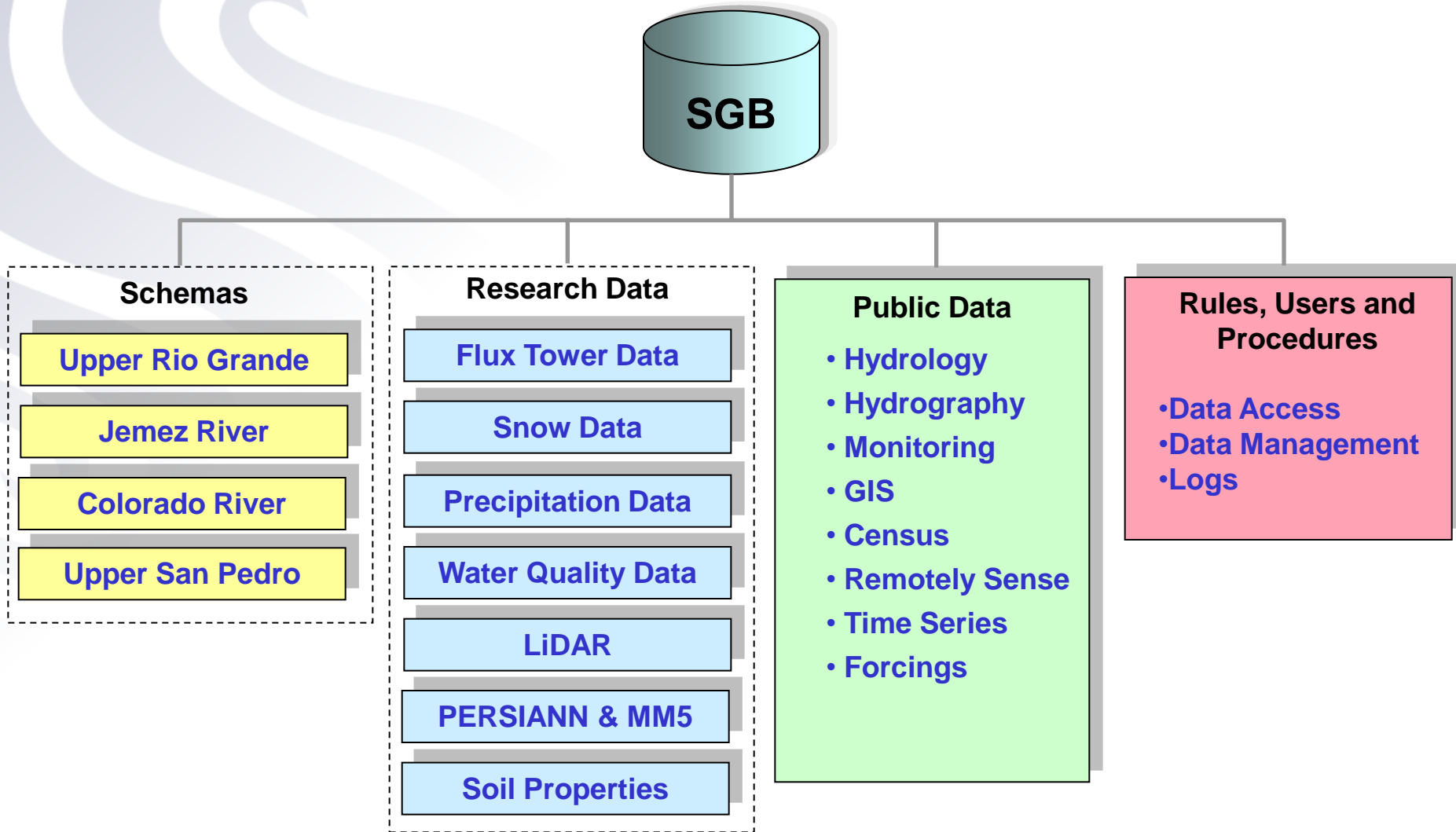


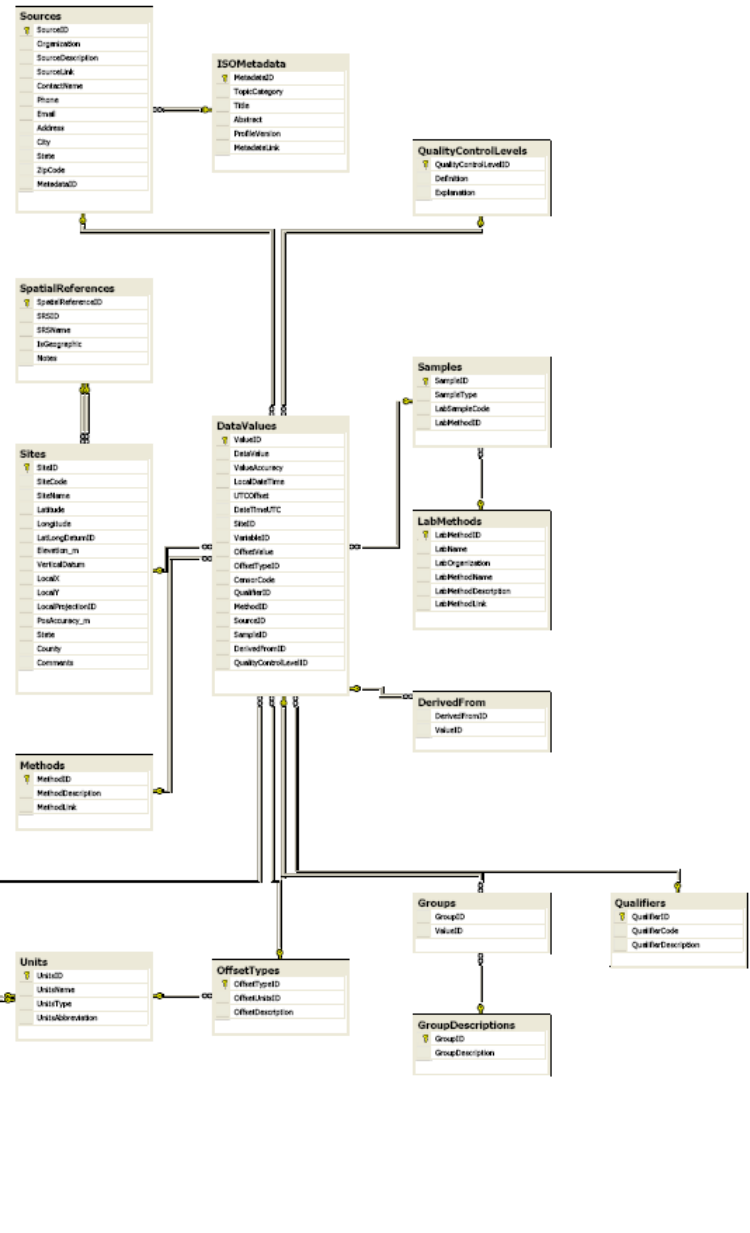
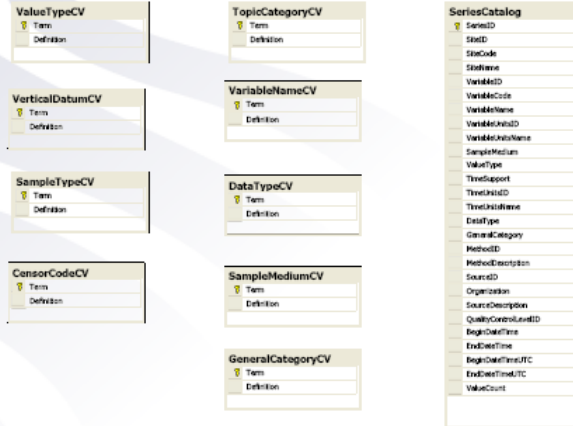
Focus Areas



