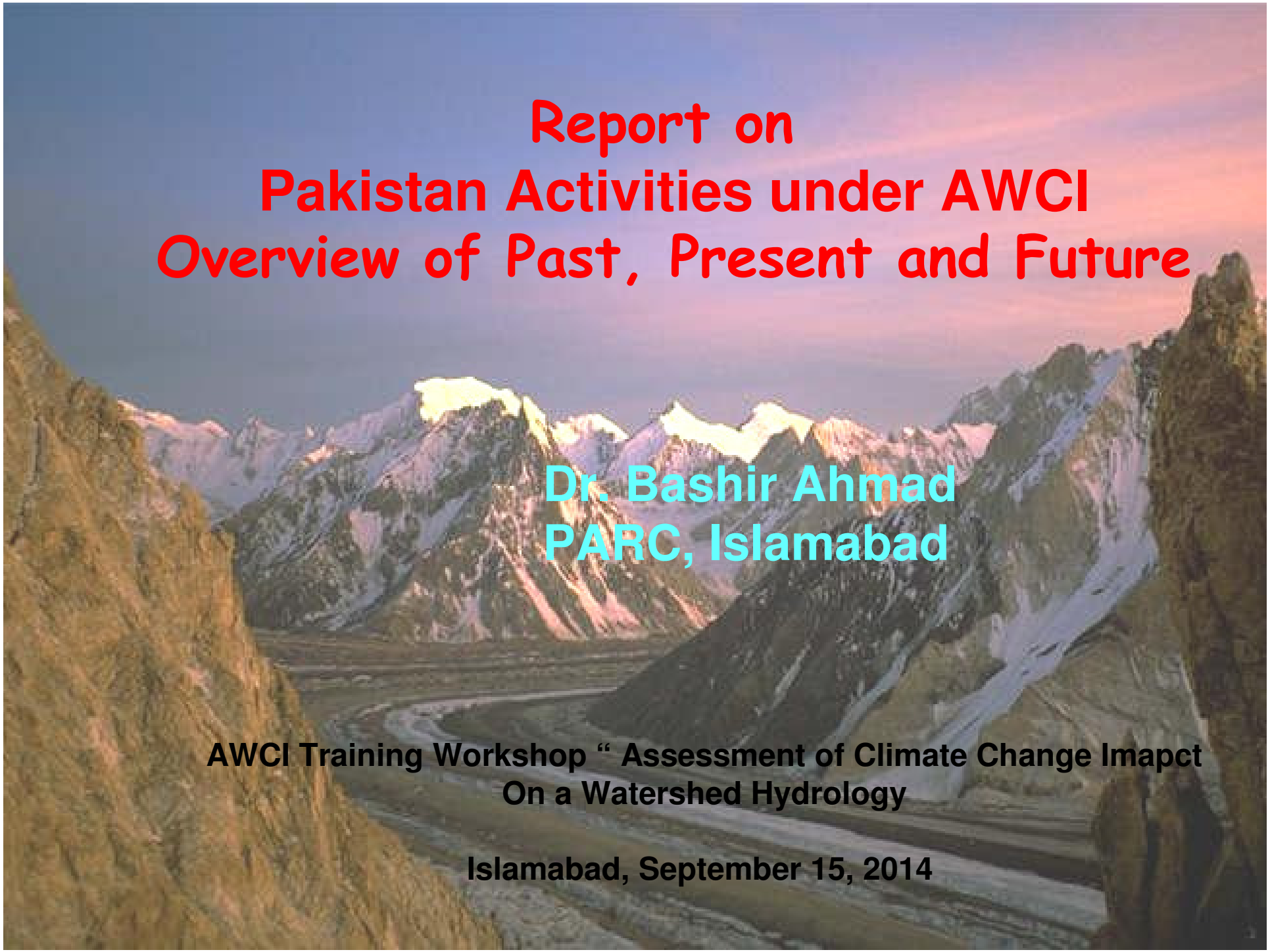


Report on
Pakistan Activities under AWCI
Overview of Past, Present and Future

