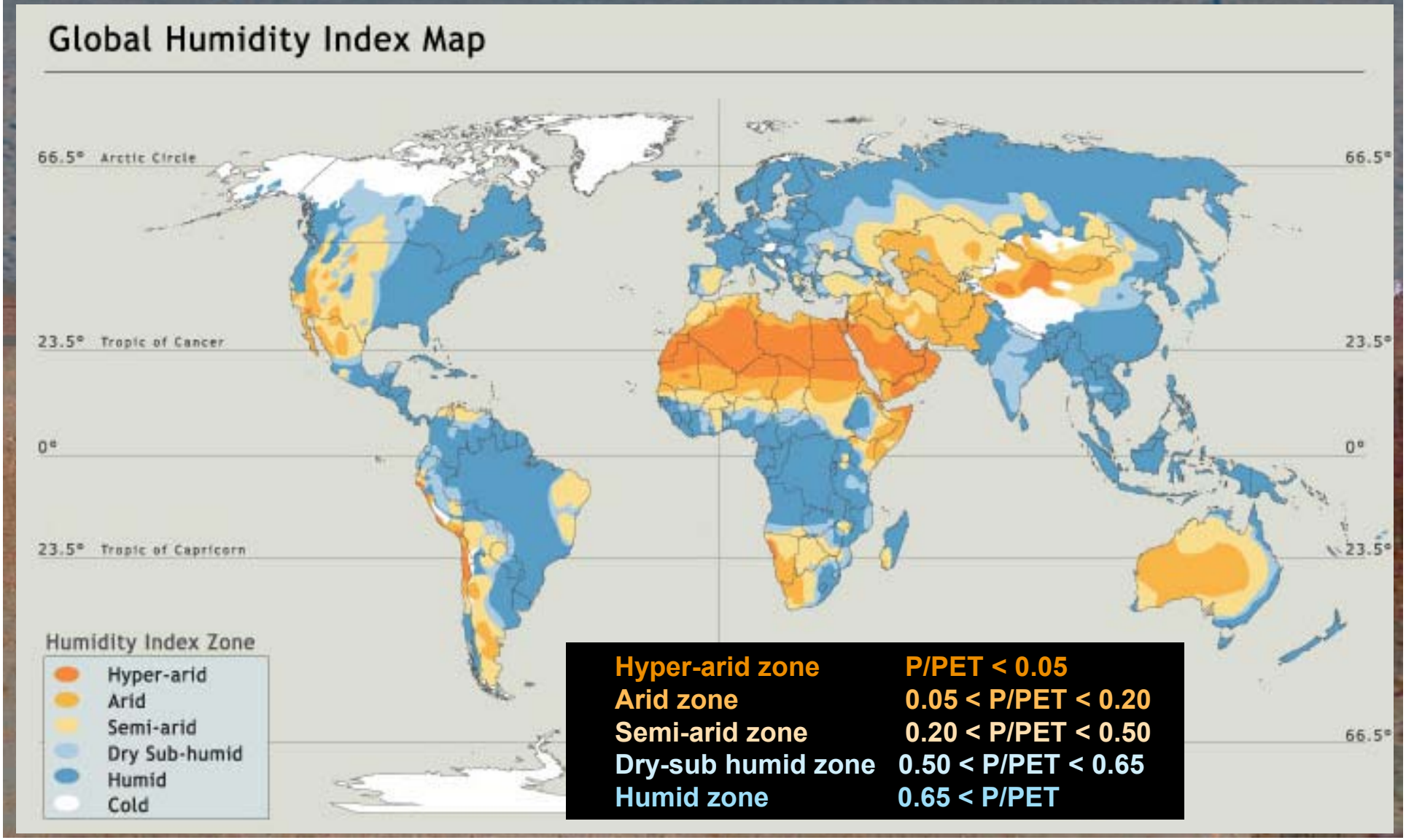
West and Central Asia



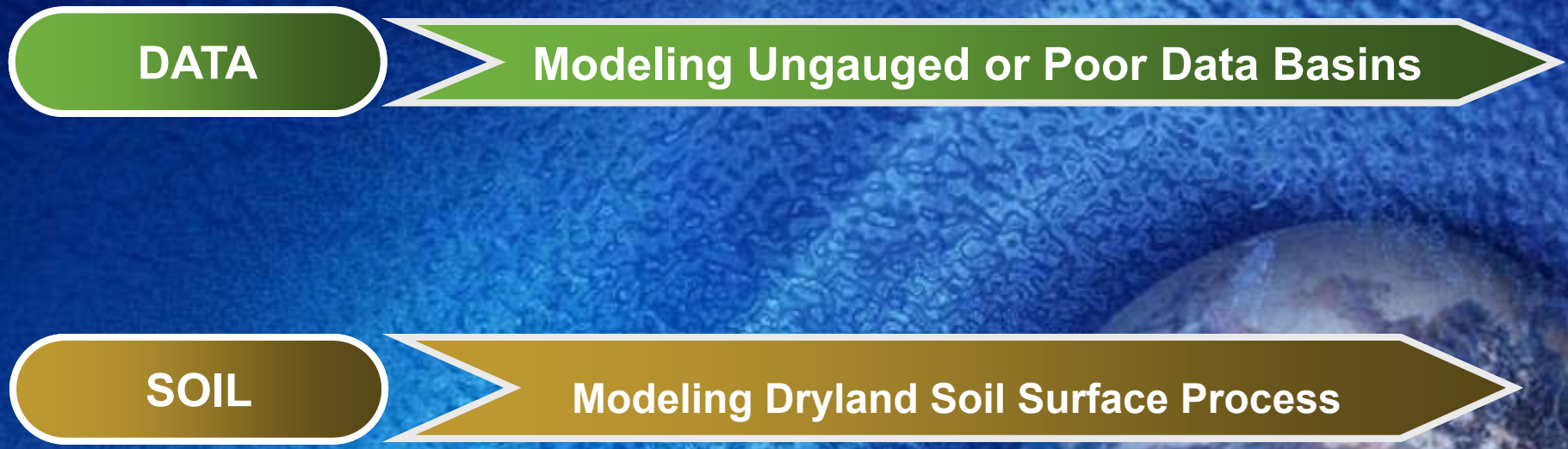
- **Prediction in Ungauged Basin (PUB)**

Arid and Semi-arid Areas

Approximately half of the Earth's land surface and 20% of its population



Challenges of Modeling Runoff Generation in Arid and Semi-arid Areas



Ungauged or Poor Data Basins

Lack of Measurement

WMO Regions	No. of Countries	Average time series length [years]
World	155	37.1
Africa	42	20.6
Asia	24	29.3
Oceania	15	36.0
Europe	44	42.4
America (N & S)	29	44.8

Source: Global Runoff Data Center (GRDC)

