ALPS - Advanced LINUX Workstations

- Remote access to special HMT datasets in field offices along with regular product streams
  - Local ensemble
  - MADIS: surface data, profilers, special RAOBs

- Workstations successfully deployed at four offices (Sacramento WFO and RFC, Monterey WFO and Reno WFO) during the last two field seasons.
How an Ensemble-Based System Works

HMT Soil Moisture Observations

Accomplishments and Plans for the future.

- Instrumentation of the Russian (3), American (11) and San Pedro River Basins (6)
- Developed Calibration and QC Algorithms for the Time Domain Reflectometer data
- Arizona Network soil data being ingested in real-time by the CBRFC
- Preliminary Evaluation of the SAC-HT Distributed Hydrological Model in the Babocomari River
- Continue the evaluation of the SAC-HT with CBRFC on both Basin and HRAP scales
- Work with OHD to develop a system for assimilation soil moisture observations into SAC-HT

Instrumentation of the Upper Colorado River Basin. FY-09

Begin comparing soil moisture forecasts made using NMM and the Noah LSM with PSD soil moisture observations.

![Graph showing soil moisture observations over time]
Installed and Operational

- Freeman Spring (FMS) 5/18/08
- Canelo Fire Station (CNL) 5/19/08
- Elgin (ELG) 5/20/08
- Black Oak Cemetery (BOC) 5/21/08
- Whetstone (WST) 5/22/08
Preliminary data from 1st Event

- Active monsoon period over 4 days (19-24 Jul 2008)
- Whetstone site used to highlight the event
- ~100 mm (4 inches) of rain fell in 4 storms over the 4 days
- Evidence of gradual moistening to greater depths over time
- After a 2-day delay for the rain from the first storm to reach 50 cm, the response to the next storm occurred within 1 h.
- A significant runoff event was associated with this storm; streamflow went from near zero to 3500 cfs, and flow exceeded 5 feet in depth, i.e., a flash flood occurred
NWS BABA3
Nearest Gauge to Whetstone Site

--- Provisional Data Subject to Revision ---
NWS BABA3
Nearest Gauge to Whetstone Site

Discharge, cubic feet per second


--- Provisional Data Subject to Revision ---

△ Median daily statistic (8 years)  --- Discharge
Three precipitation events brought the soil at Whetstone to saturation from 5.0 cm to 50 cm.

The 33 mm rainfall event on July 23-24 was felt through the depth of the soil layer and caused an immediate response in the Babocamari River flow measured at the BABA3 river gauge.
A closer look at the infiltration

- The soil moisture observations captured the movement of rainfall as it penetrated deeper into the soil.
- The water takes ~ 20 minutes to move from the surface to 50 cm depth in the nearly saturated layer.
Without radar bias corrections the MPE significantly underestimated the amount of precipitation input to the SAC-SMA-HT.

Max MPE Over Whetstone ~ 0.75”
Observed at Whetstone ~ 1.29”
- Simulated soil moisture values have a dry bias.
- Observed values appear to have a wet bias based on USGS field capacity estimates in the San Pedro River Basin.
Preliminary results suggest that the new soil moisture observations will play an important role in the refinement of the hydrological models used operationally by the NWS CBRFC over the San Pedro River Basin.
Recent Accomplishments

• Dan Gottas PSD has completed ingesting and archiving the Arizona Soil Moisture Network observations in Boulder and making them available to the NWS by FTP.

• Ed Clark CBRFC has calibrated the San Pedro River Basin and begun bringing the PSD precipitation, soil temperature and soil moisture data into the River Forecast Center.

• Bob Zamora and Ed Clark have made the initial comparisons between the CBRFC soil moisture and precipitation estimates and the PSD observations.

• Pedro Restrepo (OHD) has obtained the July 18-25, 2008 data set from Whetstone and with Bob Zamora is evaluating the infiltration rates for the event.
Future Plans

- Complete the installation of the Fairbank, AZ site.
- Ed Clark plans on ingesting the PSD precipitation data into the Distributed Hydrological Models at CBRFC.
- Ed Clark will begin updating the CBRFC models with USGS soil texture data.
- Bob Zamora will obtain in-situ dry and weight soil samples at the end of the monsoon season and update the calibration for each Arizona site.
- Ed Clark and Bob Zamora will begin detailed evaluations of the CBRFC simulated soil moisture products with the PSD observations.
- Ed Clark and Bob Zamora will start evaluating the heterogeneity of precipitation and soil moisture in the Upper Babacomari using the three HRAP scale stations: Black Oak Cemetery, Canelo and Freeman Spring.
Partners

- Ed Clark and Dave Brandon NWS/CBRFC
- Pedro Restrepo and Victor Koren NWS/OHD
- Ken Mitchell and Michael Ek NWS/NCEP/EMC
- Tilden Meyer OAR/ARL
The Bigger Picture

• The collaboration between CBRFC and PSD can be used as an example of how NOAA operations and NOAA research can partner to refine and improve services that are crucial to NOAA’s mission.
The Future

• Improvements in QPF cannot be accomplished without a better understanding of how hydrological processes impact the evolution of the atmospheric boundary layer. In turn we cannot expect improvement in hydrological forecasts without better QPF.
Plans for the Upper Colorado

- Gunnison and Upper Colorado Basins have been calibrated by CRBFC 2008
- Install soil moisture and temperature instrumentation at Granby, CO (Spring 09)
- Install soil moisture and temperature instrumentation at Gunnison, CO (Spring 09)
PQPF Issues

- Ensembles don’t sample the range of possibilities (typically they are overconfident).
- “Drizzle” problem - overestimate prob of light rain.
- Extremes under-represented - underestimate probability of flooding rains.
PQPF Calibration using reforecasts
“statistical downscaling”