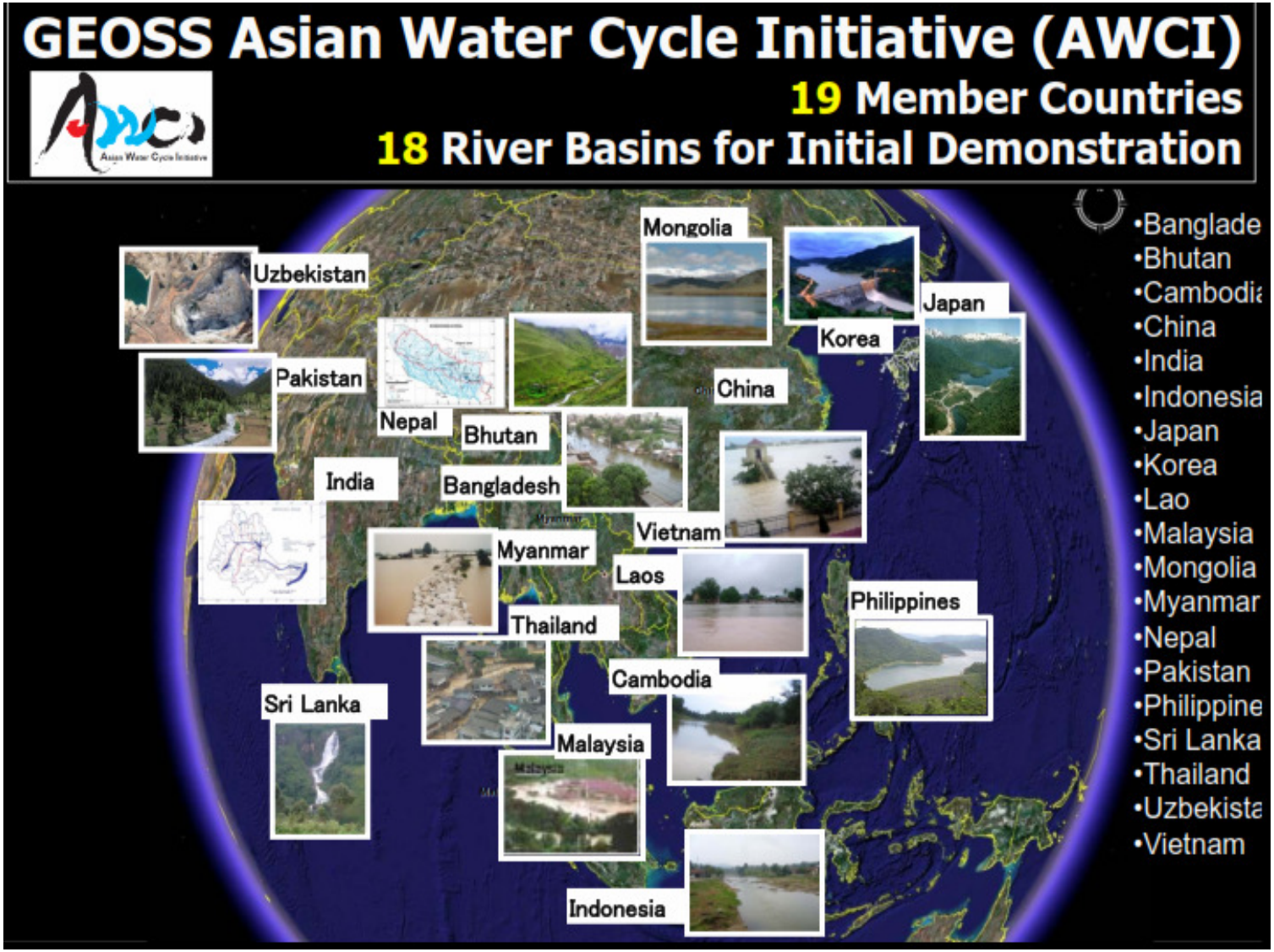
Dr. Bashir Ahmad
PARC, Islamabad

AWCI Training Workshop " Assessment of Climate Change Imapct On a Watershed Hydrology