Ungauged or Poor Data Basins

Access to Data

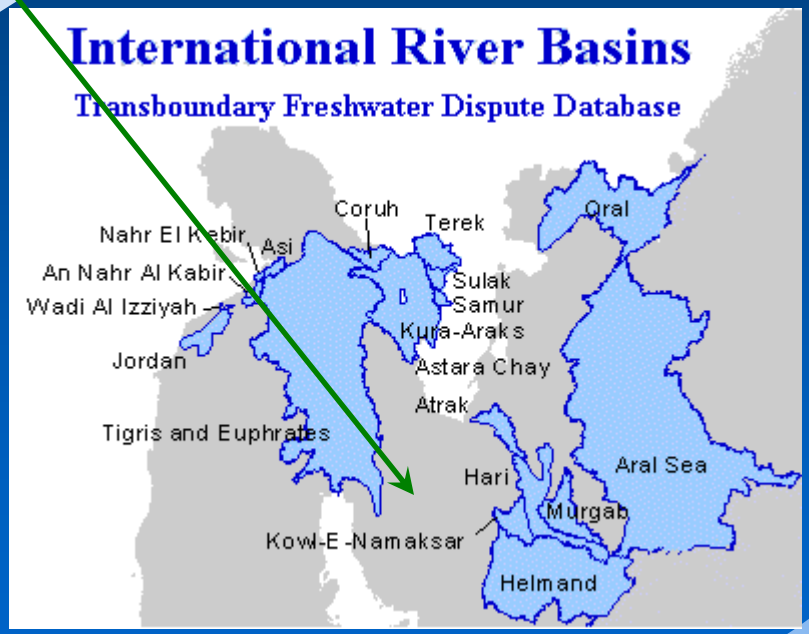
IRAN

Perimeter

Land
47 %

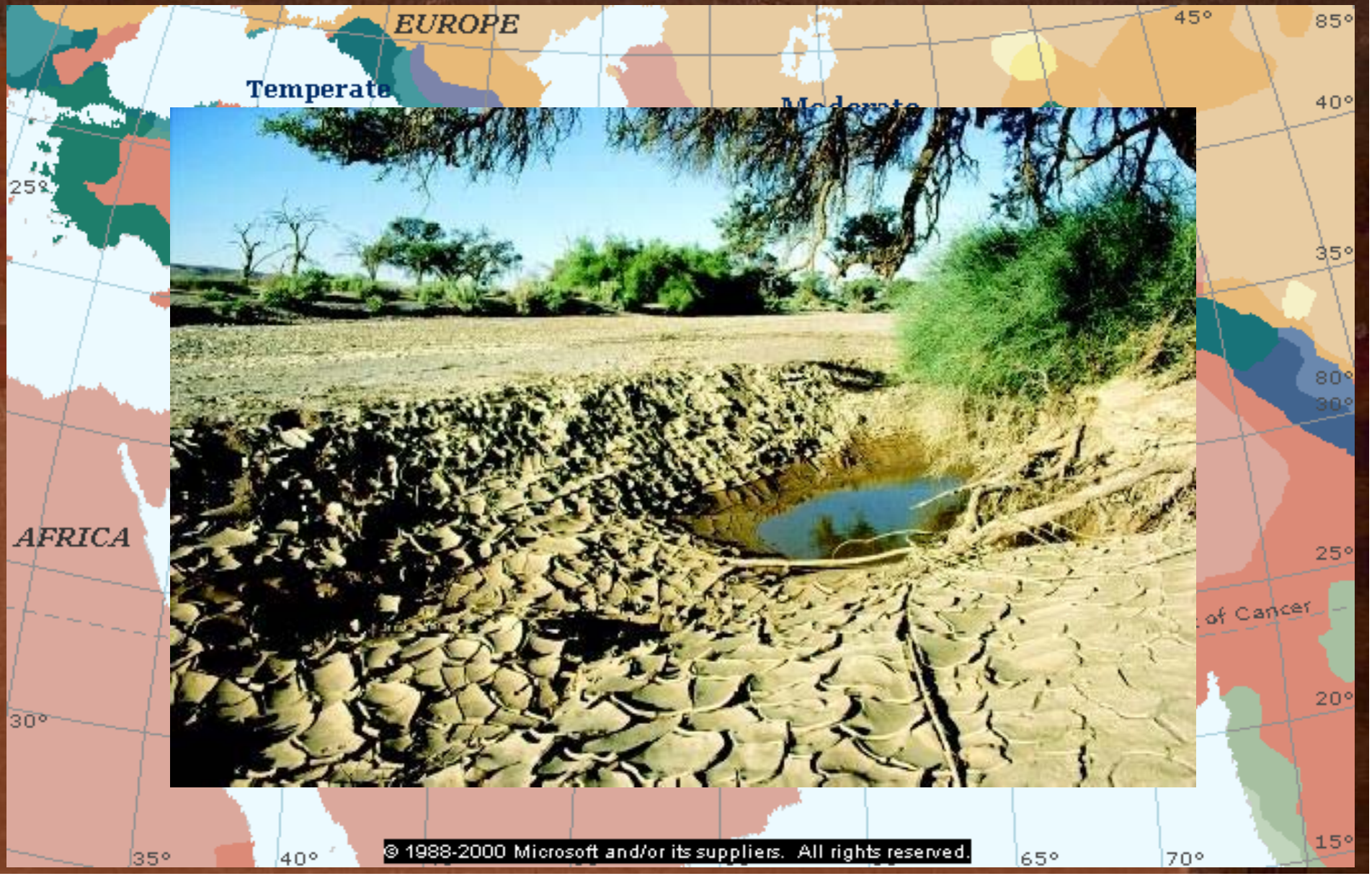
Sea
31 %

River
22 %



Soil Surface Processes

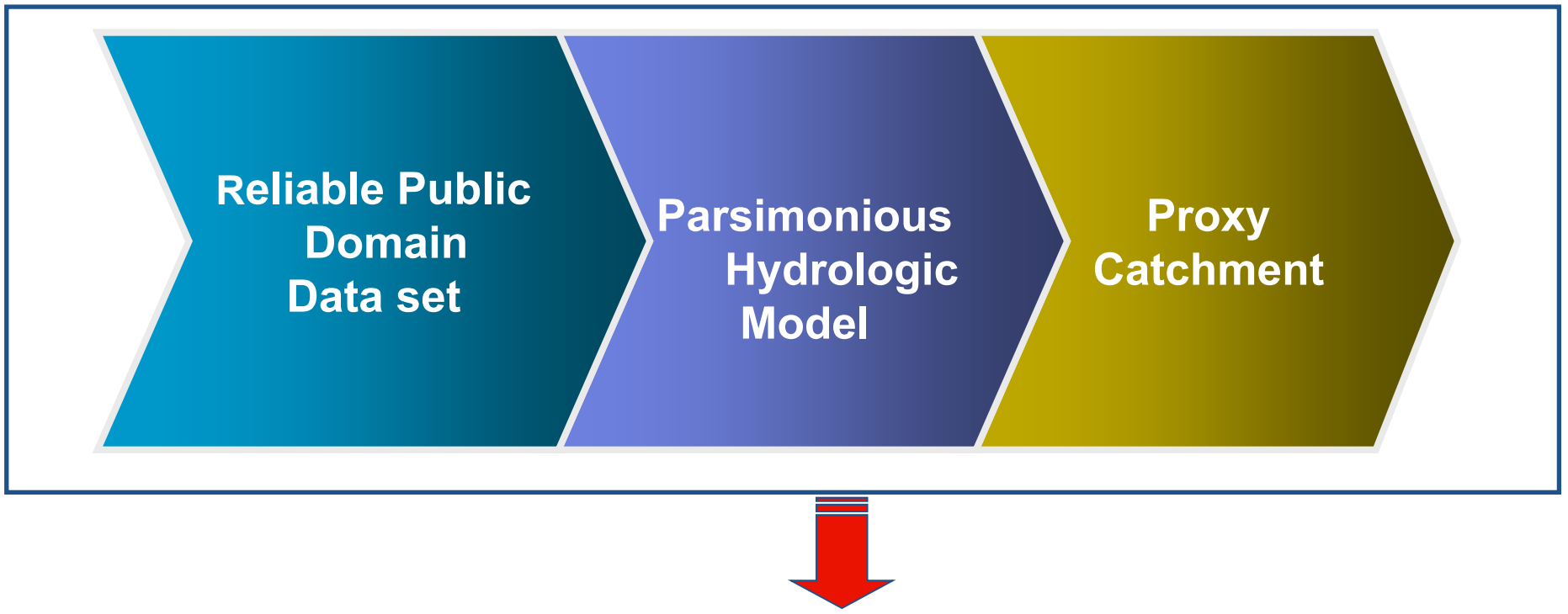
Dryland Infiltration



RS & GIS Application

Main Challenges of Prediction in Ungauged Basin (PUB)

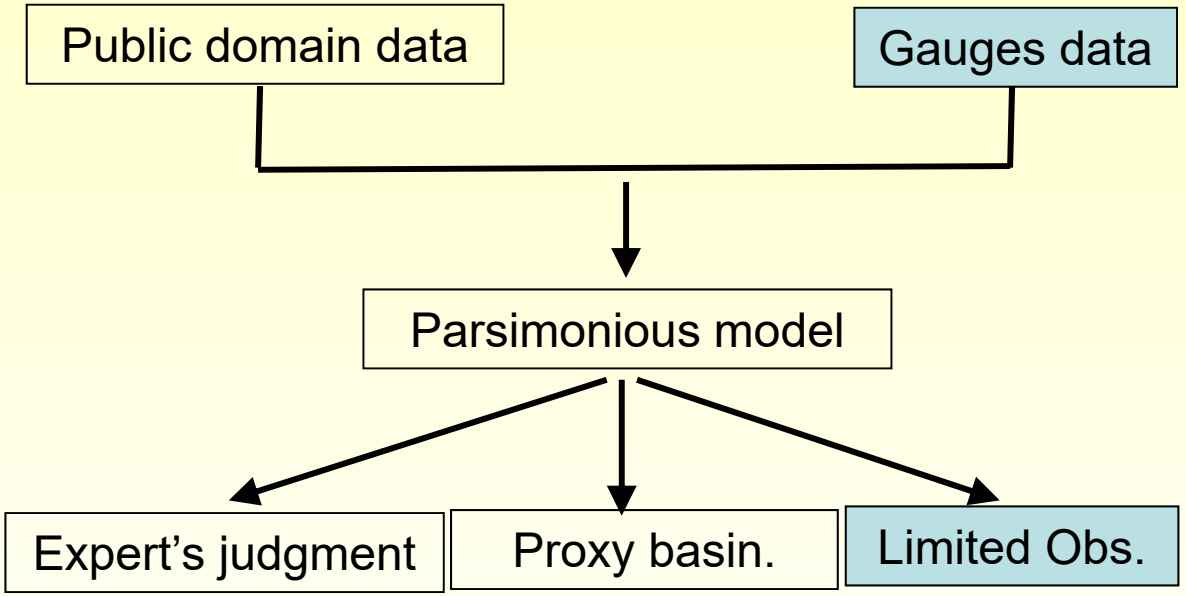
Data | **Model** | **Calibration**



Hydrological Analysis, DSS, …

Blind Test Methodology

- **Input data**
- **Models**
- **Parameters**
- **Target Variables**



Flow Hydrograph	Flow Hydrograph
Annual flow volume	Annual flow volume
Monthly flow volume	Monthly flow volume
Annual flood peak	Annual flood peak

Input Data

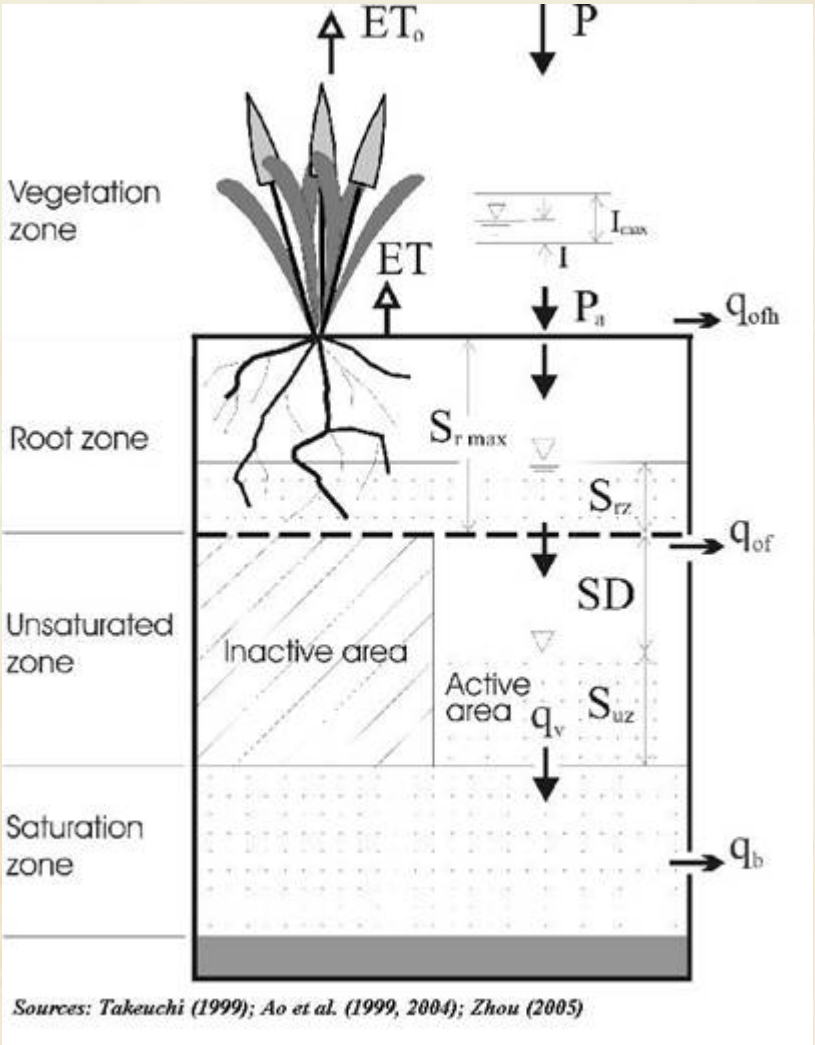
- DEM: 1km grid (USGS GTOPO30)
- Soil map: 45% sand, 35% clay, 20% silt (FAO soil classes, 5km grid)
- Land cover: 75 % of basin covered by Evergreen and 18% by Deciduous Broadleaf Forest (IGBP Ver. 2.0, 1km grid)
- Potential Evapotranspiration: Shuttleworth-Wallace method *(DIAS 2012)*

Parsimonious Model

n_0: Block average of Manning's roughness coefficient

T_0: Lateral transmissivity (m^2/h)

m: Decay factor of lateral transmissivity (m)

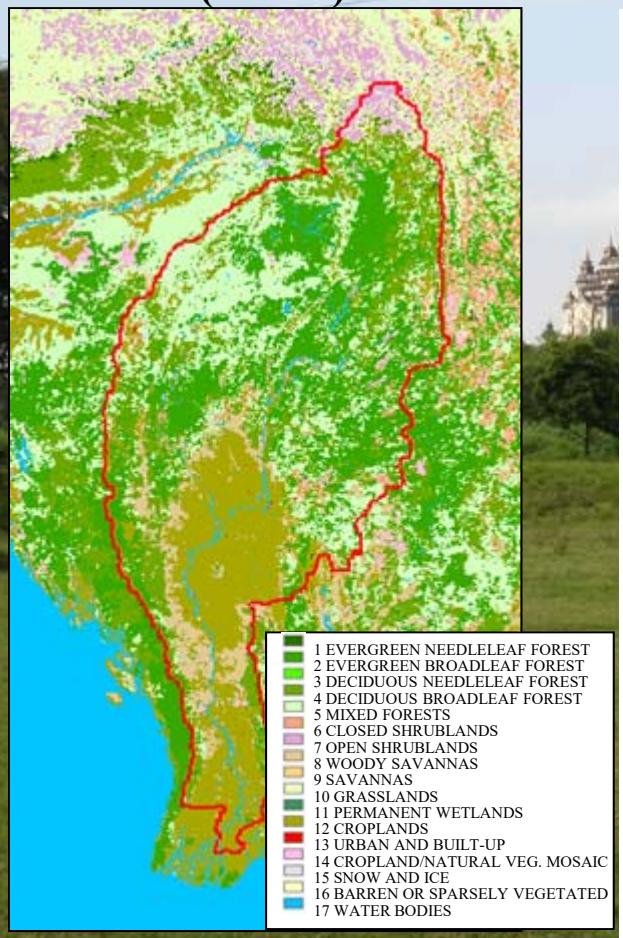


Ayeyarwady Basin (Myanmar)