Geo-database Structure



Database Schema



- **Source**

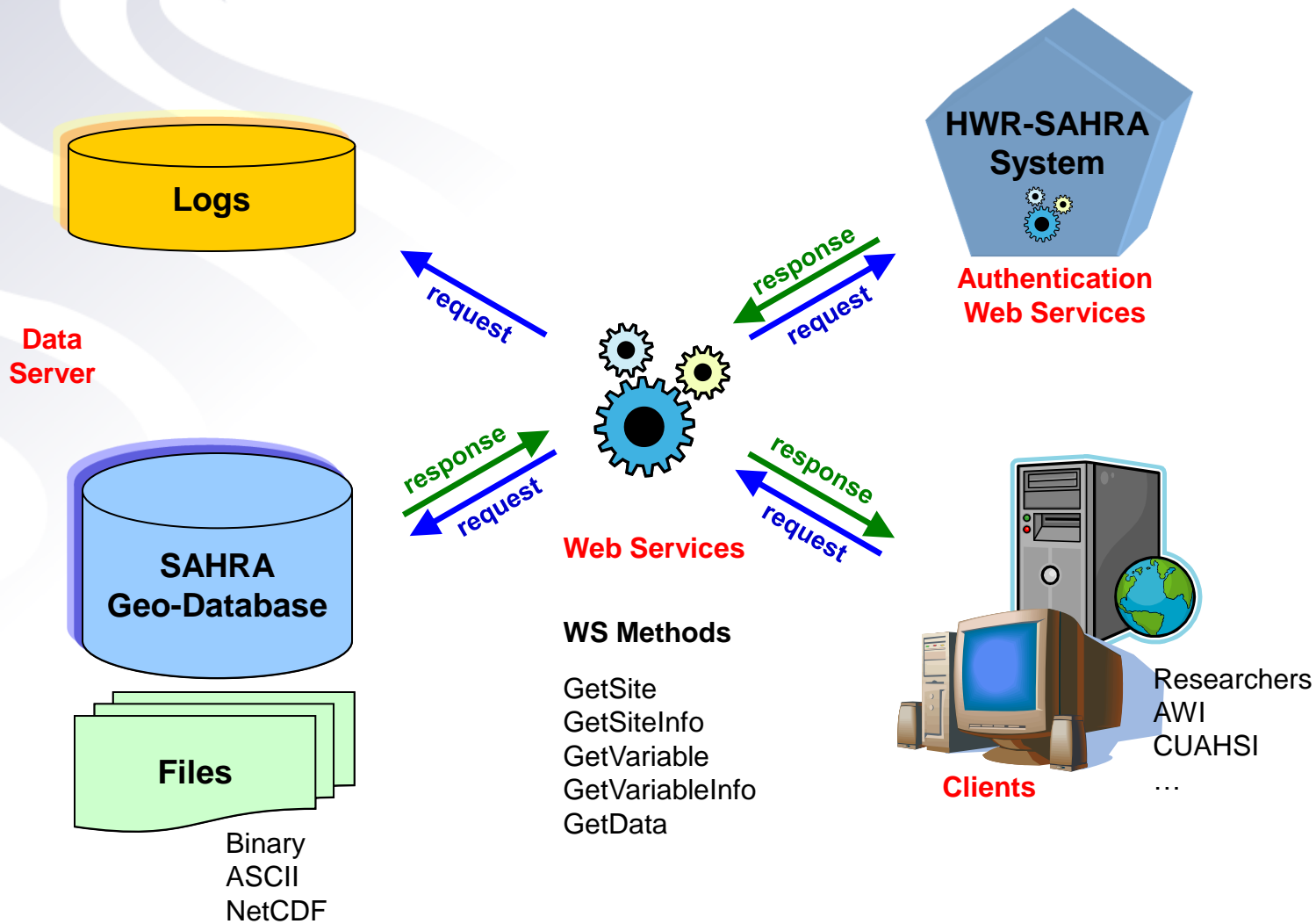
- CUAHSI Observation Data Model (ODM)
- SQL Server
- <http://www.cuahsi.org/his/odm.html>