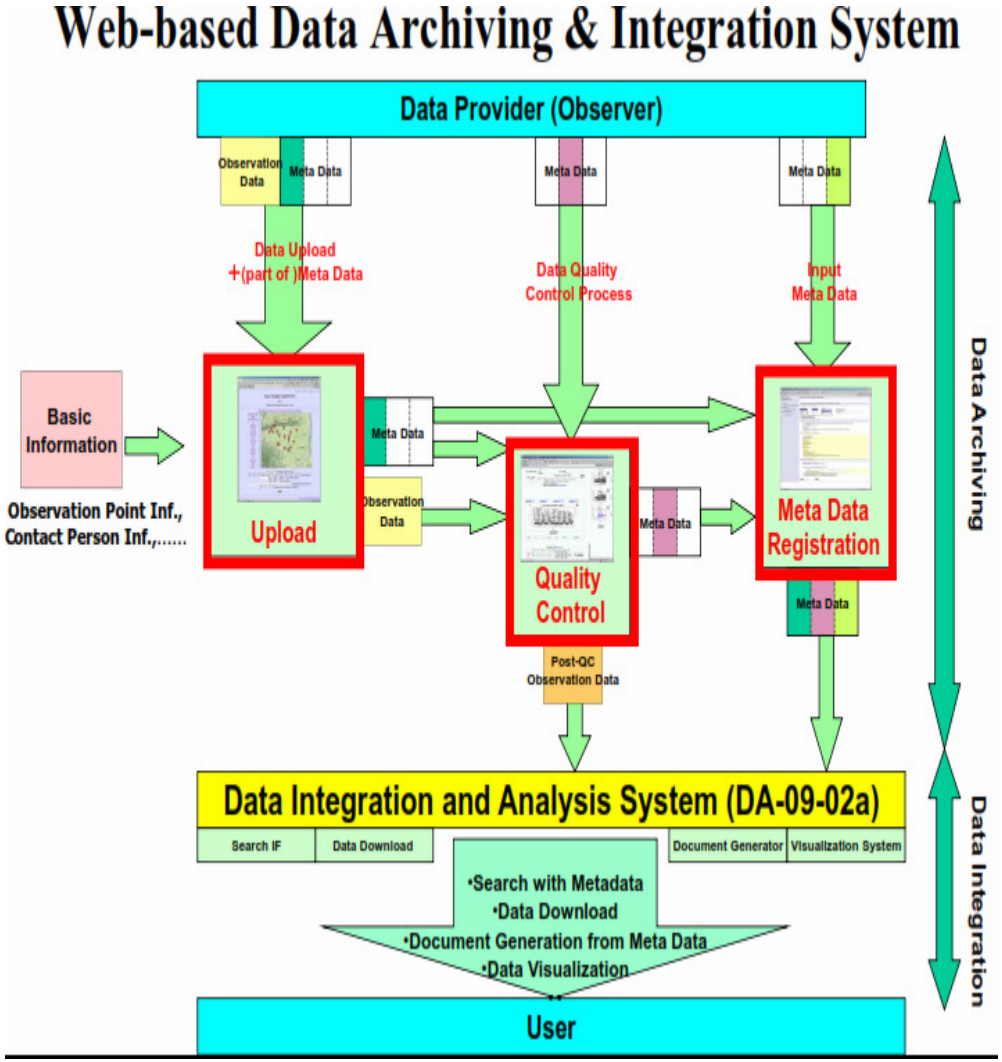
Islamabad, September 15, 2014

- **Founder and important member of AWCI**

Participated and contributed in most of activities

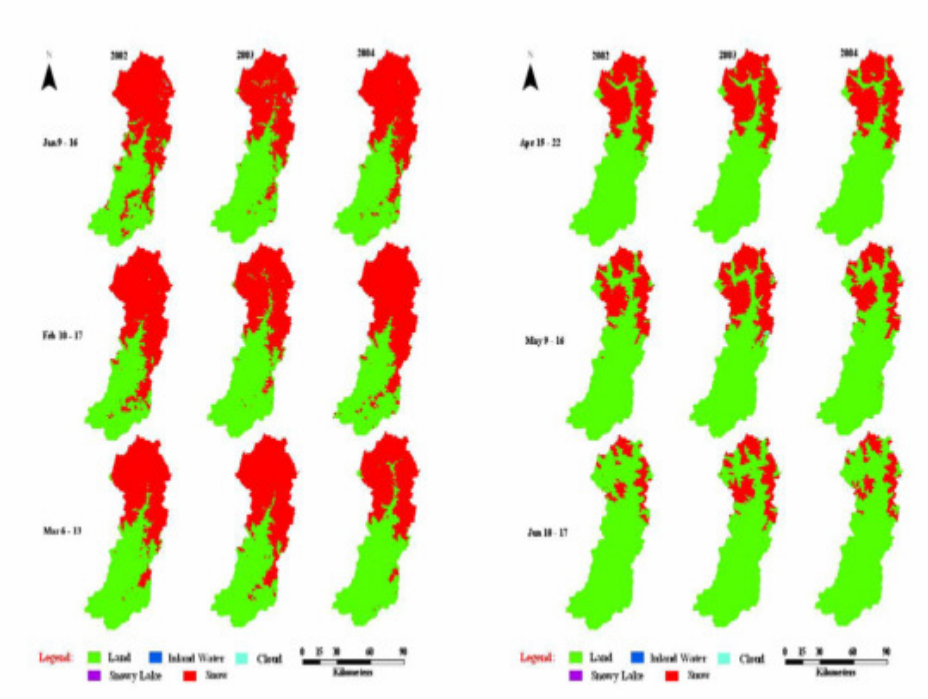


Past Activities



- **Initially Swat Basin was selected as demonstration in 2006**
- **Hunza Basin was selected as demonstration basin in 2010 due to disturbances in Swat**
- **Web-based Data Archiving & Integration System were developed**
- **Uploaded 17 stations data of various hydro-met parameters on daily scale from 2000-04**