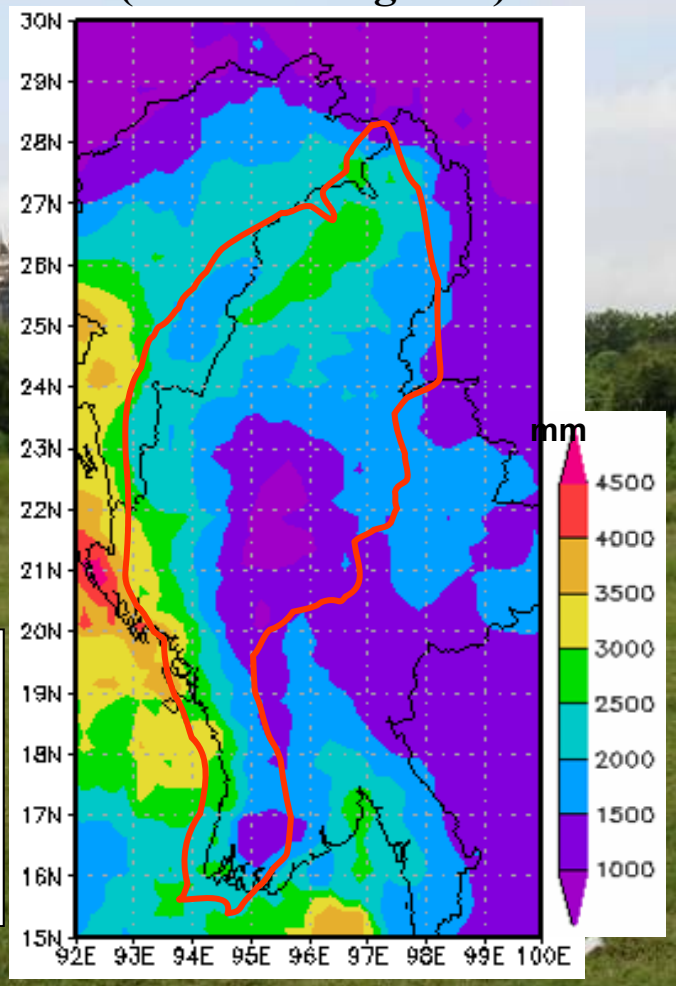
Satellite-based data

Satellite-based Precipitation

Landcover (IGBP)

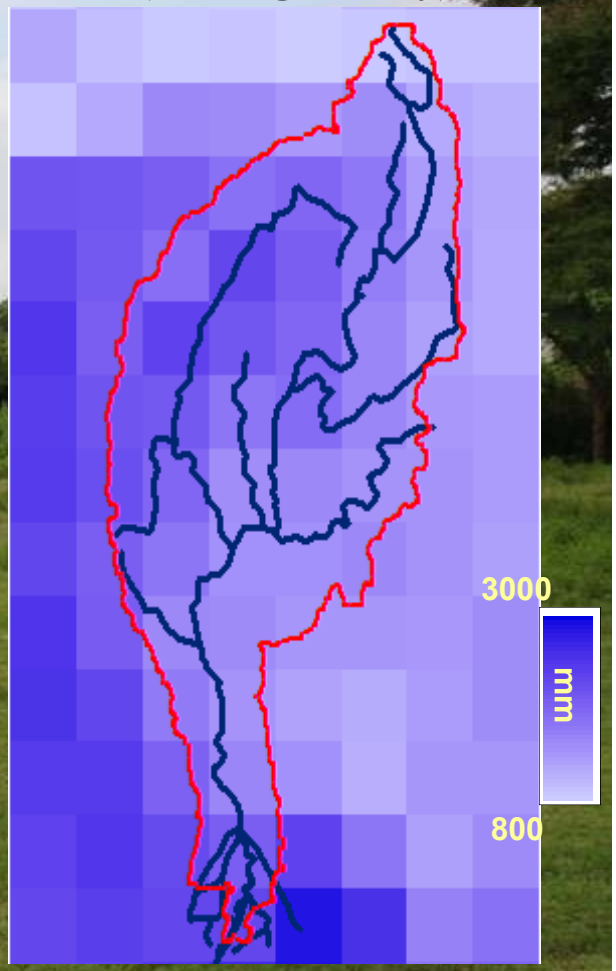


TRMM 3B62RT (0.25x0.25deg. 3hr)



Annual avg.(2000)

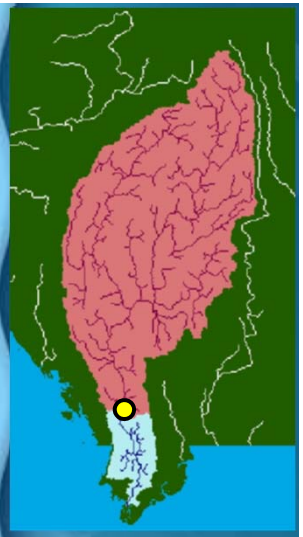
GPCP 1DD (1x1deg., Daily)



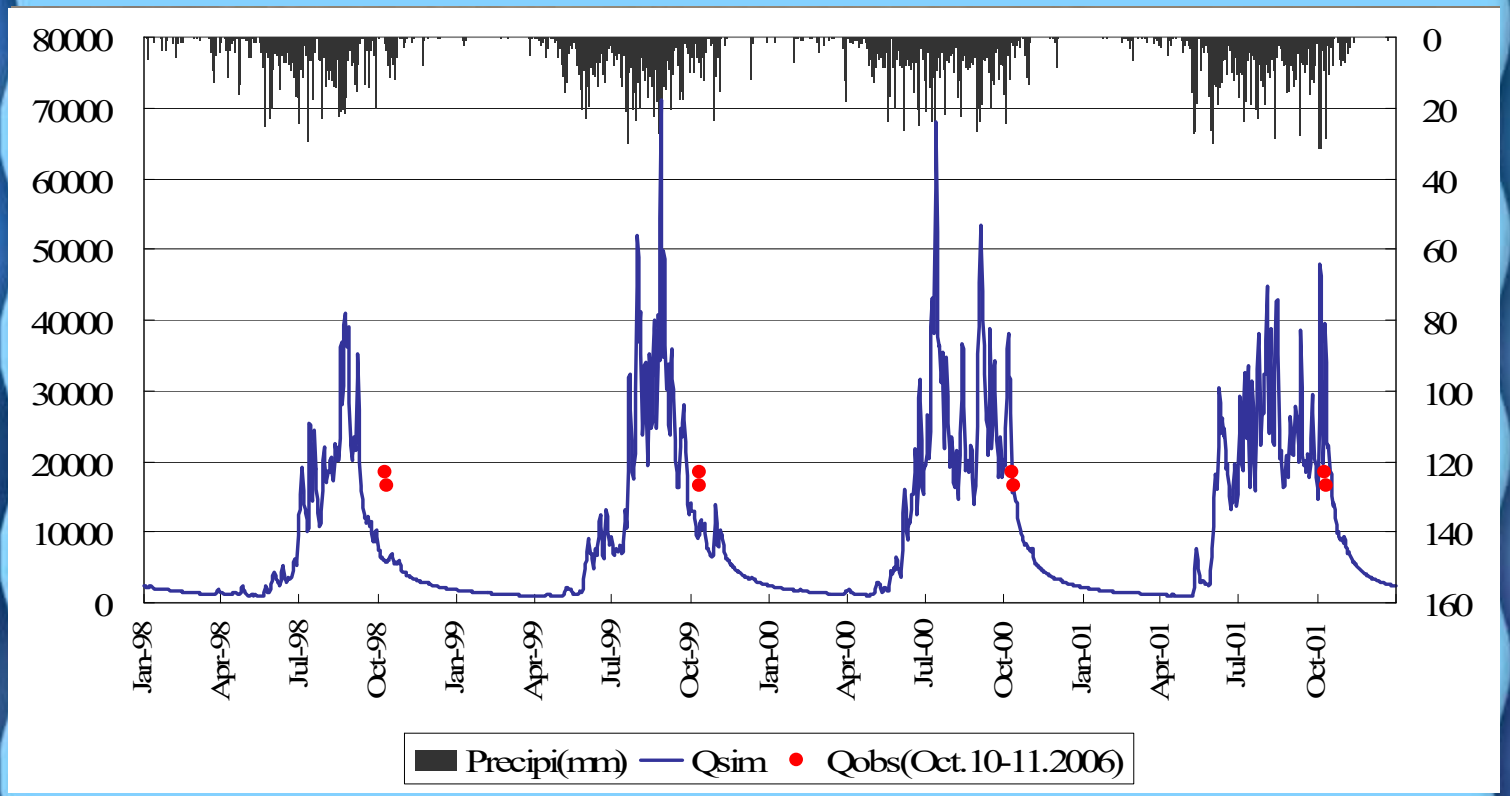
Annual avg.(2000)