- **Implementation**

- Oracle Database



Geo-database Architecture

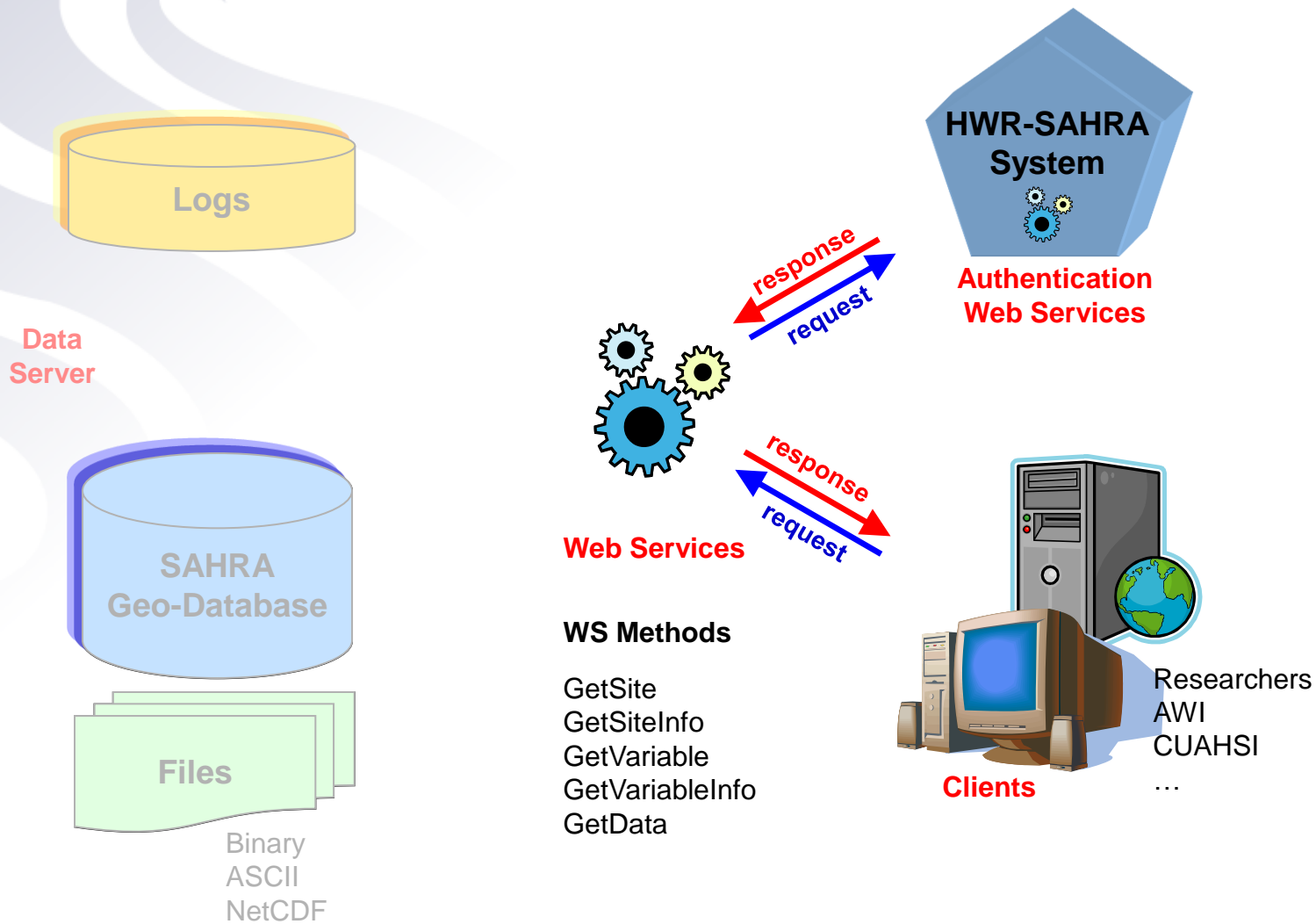


WS Methods

- GetSite
- GetSiteInfo
- GetVariable
- GetVariableInfo
- GetData



Geo-database Architecture



Public Data

Data	Source	Time Stamp
Stream Flows	USGS	Daily/15 min
GW Levels	USGS	Irregular/daily/15 min
Precipitations, Temperatures	NOAA	Daily/Hourly
Reservoir operations	B of R	Monthly/daily
Water quality	USGS	Irregular
SWE	NRCS	Daily/monthly
<i>Prec, Temp, Press, Wind, Rad, RH</i>	EPG - FH	15 min



SAHRA Research Data

Data	Source	Time Stamp
<i>Range coverage/utilization</i>	VCNP	Irregular
<i>Cond, pH, Turb, O</i>	VCNP	15 min
<i>Water chemistry</i>	VCNP	Irregular
<i>Water chemistry and stage</i>	SAHRA	irregular
<i>Stream Flow</i>	SAHRA	10 min
<i>Met/flux dataset</i>	LTER	1 hour
<i>Pressure transducer</i>	SAHRA	10 min
<i>Flux tower data</i>	SAHRA/USDA	5/15/30 min
<i>Rio Grande water chemistry</i>	SAHRA	Irregular
<i>Hueco geo-chemical data</i>	SAHRA/CEA-CREST	Irregular
<i>San Pedro water quality</i>	SAHRA	Irregular
<i>San Pedro surface water chemistry</i>	SAHRA	Irregular
<i>San Pedro LiDAR</i>	SAHRA	2003