Cryosphere Monitoring and Modelling for Water Resources assessment



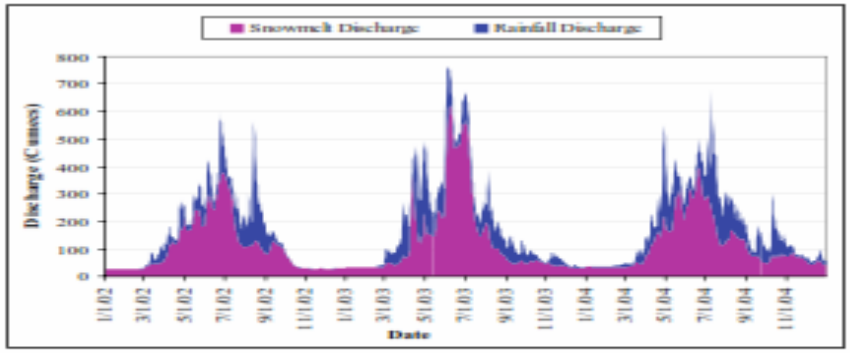
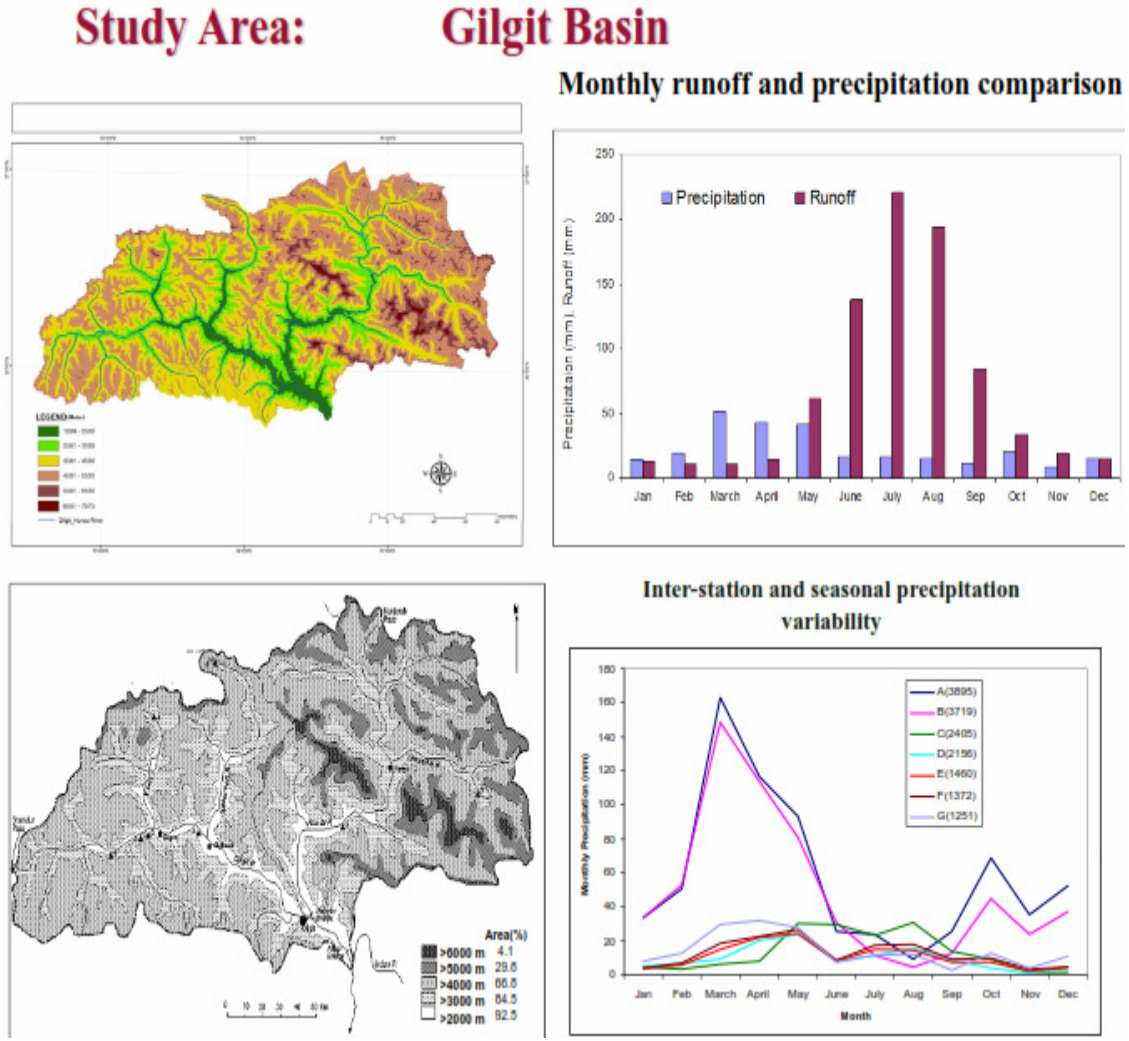


Fig. 9. Computed snowmelt and rainfall runoff components.