Simulation Result

Observed validation Values

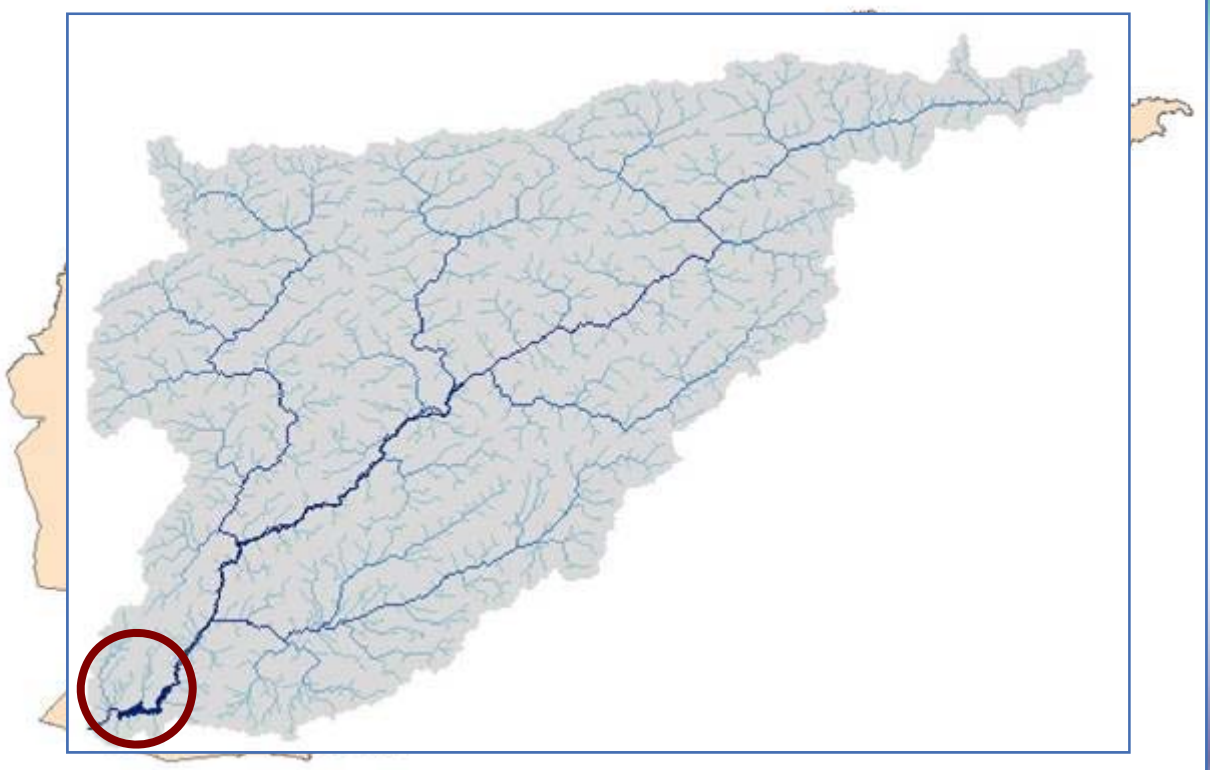


Irrawaddy at Pyay Station
1998.01.01 – 2001.12.31



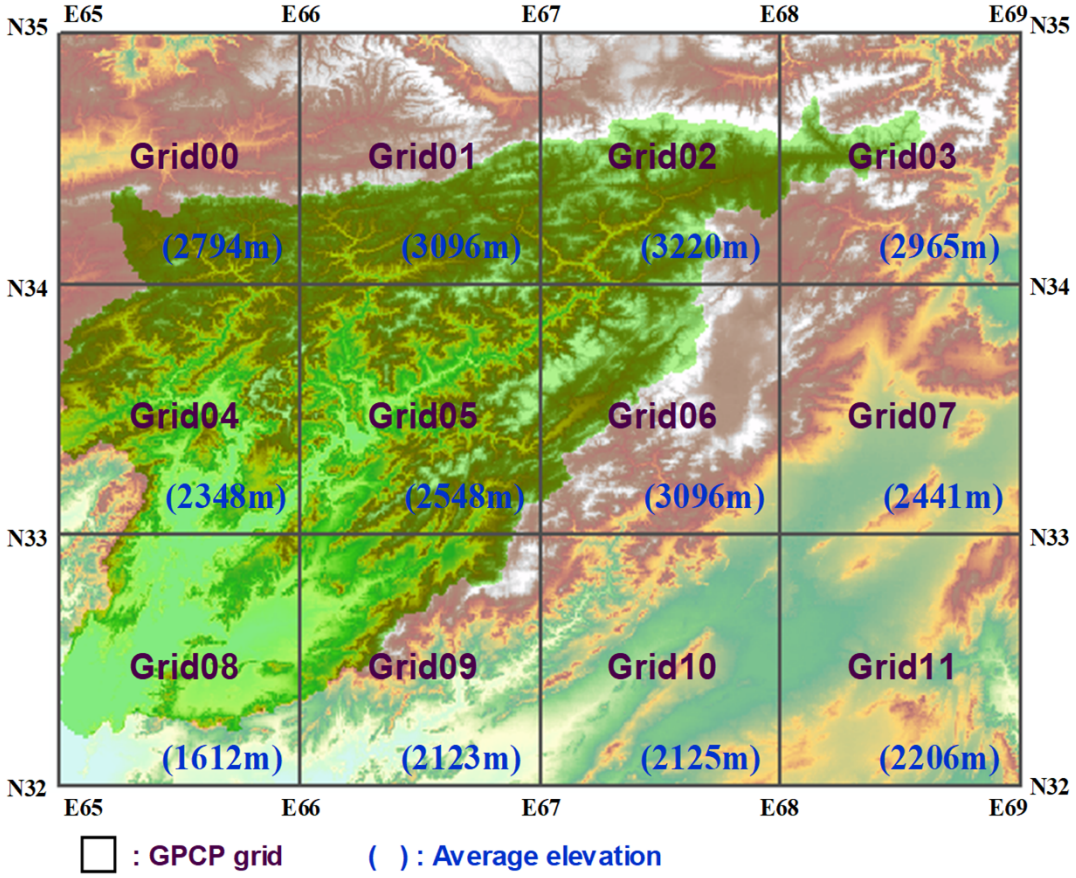
Transboundary River

Motivation



Kajaki Dam: 1200 MCM Reservoir Capacity

Study Area, Data and Model

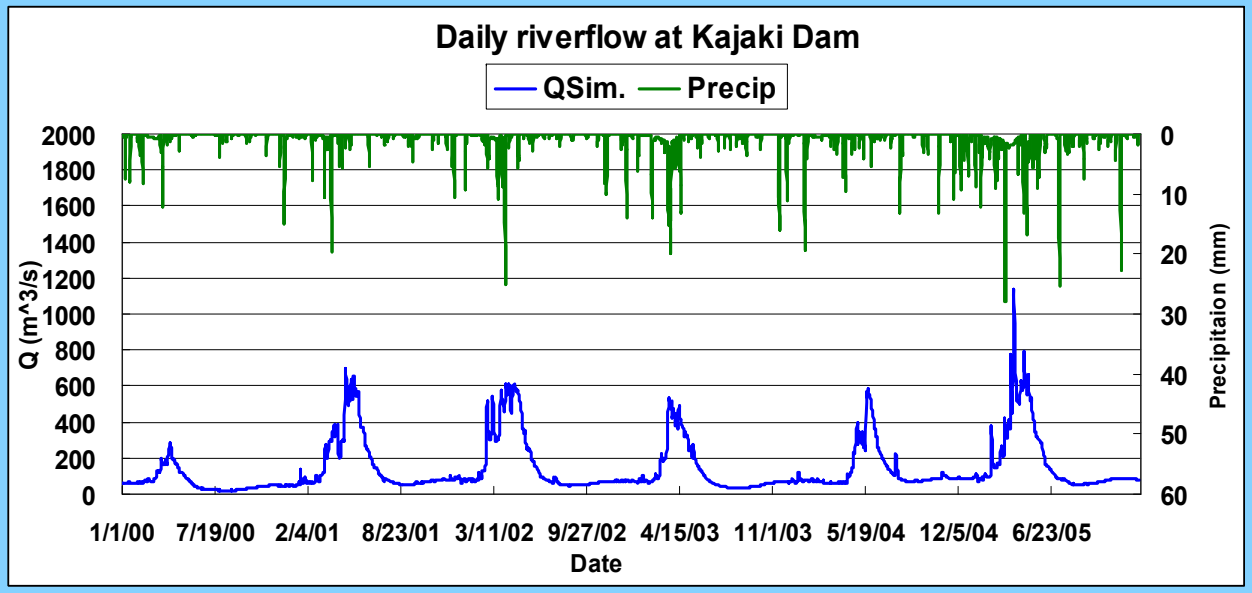


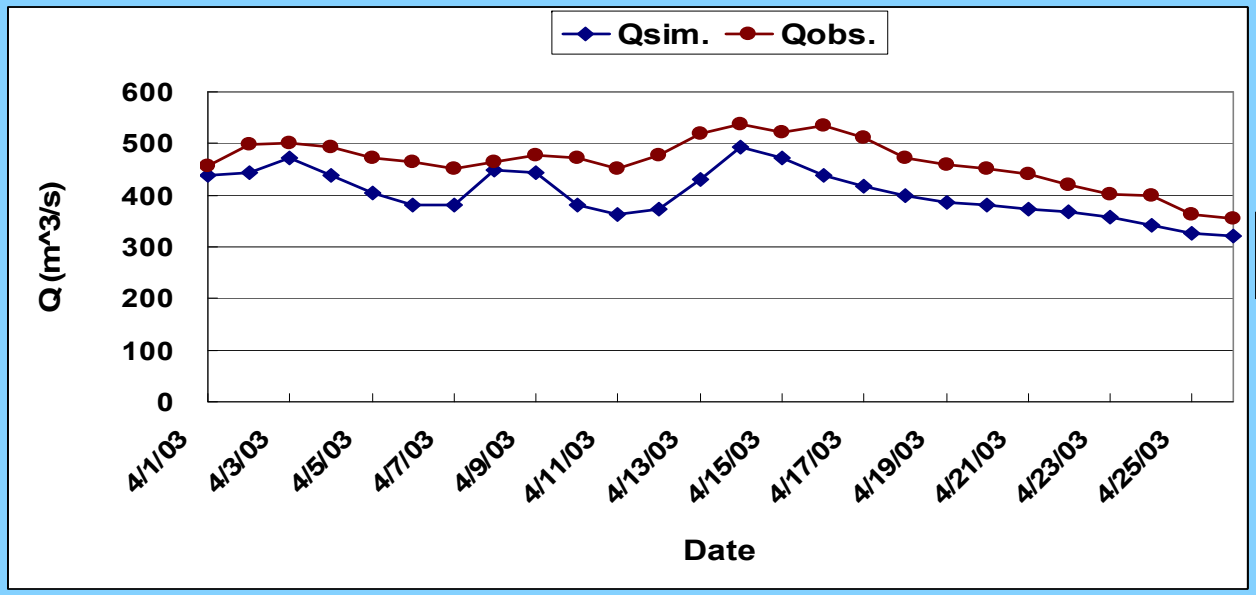
- **Basin Area:**
  48700 km^2
- **Soil Types:**
  Sand (58%), Silt(20%), Clay(22%)
- **Land cover:**
  Open shrubland (60%)
- **Precipitation:**
  GPCP data
- **Proxy-basin:**
  Upstream of Karaj
- **Models**:
  BTOPMC and Snow17

Blind Test of Daily River flow (B0-level)

