SWFDP-SARFFG Product and Systems Development
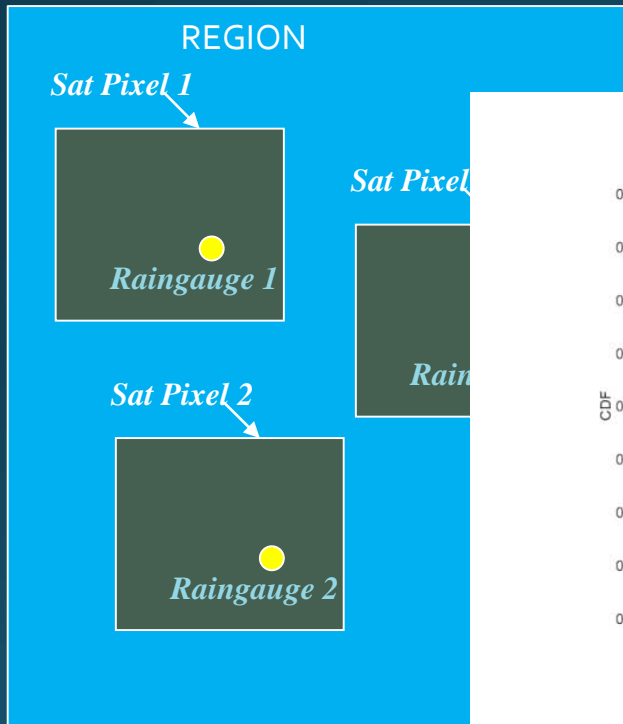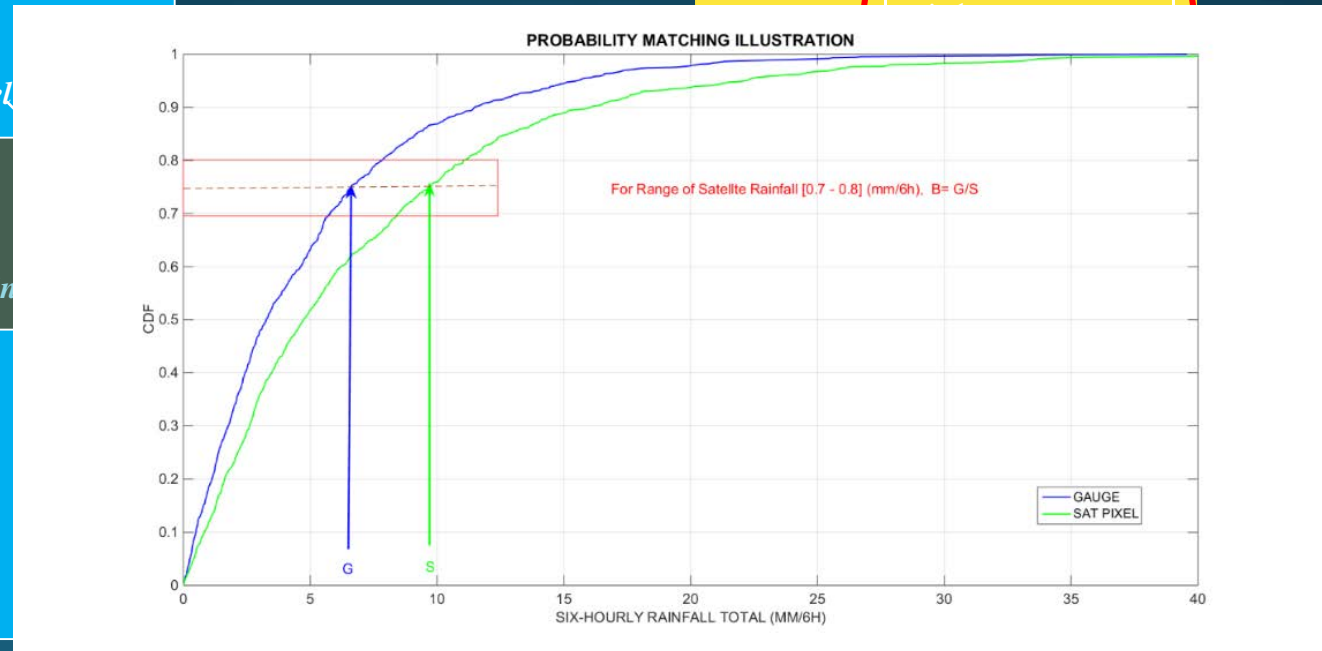
Hydrologic Research Center