- **Initiated efforts on distributed hydrological modelling using global data sets**
- **Snowcover distribution using MODIS data**
- **Snowmelt runoff models were successfully developed for SWAT and Gilgit Hunza Basins**
- **Problems was:**
  - **Identification and classification of clean and debris cover glaciers**
  - **glaciermelt assessment**

Cryosphere Monitoring and Modelling for Water Resources assessment



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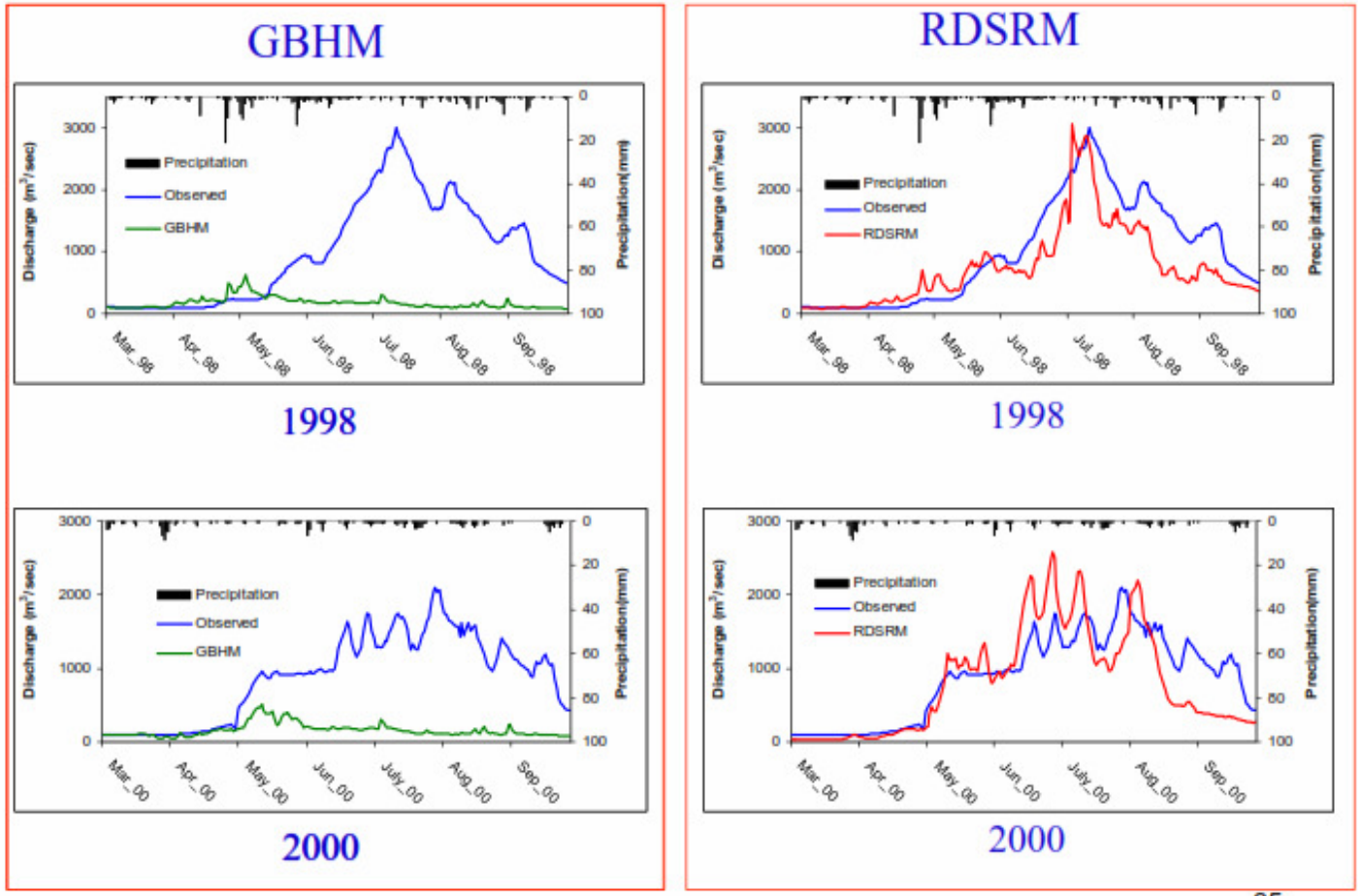
Cryosphere Monitoring and Modelling for Water Resources assessment

Discharge Results: Gilgit River at Alam



35

- **GBHM** – Meteorological data based distributed hydrological model
- **RDSRM** – Remote sensing based distributed snowmelt runoff model