Parameter	m	n_0	T_0-Clay	T_0-Sand	T_0-Silt	Sr_{max}
Value	.08	.003	20	32	8	.01

Proxy-basin Karaj





Validation

Precipitation

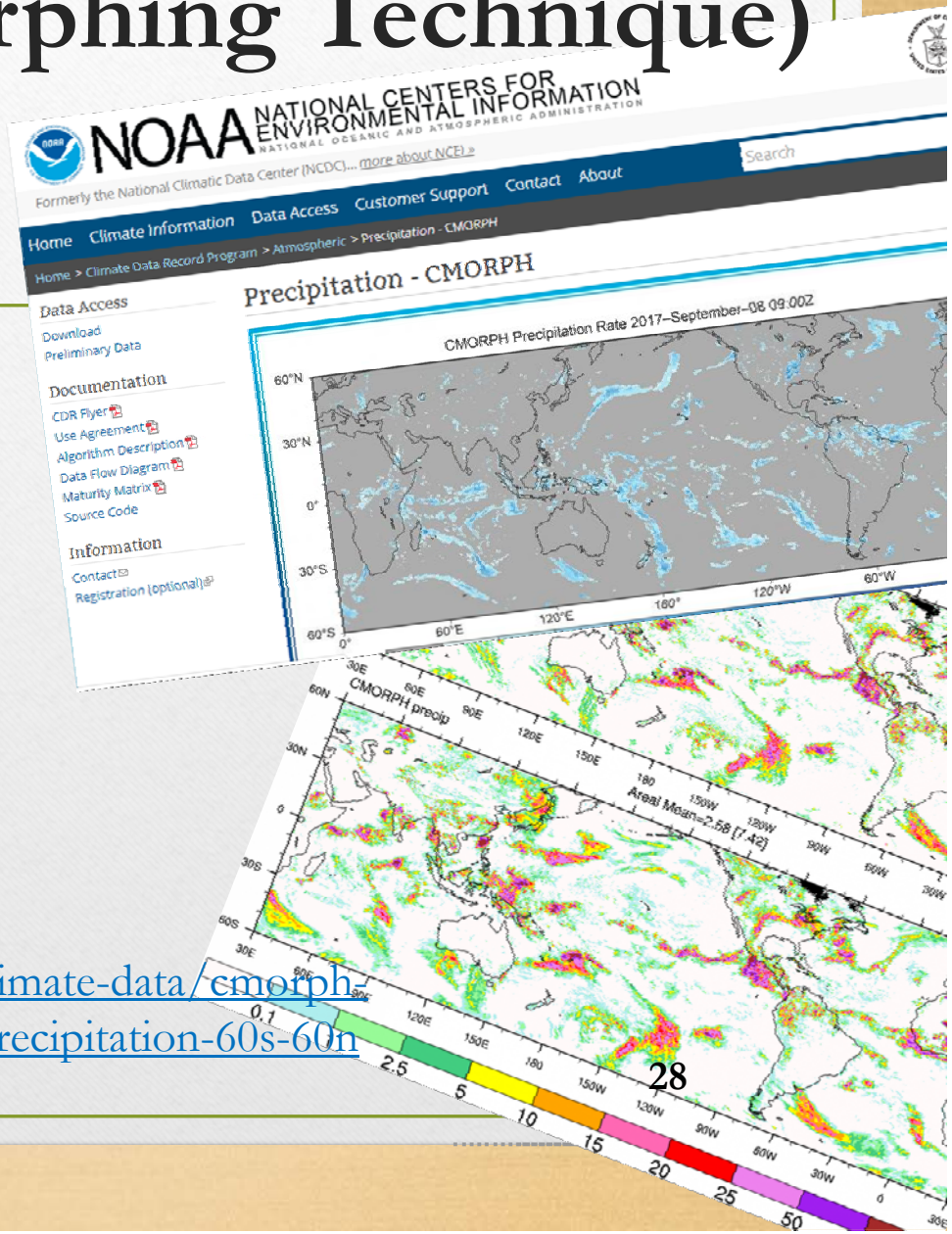
Satellite-based Precipitation Data Sets

Product	Resolution		Pixel Size (km^2)	Time Step	URL
	Spatial	Temporal			
CMORPH	60 S - 60 N	Since 2003	8*8 25*25	30 minutes, 3 hourly & daily	https://climatedataguide.ucar.edu/climate-data/cmorph-cpc-morphing-technique-high-resolution-precipitation-60s-60n
GSMap	60 S - 60 N	Since 2008	10*10 25*25	1 hourly & daily	http://sharaku.eorc.jaxa.jp/GSMaP/
PERSIANN	60 S - 60 N	Since 2003	4*4	1, 3, 6 hourly & daily	http://chrs.web.uci.edu/persiann/data.html
IMERG	60 S – 60 N 90N-90S (Gridded)	Since 2000	10*10	30 minutes, 3 hourly & daily	https://pmm.nasa.gov/data-access/downloads/gpm

Cmorph (Cpc Morphing Technique)

A means by which estimates from existing microwave rainfall algorithms can be combined.

- Data source: PMW data with IR imagery
- Coverage: 60S-60N
- Pixel Size (km^2): 25x25
- Time Step: Sub-daily & daily

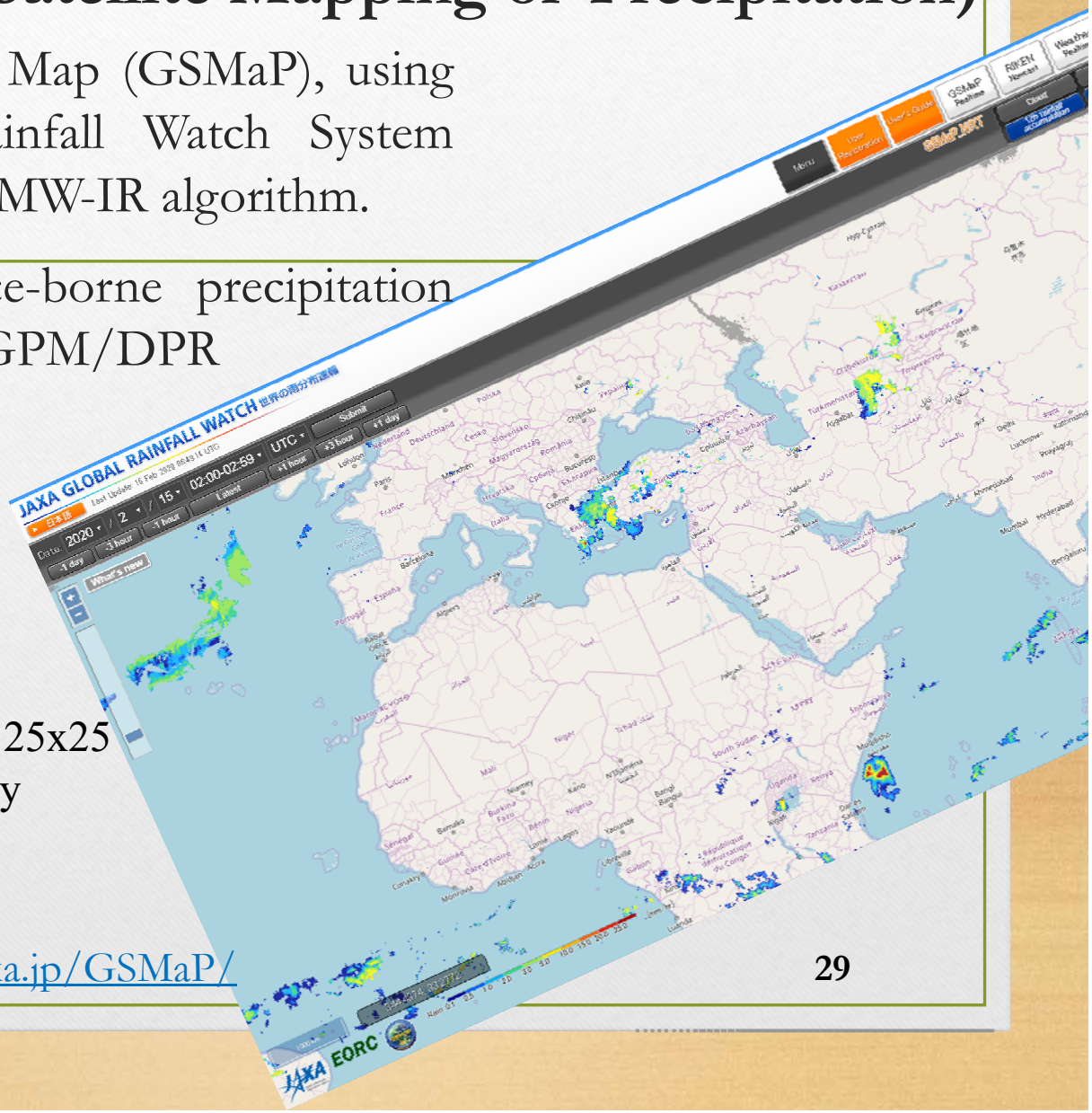


URL: https://climatedataguide.ucar.edu/climate-data/cmorph-cpc-morphing-technique-high-resolution-precipitation-60s-60n

GSMap (Global Satellite Mapping of Precipitation)

Hourly Global Rainfall Map (GSMaP), using the JAXA Global Rainfall Watch System based on the combined MW-IR algorithm.

Data source: the space-borne precipitation radar, TRMM/PR and GPM/DPR



- Coverage: 60S-60N
- Pixel Size (km^2): 10x10 & 25x25
- Time Step: 3 hourly & daily

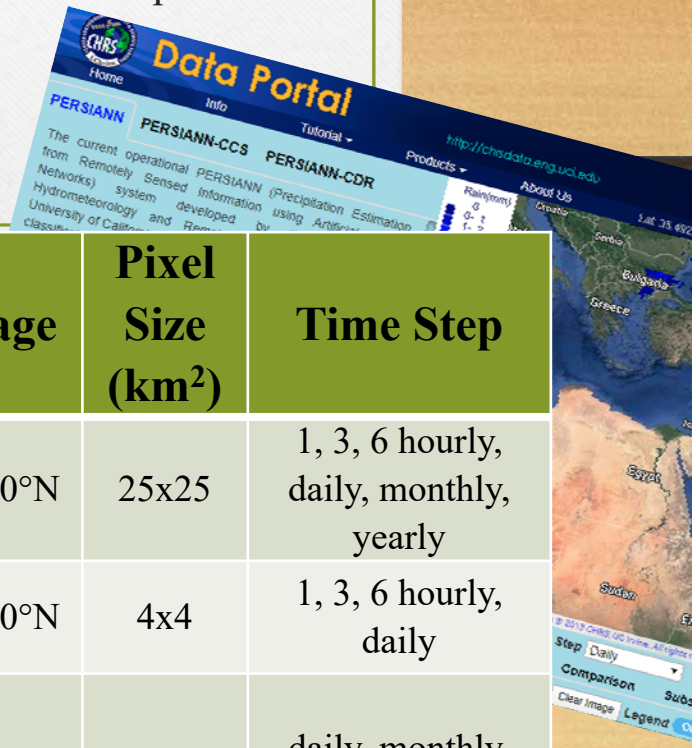
URL: https://sharaku.eorc.jaxa.jp/GSMaP/

United Nations Educational, Scientific and Cultural Organization | Regional Centre on Urban Water Management (under the auspices of UNESCO)

وزارة البلديات الإقليمية وموارد المياه
Ministry of Regional Municipalities and Water Resources

Satellite-based Precipitation Data Sets
PERSIANN

- Precipitation Estimation from Remotely Sensed Information using Artificial Neural Networks (PERSIANN) is one of the popular satellite-based precipitation estimations which has three products in different spatio-temporal resolutions.
- Data source: geostationary longwave infrared imagery



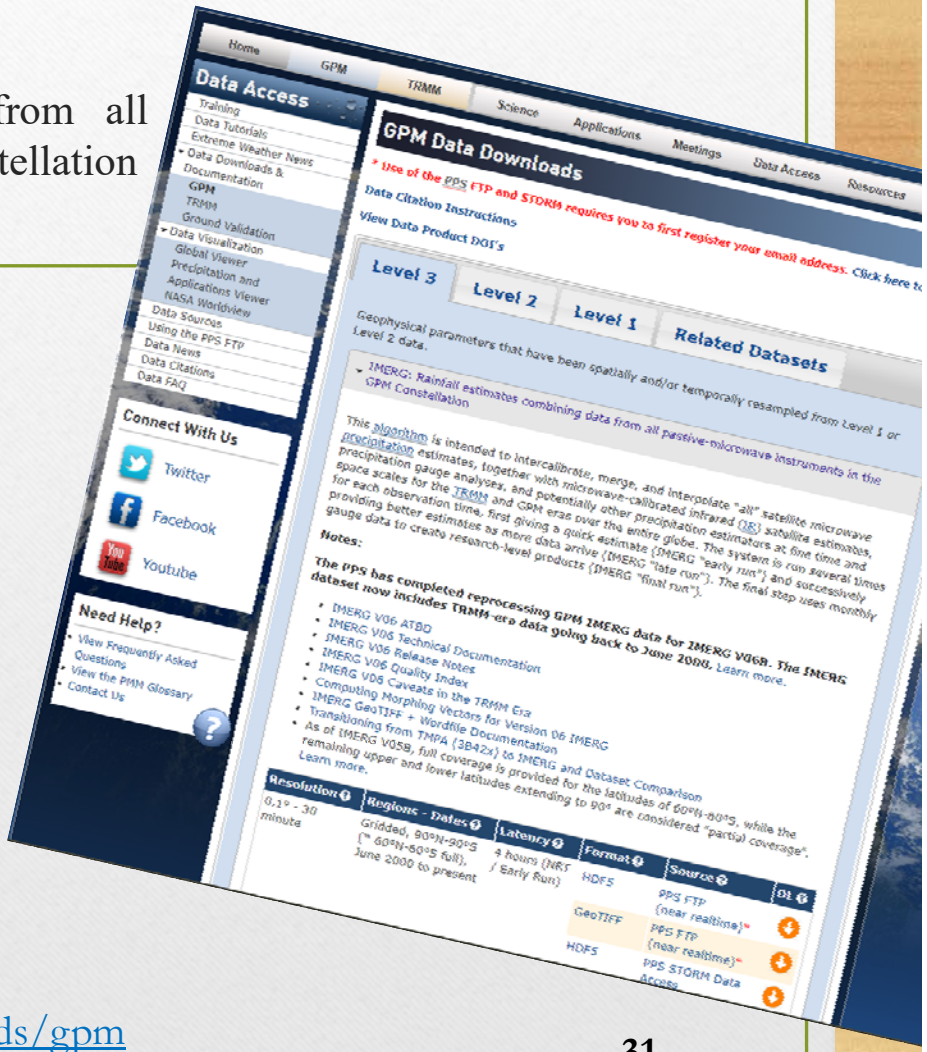
Data	Full Name	Data Period	Coverage	Pixel Size (km^2)	Time Step
PERSIANN	The current operational PERSIANN	Mar 2000 - Present	60°S to 60°N	25x25	1, 3, 6 hourly, daily, monthly, yearly
PERSIANN CCS	Cloud Classification System	Jan 2003 - Present	60°S to 60°N	4x4	1, 3, 6 hourly, daily
PERSIAN CDR	Precipitation Estimation from Remotely Sensed Information using Artificial Neural Networks - Climate Data Record	Jan 1983 - Present	60°S to 60°N	25x25	daily, monthly, yearly

