Group 1: Semi-arid and arid regions
Data differences between rich-scarce

- Precip
- Temp
- Streamflow
- GW levels
- Soil moisture
- SWE
- SCA
- Topography

- Solar radiation/insolation
- Wind
- Land use/cover
- Soil types
- Geology
- Water extractions/use
- Water quality
Group 1: Semi-arid and arid regions
Data differences between rich-scarce

- Precip
- Temp
- Streamflow
- GW levels
- Soil moisture
- SWE
- SCA
- Topography

Solar radiation/insolation

- Wind
- Land use/cover
- Soil types
- Geology
- Water extractions/use
- Water quality
Group 1: Semi-arid and arid regions

Data differences between rich-scarce

- Precip
- Temp
- Streamflow
- GW levels
- Soil moisture
- SWE
- SCA
- Topography

- Solar radiation/insolation
- Wind
- Land use/cover
- Soil types
- Geology
- Water extractions/use
- Water quality
thursday: how to improve existing approaches? how to transfer knowledge from data-rich to data-poor regions?

• Monitoring related to processes
• Compulsory water use reporting
• Strengthen the link with land use management -> more reliable scenarios for “alternative future” studies
• A much better understanding of Surface/GW interactions -> Recharge as a variable, not a parameter
Most importantly, understand, quantify and REPORT the sources of uncertainty in hydrologic predictions

May not improve predictions, but at least will make them more useful
Data uncertainty estimation

- Improved methods for data in-filling
- Standardize reporting of basic data uncertainty estimates
- QA/QC and data storage + accessibility: locked-up data has an effective value of $0.00
- Integrated monitoring network planning: streamflow, GW, quality, sediment, etc.
- Improve usefulness and availability of remote sensing data
Example: Precipitation data in Sewell, Chile (2500 masl)

Time series used for water resource planning at the largest underground copper mine in the world
A little prodding showed something was amiss…

Total Precip record did not include SWE since 1982
Corrected data…

Precipitación anual corregida en Sewell
1912-2005

Año

Precipitación [mm]
Process uncertainty (or model uncertainty)

- Spend enough time characterizing the area
  - build a conceptual model
  - Different SOURCES of information

- Understand limitations of methods/models

- Better representation local climate influence on model parameters
  - In relation to spatial scale
  - Seasonal changes
Empirical methods

• Develop local coefficients
• Understand limitations
• If possible, apply several empirical relations to the same problem -> bayesian model averaging
Statistical methods

- Maintain observational networks
- Appropriate recording and reporting of data quality
- Regionalization of model parameters
- Explore fractal behavior of hydrologic variables for predictions at various scales
- Develop methods that merge information at different scales (anomalies)
- Remote sensing data as a predictor in statistical methods -> record long enough
Conceptual models

• Better process representation. E.g. natural recharge to groundwater (no more R=0.1xP)

• From J. McNamara’s talk: physically based parameters as opposed to mathematical parameters
Physically-based models

• improve geometry characterization (surface, subsurface)
• link parameters to basin properties
• investigate seasonality of model parameters
• spend time on appropriate definition of model discretization
• Improve representation of lateral flows, surface and gw interactions