Cryosphere Monitoring and Modelling for Water Resources assessment

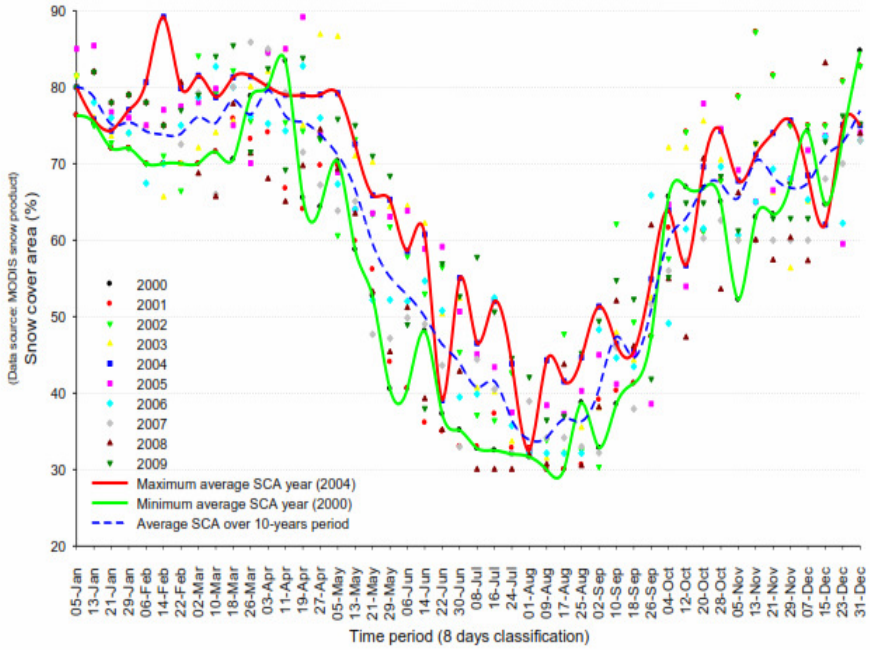


Fig. 6. Percentage snow cover area (SCA) in the Hunza River basin calculated by analysing 450 MODIS (MOD10A2)

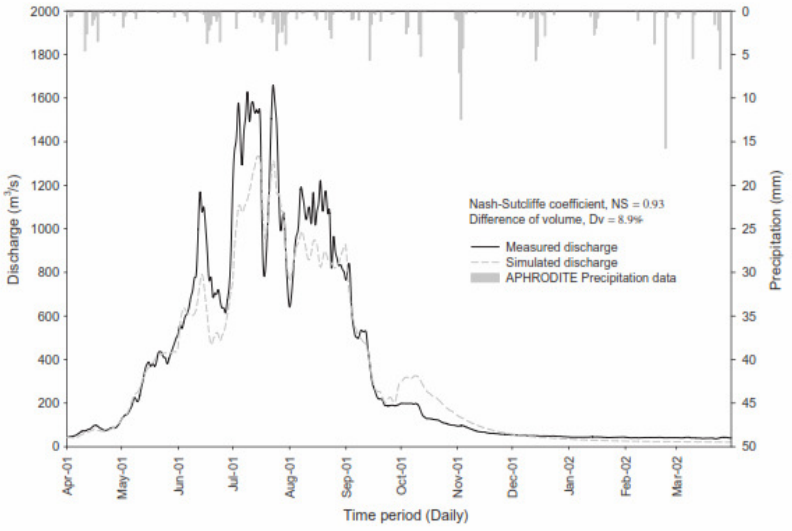
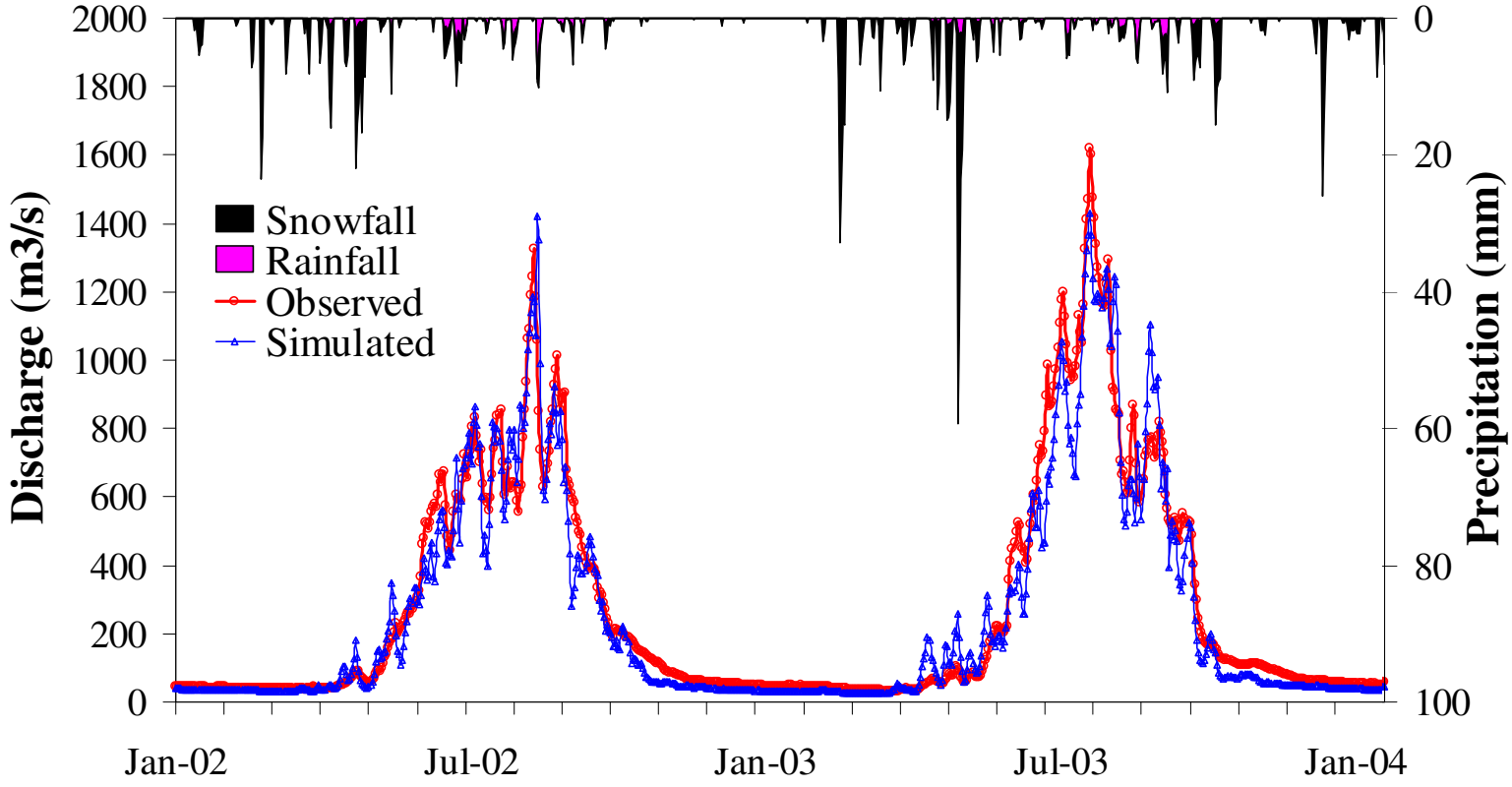