URL: https://chrsdata.eng.uci.edu/

Integrated Multi-satellitE Retrievals for GPM (IMERG)

IMERG: rainfall estimates combining data from all passive-microwave instruments in the GPM Constellation

- Coverage: 60S-60N, 90S-90N (gridded)
- Pixel Size (km^2): 10x10
- Time Step: 30 minutes, 3 hourly & daily
- Data sets:
  - 3IMERGHH/3IMERGM Final Run (multisatellite-gauge combination)
  - 3IMERGL Late Run near-real-time
  - 3IMERGE Early Run near-real-time



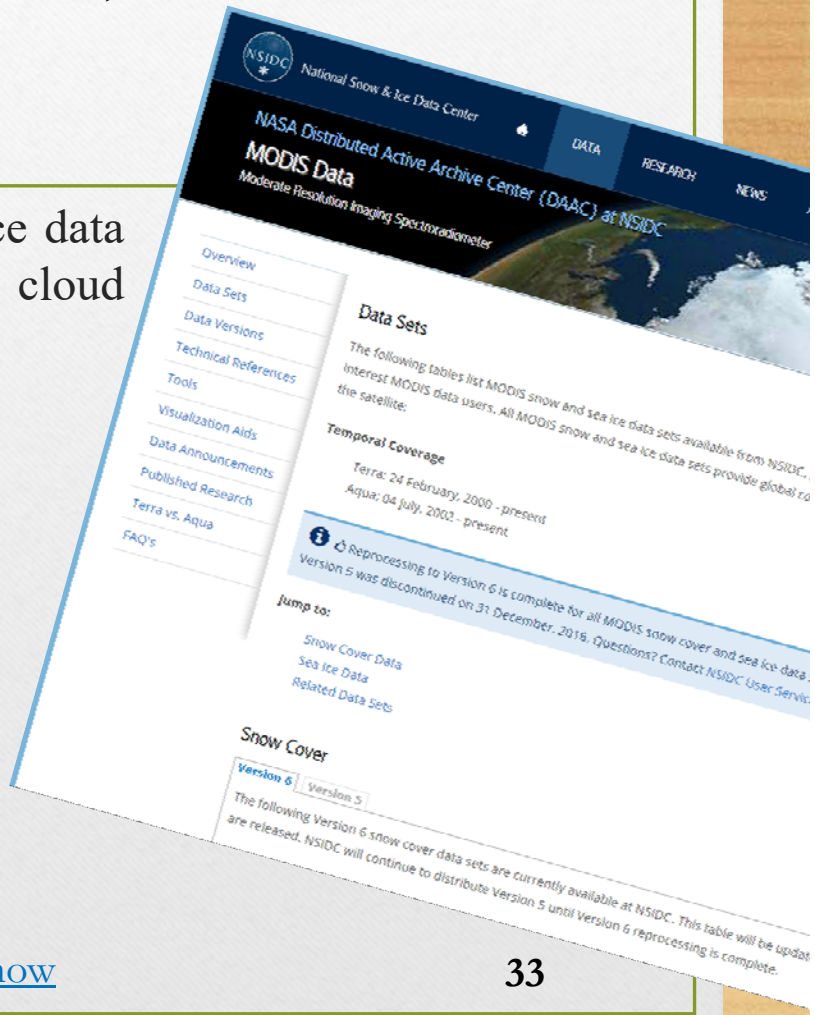
URL: https://pmm.nasa.gov/data-access/downloads/gpm

Snow Cover

Moderate Resolution Imaging Spectroradiometer (MODIS)

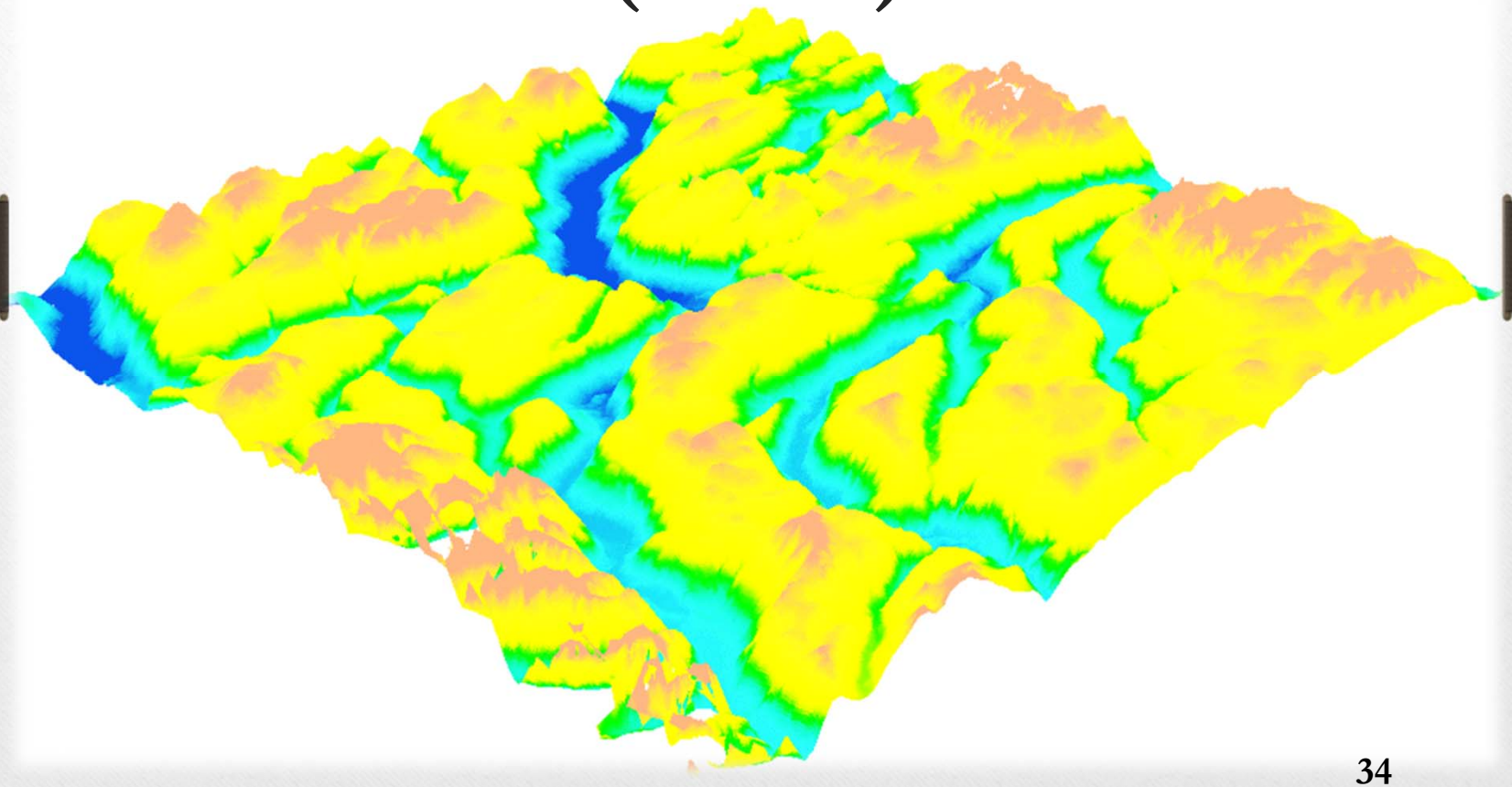
The snow cover algorithm identifies snow-covered land; it also identifies snow-covered ice on inland water.

- Data sources: the MODIS calibrated radiance data products, the geolocation products and the cloud mask products
- Temporal Coverage:
  - Terra: 24 February, 2000 - present
  - Aqua: 04 July, 2002 – present
- Pixel Size (km^2): 0.5x0.5
- Time Step: Sub-daily to monthly



URL: https://nsidc.org/data/modis/data_summaries#snow

Digital Elevation Model (DEM)



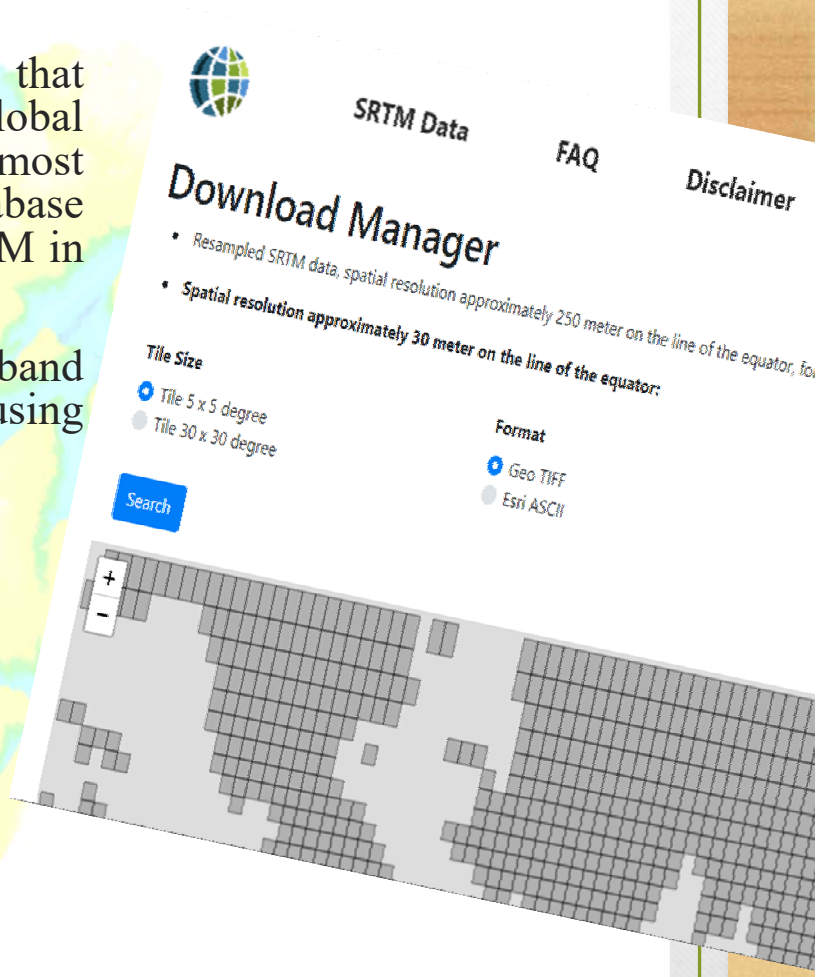
Shuttle Radar Topography Mission (SRTM)

- The SRTM is an international research effort that obtained digital elevation models on a near-global scale from 56°S to 60°N, to generate the most complete high-resolution digital topographic database of Earth prior to the release of the ASTER GDEM in 2009.
- Data source: Spaceborne Imaging Radar-C/X-band Synthetic Aperture Radar (SIR-C/X-SAR) using interferometric synthetic aperture radar (inSAR)
- Spatial Resolution: 30 & 90 meters