Public Gridded Datasets

Source	North American Regional Reanalysis	University of Washington Maurer et al. (2002)	UofW Daily Gridded Met Datasets	GRACE	TRMM
Availability	1979 - 2006	1950 - 2000	1949 – 2005 Maurer et al. 1915 – 2003 Hamlet et.al	2003 - 2006	1998-2007
Timporal Resolution	3 hours	3 hours	1 day	1 month	3 hours
Spatial Resolution	32 km, 0.25 degree	0.125 and 0.25 degree	0.125	1 degree	0.25 degree
Data Format	ASCII, binary	NetCDF, ASCII, binary	Binary	ASCII	Bin, ASCII
Basin	Colorado Upper Rio Grande	Colorado Upper Rio Grande	Colorado	Global	Global
Variables	Precipitation Temperature Air pressure Specific humidity Dwn shortwave rad Dwn longwave rad Zonal wind speed Meridional wind speed Evaporation Potential Evaporation Precip Water Water Vapor Conv Accum Snow Soil Moisture	Precipitation Temperature Relative humidity Net shortwave rad Dwn longwave rad Wind speed Albedo	Minimal Temperature Maximal Temperature Precipitation Wind speed	Mass anomalies	Precipitation



SAHRA Gridded Climate Datasets

Source	MM5	PERSIANN	SWE
Availability	1999 - 2005		1995 - 2002
Timporal Resolution	1 hour	1 hour	irregular
Spatial Resolution	4 km	0.04 degree	1 km
Data Format	Binary, (NetCDF)	Binary, DB	Arc Grid
Basin	Upper Rio Grande	135W - 65W 50N - 10N	Colorado, Rio Grande
Variables	Precipitation Temperature Air pressure Specific humidity Dwn shortwave rad Dwn longwave rad Zonal wind speed Meridional wind speed	Precipitation	Snow water equivalent