Fig. 9. Evaluation of the basin-wide SRM application over the hydrological year 2001–2002 in the Hunza River basin using APHRODITE precipitation data.

Development of water and energy budget based hydrological model for rainfed, snow and glacierized river basins; Applications at Hindukush Karakoram Himalaya (HKH) basins (Hunza)

Development of water and energy budget based hydrological model for rainfed, snow and glacierized river basins; Applications at Hindukush Karakoram Himalaya (HKH) basins (Hunza)

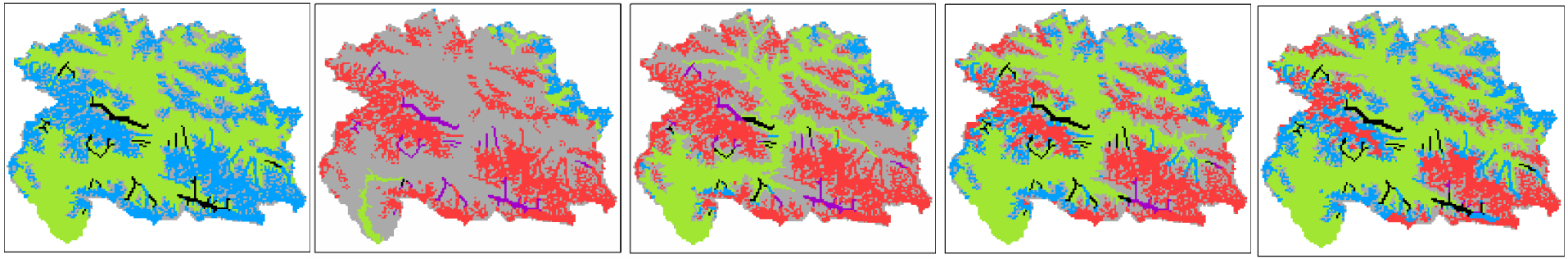
By Maheswor Shrestha and Toshio Koike



	Contribution to Discharge			Statistics		
Year	Rainfall	Snow melt	Glacier melt	NSE	MBE	R^2
2002	12%	35%	53%	0.92	+4.56%	0.97
2003	10%	40%	50%	0.94	+3.65%	0.97