URLs:

http://srtm.csi.cgiar.org/srtmdata/

https://urs.earthdata.nasa.gov/users/new



Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER)

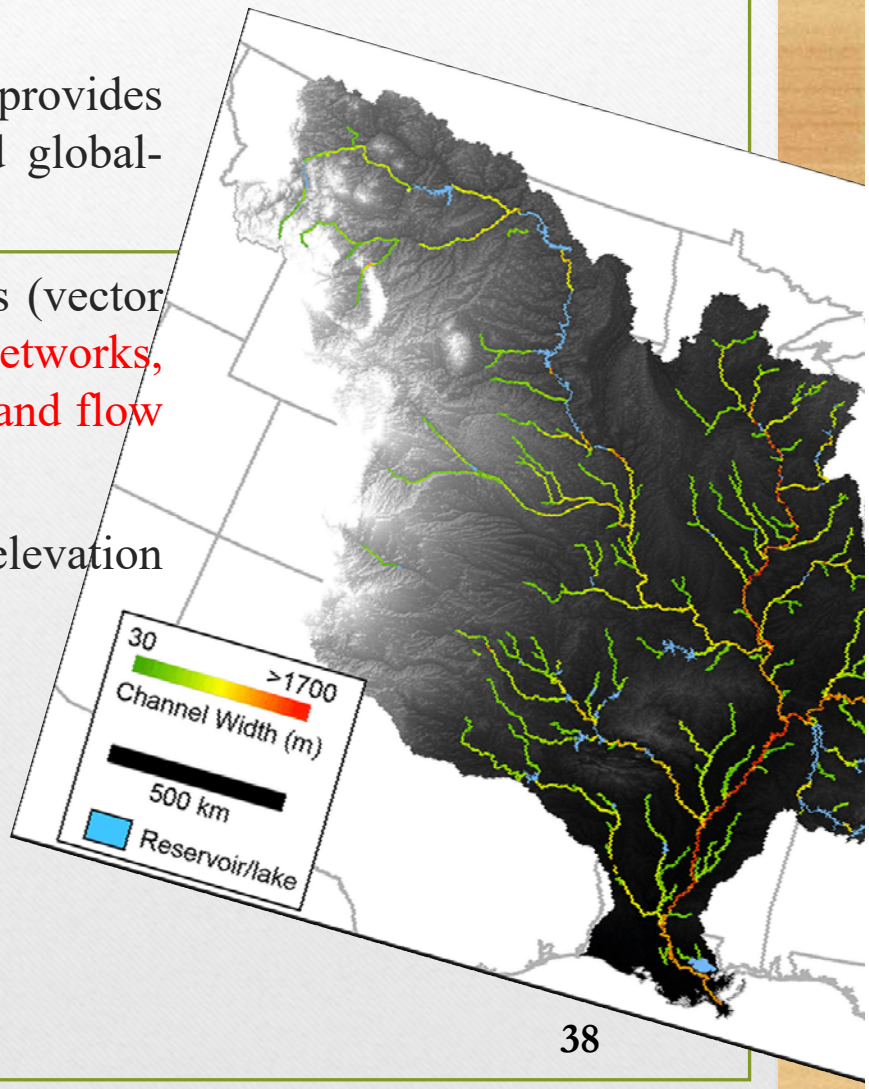
- ASTER Global DEM (GDEM) is an easy-to-use, highly accurate DEM covering all the land on 80% of the earth, and available to all users regardless of size or location of their target areas.
- Data source: stereopairs and photogrammetry to measure elevation
- Spatial Resolution: 30 (USA) & 90 (the world) meters
- ASTER GDEM can be easily used to display a bird's-eye-view map or run a flight simulation, and this should realize visually sophisticated maps.
- ASTER GDEM can be utilized as a platform, so institutions specialized in disaster monitoring, hydrology, energy and environmental monitoring can perform more advanced analysis.
- The amount of cloud cover affected the accuracy of ASTER which was not the case for SRTM DEM.
- ASTER GDEM-2 is considered a more accurate representation than the SRTM elevation model in rugged mountainous terrain.

URL: https://asterweb.jpl.nasa.gov/gdem.asp

Digital River Network

Hydrological data and maps based on SHuttle Elevation Derivatives at multiple Scales (HydroSHEDS)

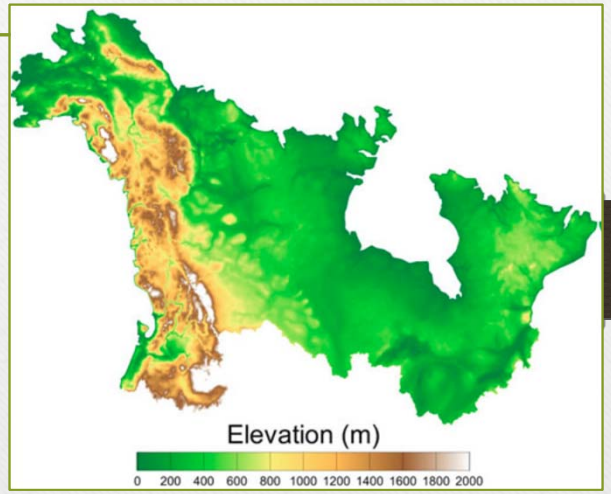
- HydroSHEDS is a mapping product that provides hydrographic information for regional and global-scale applications in a consistent format.
- It offers a suite of geo-referenced data sets (vector & raster) at various scales, including river networks, watershed boundaries, drainage directions, and flow accumulations.
- HydroSHEDS is based on high-resolution elevation data, SRTM.



URL: http://hydrosheds.cr.usgs.gov/

HYDRO1K: A global hydrologic database derived from 1996 GTOPO30 data

- HYDRO1k is a geographic database developed to provide comprehensive and consistent global coverage of topographically derived data sets, including streams, drainage basins and ancillary layers derived from the USGS' 30 arc-second digital elevation model of the world (GTOPO30).
- HYDRO1k provides a suite of geo-referenced data sets, both raster and vector, which will be of value for all users who need to organize, evaluate, or process hydrologic information on a continental scale.



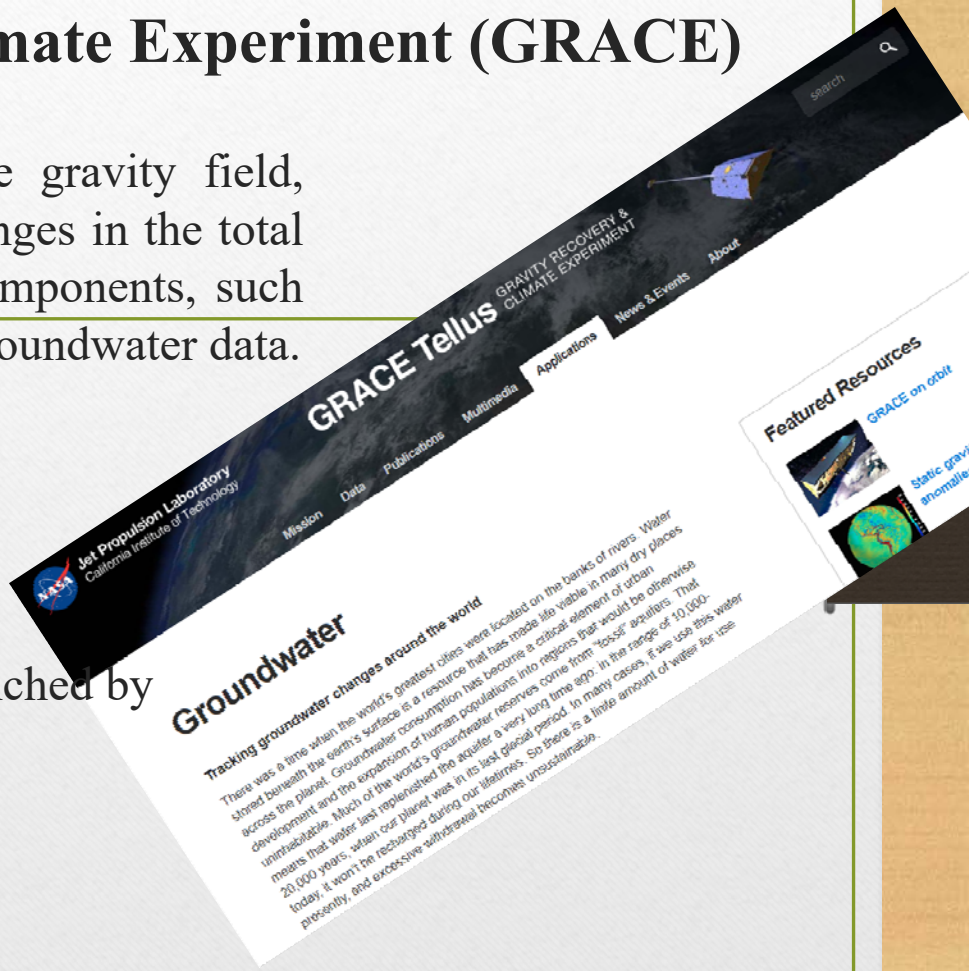
Topographic elevations derived from HYDRO1K (USGS) for the Canadian Continental Basin (CCBM) model.

URLs:
https://lta.cr.usgs.gov/HYDRO1K
http://eros.usgs.gov/#/Find_Data/Products_and_Data_Available/gtopo30/hydro

Groundwater

Gravity Recovery and Climate Experiment (GRACE)

- The time-variable component of the gravity field, which can be written in terms of changes in the total water storage. By removing other components, such as soil moisture, GRACE can show groundwater data.
- Coverage: Global
- Pixel Size (km^2): 50x50
- Time Step: weekly, monthly and daily
- End of the Mission: October 2017, lunched by GRACE-FO (Follow up) in May 2018

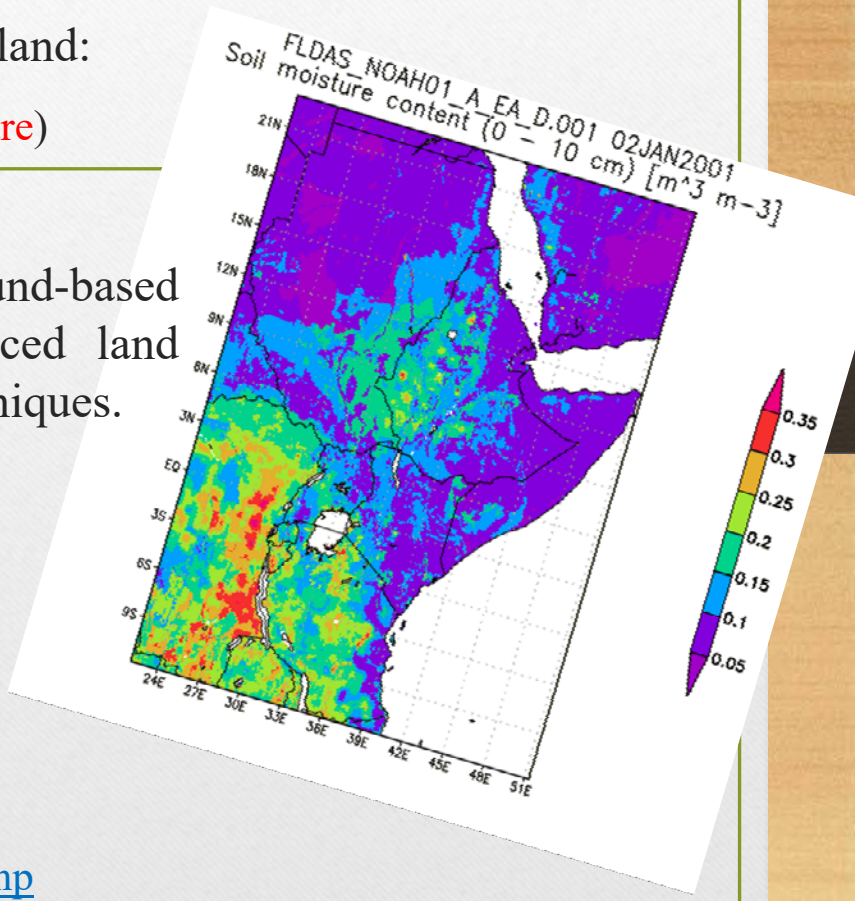


URL: https://grace.jpl.nasa.gov/data/get-data/

Soil Moisture and Temperature

LDAS: Land Data Assimilation Systems

- LDAS aim to produce high quality fields of land:
  - ✓ Surface states (e.g., soil moisture, temperature)
  - ✓ Fluxes (e.g., evapotranspiration, runoff)
- By integrating satellite- and ground-based observational data products, using advanced land surface modeling and data assimilation techniques.