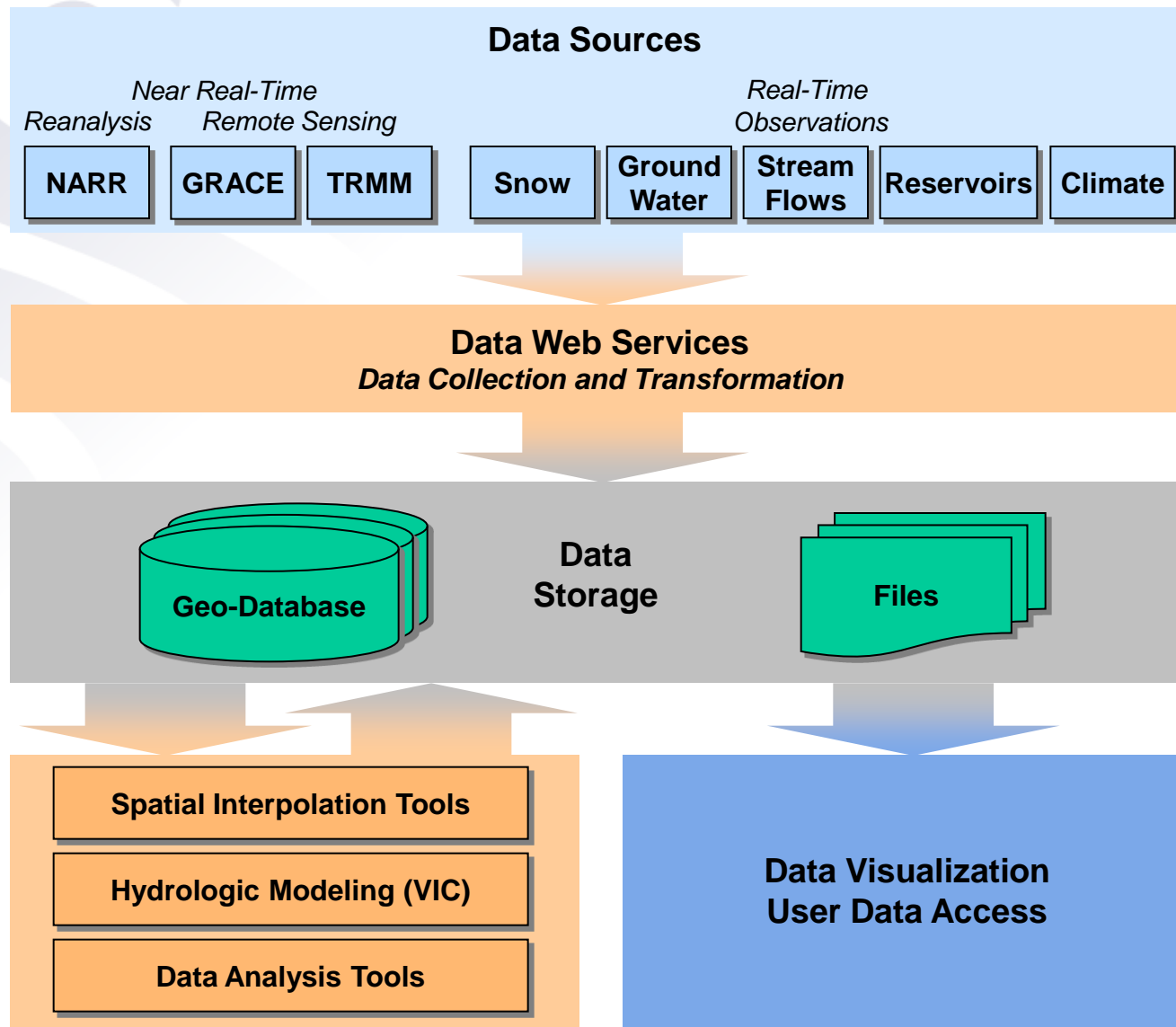


In Progress

- **Implementation of data access for all data stored in the database using SAHRA Data Web Services (WaterOneFlow and WaterML)**
- **Loading research data**
- **Updating existing time series data from the following sources: USGS, USDA-ARS, the US Army, NWS, SnoTel, etc.**
- **Downloading current reanalysis climate data**
- **Development and implementation of customized automated tools**
 - *Connection of hydrologic model (VIC, BSWB, HyMOD) with database*
 - *Automated downloading, analysis and data processing*



Data Processing Schema for TWS



TWS Data Summary

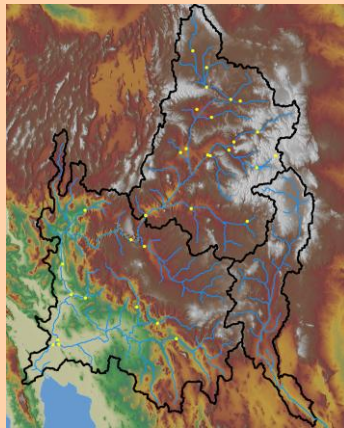
Dataset	Time Step	Source	Number of Active Sites	
			Colorado	Upper RioG
<i>Stream flows</i>	daily	NWIS	431	88
<i>Groundwater levels</i>	daily	NWIS	34	83
<i>SnoTel SWE</i>	daily	NRSC	163	37
<i>SnoTel precipitation</i>	daily	NRSC	163	37
<i>SnoTel temperature</i>	daily	NRSC	163	37
<i>Precipitation</i>	daily	NOAA	384	94
<i>Temperatures (max & min)</i>	daily	NOAA	415	85
<i>NARR reanalysis data</i>	3 hourly	NCEP	758	167
<i>Naturalized flows</i>	monthly	BofR	29	
<i>Groundwater levels</i>	>4 times/year	NWIS	84	283
<i>Snow Course SWE</i>	monthly	NRSC	298	91
<i>Snow Course depth</i>	monthly	NRSC	298	91



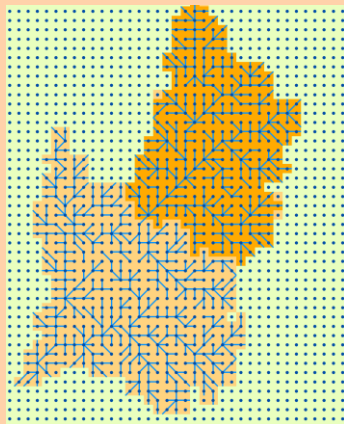
Database and Hydrologic Modeling

SAHRA Geo-database

Spatial Data

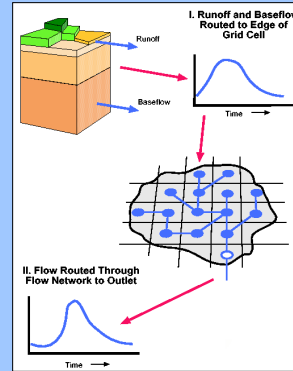


Model Representation

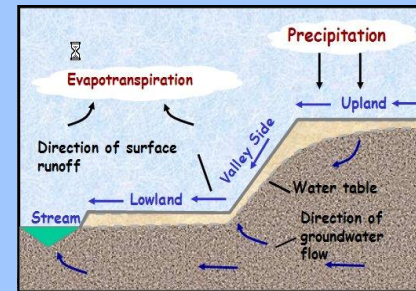


Hydrologic Models

Multi-Resolution Distributed Models



Conceptual Modeling (Hydrologic Landscapes)