Snow and Glacier Cover @ Hunza Basin, Upper Indus

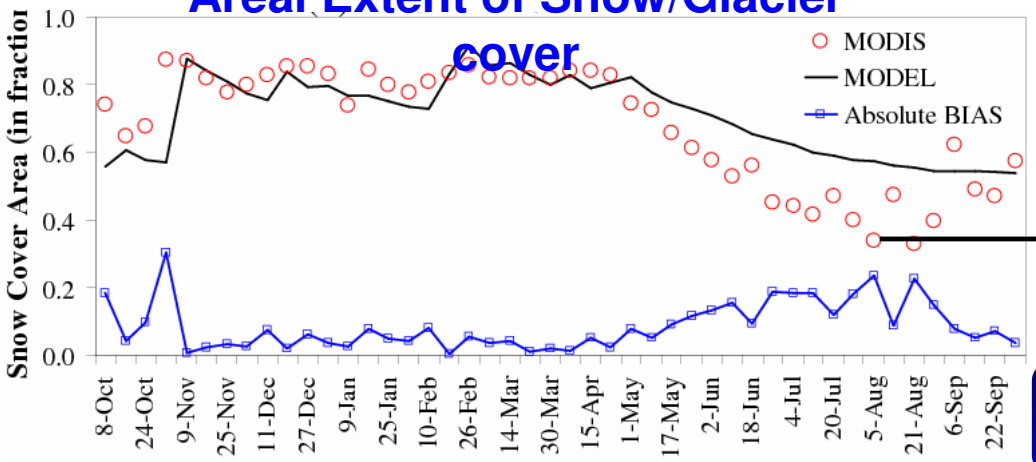
Model Output (Year 2002)



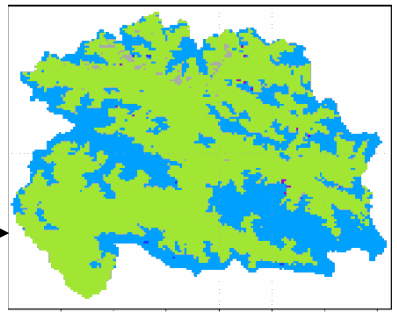
Initial Condition (Inventory-ICIMOD) | Feb. 24 | May 18 | Jul. 12 | Sep. 30

Land
Snow over Land
Clean glacier
Snow over clean glacier
Debris covered glacier
Snow over debris glacier

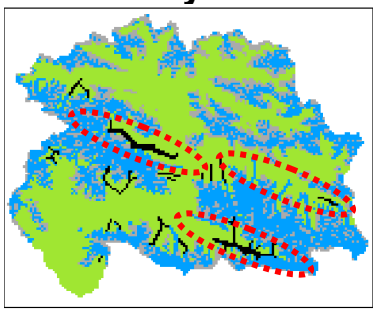
Areal Extent of Snow/Glacier cover



MODI



Inventory



MODIS was unable to capture debris covered glaciers and low altitude

From Maheswor Shrestha and Toshio Koike

AWCI Drought Working Group

- Drought monitoring system development by integrating in- situ data, satellite data and numerical model output
- Developing the early warning system of drought hazard in member countries
- Building up drought monitoring and researching network of member Asian countries for AWCI
- Providing and sharing the soil moisture and other meteorological data of the ground-based and satellite monitoring
- Climate change impact assessment on hydrological regime in a semi-arid river basin
- Assesment of economical impact of drough through modeling (presently)

AWCI Flood Working Group

- Capacity building in on state-of-the-art hydrological models such as UT-GBHM, ICHARM-IFAS(PWRI & BTOP), and application in Kabul and Hunza Basins
- Rainfall forecasting (downscaling from global numerical weather forecast data)
- Considered the characteristics & the possible change of flood characteristic s (frequency, magnitude, etc.) induced by climate change
- Assesment of economical impact of floods through modeling (presently)

Ongoing AWCI Activities -Pakistan

- **APN CAPaBLE "Impact of Climate Change on Glacier Melting and Water Cycle Variability in Asian River Basins"**
  1. To improve the Climate Change Assessment and downscaling techniques
  2. Building the capacity of member countries for the finest temporal and spatial Climate projections (10km at 5 year interval) for glacierized mountains of Asia.
  3. Assessment of Glacier melt and Hydrological regime shift in the light of Climate Change scenarios
  4. Assessment of Water Cycle variability and development of drought early warning system
- **Safe Prototyping by JAXA "Monitoring Water Cycle Variations and Assessing the Climate Change Impacts on them in Pakistan**

Future Projects -Pakistan

- **Improving skills on evaluating climate change impacts on agriculture in drought/flood prone areas of South Asia (Submitted)**
  1. Improving skills to analyse climate change impact on agriculture in drought/flood prone areas of South Asia (tools and methodologies)
  2. Capacity building and improving linkages of scientists on improved climate change risk mitigation strategies
- **Improving water cycle observations and prediction of meteorological and hydrological disasters in Pakistan (Proposed)**
  3. Demonstrate improvement of water cycle observations.
  4. Demonstrate capability of flood and drought forecast and early warning
  5. Assess climate change impacts on floods, droughts, water-nexus and food security (agriculture, in particular)

Here major focus would be on developing land-vegetation scheme in hydrological modeling for irrigation simulations and crop productivity assessment