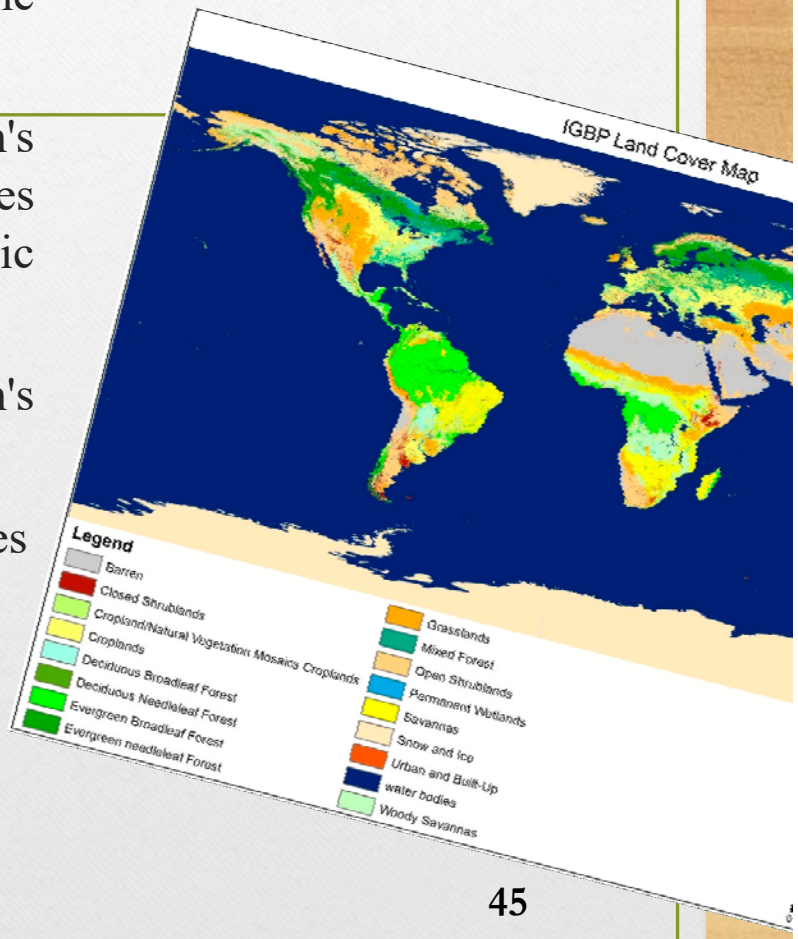
URL: https://ldas.gsfc.nasa.gov/gldas/GLDASsoils.php

Land Cover and Soil Type

International Geosphere-Biosphere Programme (IGBP)

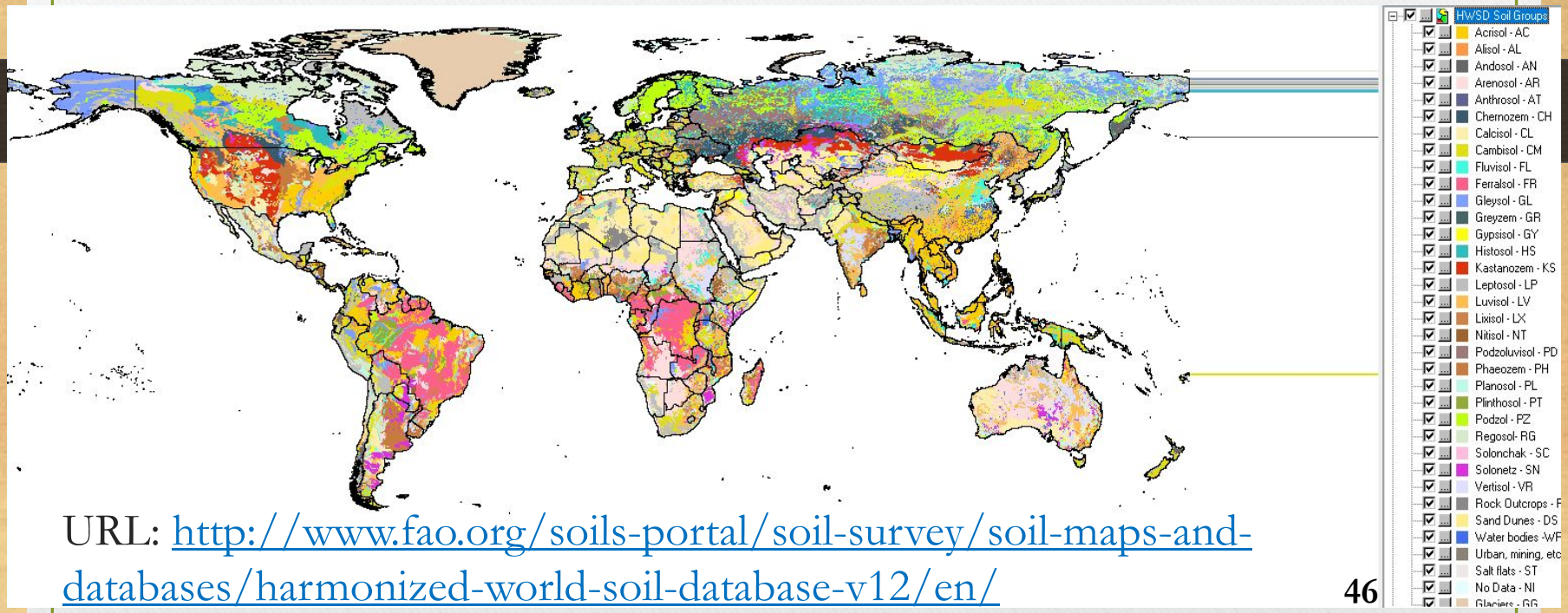
- Land use map as an important input for some hydrological models like TOPMODEL
- IGBP views the earth system as the earth's natural physical, chemical and biological cycles and processes and the social and economic dimensions.
- Data source: the CERES (Clouds and Earth's Radiant Energy System)10-minute data
- Raster file including 17 different land use classes
- Pixel Size (km^2): 1x1

URL: http://www.igbp.net/



HWSD: Harmonized World Soil Database

- Spatial resolution: 30 arc-second, approximately 1 (km)
- Geographic longitude: 180°W to 180°E
- Geographic latitude: 90°S to 90°N
- Data source: existing regional and national updates of soil information worldwide (SOTER, ESD, Soil Map of China, WISE) and the information contained within the 1:5 000 000 scale FAO-UNESCO Soil Map of the World (FAO, 1971-1981).

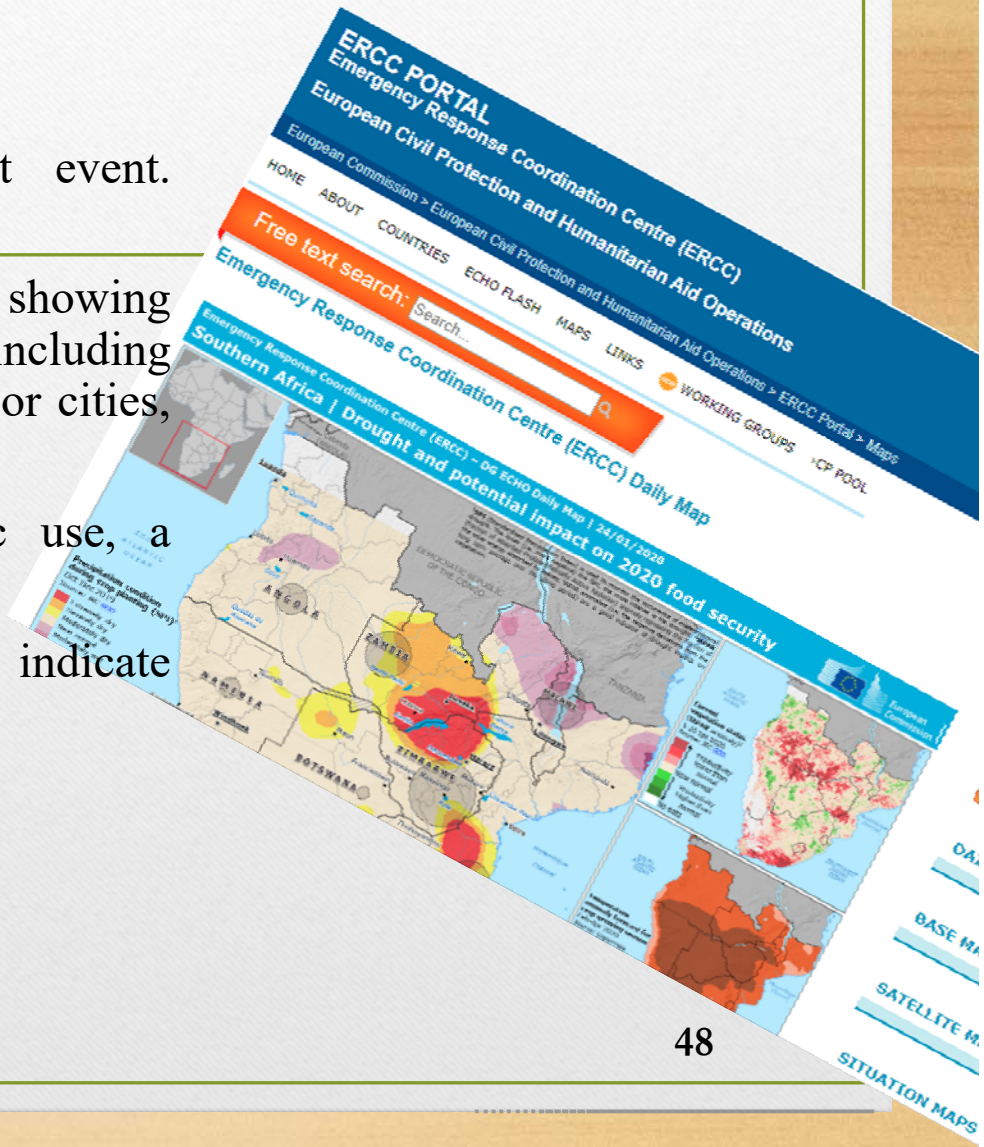


URL: http://www.fao.org/soils-portal/soil-survey/soil-maps-and-databases/harmonized-world-soil-database-v12/en/

Other

ERCC PORTAL: Emergency Response Coordination Centre

- Daily maps: The most important event. Available to the public.
- Base maps: Map of a country or area showing typical geographical information, including borders, administrative divisions, major cities, roads and disputed areas
- Satellite maps: Not for the public use, a satellite view of earth.
- Situation maps: These maps indicate anthropogenic data of regions.



URL: rccportal.jrc.ec.europa.eu/Maps


RCUWM-Tehran is one of the most active Category II Centre's of UNESCO and Secretariat to International Drought Initiative
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(under the auspices of UNESCO)
Regional Centre on
Urban Water Management - Tehran
(under the auspices of UNESCO)
established February 2002

Thank You