TimeSeries - Table	ObsID	Time	Value	QCValue
8903200	21070998	18/5/1999 1:14:00 PM	1.585752	
8903201	21070998	18/5/1999 3:29:00 PM	1.529118	
8903202	21070998	18/5/1999 5:44:00 PM	1.503091	
8903203	21070998	18/5/1999 8:59:00 PM	1.444167	
8903204	21070998	18/5/1999 11:14:00 PM	1.444167	
8903205	21070998	18/5/1999 2:29:00 PM	1.512258	
8903206	21070998	18/5/1999 4:44:00 PM	3.761611	
8903207	21070998	18/5/1999 7:59:00 PM	4.116710	
8903208	21070998	18/5/1999 10:14:00 PM	4.350818	
8903209	21070998	18/5/1999 12:29:00 PM	4.134282	
8903210	21070998	18/5/1999 2:44:00 PM	3.907746	
8903211	21070998	18/5/1999 5:59:00 PM	3.907746	
8903212	21070998	18/5/1999 8:14:00 PM	2.148513	
8903213	21070998	18/5/1999 10:29:00 PM	3.596259	
8903214	21070998	18/5/1999 12:44:00 PM	3.596259	
8903215	21070998	18/5/1999 3:59:00 PM	3.39804	
8903216	21070998	18/5/1999 6:14:00 PM	3.98627	
8903217	21070998	18/5/1999 8:29:00 PM	3.511917	
8903218	21070998	18/5/1999 10:44:00 PM	3.058230	
8903219	21070998	18/5/1999 13:59:00 PM	2.860017	
8903220	21070998	18/5/1999 16:14:00 PM	4.34282	
8903221	21070998	18/5/1999 18:29:00 PM	4.441707	
8903222	21070998	18/5/1999 21:44:00 AM	6.942959	
8903223	21070998	18/5/1999 24:59:00 AM	5.544778	
8903224	21070998	18/5/1999 2:14:00 AM	5.578449	
8903225	21070998	18/5/1999 4:29:00 AM	5.532379	
8903226	21070998	18/5/1999 6:44:00 AM	4.360818	
8903227	21070998	18/5/1999 9:59:00 AM	4.360818	

1979	01	01	00	0.0000	0.0000	0.0000	0.0000	0.0000	21.4213
1979	01	01	01	0.0000	0.0000	0.0000	0.0000	0.0000	21.4178
1979	01	01	02	0.0000	0.0000	0.0000	0.0000	0.0000	21.4132
1979	01	01	03	0.0000	0.0001	0.0000	0.0000	0.0000	21.4051
1979	01	01	04	0.0000	0.0000	0.0000	0.0000	0.0000	21.3992
1979	01	01	05	0.0000	0.0001	0.0000	0.0000	0.0000	21.3911
1979	01	01	06	0.0000	0.0000	0.0000	0.0000	0.0000	21.3829
1979	01	01	07	0.0000	0.0000	0.0000	0.0000	0.0000	21.3748
1979	01	01	08	0.0000	0.0000	0.0000	0.0000	0.0000	21.3667
1979	01	01	09	0.0000	0.0000	0.0000	0.0000	0.0000	21.3586
1979	01	01	10	0.0000	0.0000	0.0000	0.0000	0.0000	21.3505
1979	01	01	11	0.0000	0.0000	0.0000	0.0000	0.0000	21.3424
1979	01	01	12	0.0000	0.0000	0.0000	0.0000	0.0000	21.3343
1979	01	01	13	0.0000	0.0000	0.0000	0.0000	0.0000	21.3262
1979	01	01	14	0.0000	0.0000	0.0000	0.0000	0.0000	21.3181
1979	01	01	15	0.0000	0.0000	0.0000	0.0000	0.0000	21.3100
1979	01	01	16	0.0000	0.0000	0.0000	0.0000	0.0000	21.3019
1979	01	01	17	0.0000	0.0000	0.0000	0.0000	0.0000	21.2938
1979	01	01	18	0.0000	0.0000	0.0000	0.0000	0.0000	21.2857
1979	01	01	19	0.0000	0.0000	0.0000	0.0000	0.0000	21.2776
1979	01	01	20	0.0000	0.0000	0.0000	0.0000	0.0000	21.2695
1979	01	01	21	0.0000	0.0000	0.0000	0.0000	0.0000	21.2614
1979	01	01	22	0.0000	0.0000	0.0000	0.0000	0.0000	21.2533
1979	01	01	23	0.0000	0.0000	0.0000	0.0000	0.0000	21.2452
1979	01	01	24	0.0000	0.0000	0.0000	0.0000	0.0000	21.2371
1979	01	01	25	0.0000	0.0000	0.0000	0.0000	0.0000	21.2290
1979	01	01	26	0.0000	0.0000	0.0000	0.0000	0.0000	21.2209
1979	01	01	27	0.0000	0.0000	0.0000	0.0000	0.0000	21.2128
1979	01	01	28	0.0000	0.0000	0.0000	0.0000	0.0000	21.2047
1979	01	01	29	0.0000	0.0000	0.0000	0.0000	0.0000	21.1966
1979	01	01	30	0.0000	0.0000	0.0000	0.0000	0.0000	21.1885
1979	01	01	31	0.0000	0.0000	0.0000	0.0000	0.0000	21.1804

Temporal Datasets

Visualization



SAHRA



An NSF Science and Technology Center

Data Access – Research Data

- **Geo-database web site**

- http://sahra.arizona.edu/research_data/SAHRAGeoDB/

SAHRA
Sustainability of semi-Arid Hydrology and Riparian Areas
Ensuring water in a changing world

Welcome to the SAHRA GeoDatabase Website!

The SAHRA GeoDatabase

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SAHRA Flux Tower Data

Mt. Bigelow Eddy Correlation Tower

Download selected data:

[Comma Delimited File](#)
[Chart Image](#)

Close Window

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Research (private) data users are required to acknowledge SAHRA, NSF and the data-custodian in any documentation and/or publications, and are encouraged to inform the data-custodian of any data use and publication plans or to offer participation as co-author. The data-custodian should decide the form of his/her written consent from the

I have read and agree to the terms of the SAHRA GeoDatabase Website

*Email/Username: _____

*Password: _____

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If you have an email address different from "@hwr" or "@sahra" you can use the "Public Data" link.

If you forgot this password, [have it emailed to you](#).

If you do not have an username/password, you can use the "Get Values" link.

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Get Values

This method returns a graph image if selected and comma delimited file of flux tower time series for selected site, variable and time period.

Select Site:

OR

Select Variable:

Select Variable:

Select Whole Time period: (if not, specify the start and end time)

Use following date format YYYYMMDD. Selection will include the start and end date.

Enter Start Time:

Enter End Time:

Print time series chart:

Get Values

Close Window

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Research Data Public Data

Last updated on 6-Mar-2007 by [Matej Durcik](#)

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Data Access – Public Data

- **Geo-database web site**

– <http://www.sahra.edu/GeoDB/>

SAHRA Upper San Pedro Precipitation Data **GeoDB/**

Layers

- rainGages
 - AGENCY
 - EPG
 - EPG/USDA
 - NWS
 - USDA-ARS
 - USGS
- HydroEdges
- imageArea
- Watersheds
- Roads
- MXStates
- USStates

Data Web Service

- [Get Variables](#)
- [Get Variables Info](#)
- [Get Sites](#)
- [Get Site Info](#)
- [Get Values](#)
- [Get Chart](#)
- [Get Image](#)

Metadata

- [HTML](#)
- [XML](#)

Help

- [Web Service Methods](#)
- [About Data Access](#)

Data Web Service

custodian(s) in any and all documentation and acknowledgments and kindly inform data-custodian or how data were used. Please, provide [\[RA Data Policy\]](#)

See with the SAHRA data policy.

Address: mdurcik@hwr.arizona.edu

Please note that this application is still under development.

[GeoDB Home](#) [Data Sets Description](#) [Metadata](#)

Last updated on 6-Mar-2005

San Pedro Precipitation Data

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