Enhancements to be discussed

A. Climatological Bias Adjustment of Quantitative Precipitation Estimates (QPE)

B. Quantitative Precipitation Forecast (QPF) Utility

C. Flash Flood Risk (FFR) Products

D. Multiple Mesoscale Model Input

E. On-line Training Program enhancements

F. Snow Products

G. Forecaster interface enhancement

A. Climatological Bias Adjustment of Quantitative Precipitation Estimates (QPE)

➢ **UTILITY AT REGIONAL CENTER TO DEVELOP SATELITE PIXEL TABLES CORRESPONDING TO GAUGE SITES**
➢ **STANDALONE PC UTILITY TO DEVELOP QUANTILE-QUANTILE MATCHING FOR CLIMATOLOGICAL BIAS ADJUSTMENT FACTORS**
➢ **USER GUIDE AND TRAINING AS PART OF THE HRC HANDS-ON TRAINING**

REGION

Sat Pixel 1

Sat Pixel

Raingauge 1

Rain

Sat Pixel 2

Raingauge 2

$$\sum_{}^{N_g} R_g(t,j)$$

B)

PROBABILITY MATCHING ILLUSTRATION

For Range of Satelite Rainfall [0.7 - 0.8] (mm/6h), B= G/S

CDF

SIX-HOURLY RAINFALL TOTAL (MM/6H)

GAUGE
SAT PIXEL

G   S
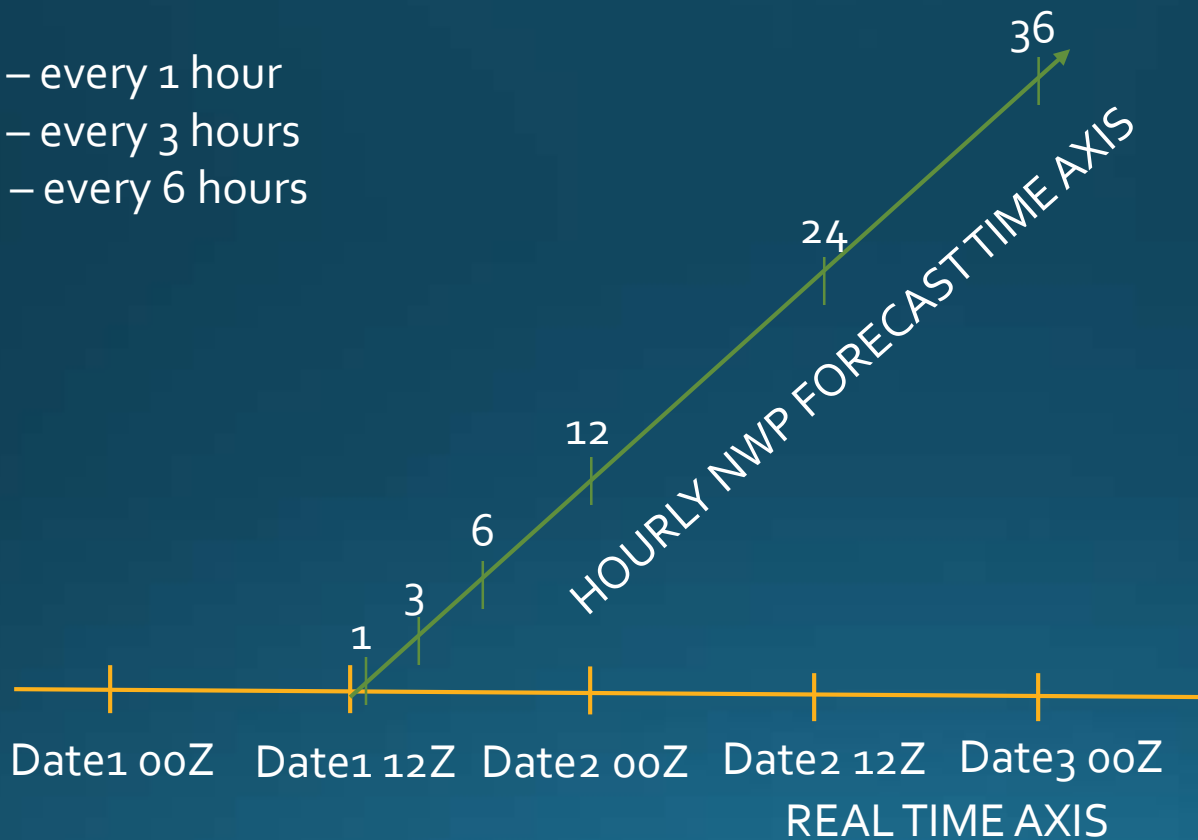
B. Quantitative Precipitation Forecast (QPF) Utility

➢ Using information from the FFG system and available gauge data this utility will be able to quantify the skill of the forecast products (e.g. NWP, FMAP).

➢ The QPF utility produces bias analysis for the logarithm of the data based on the distribution matching of spatial averages for the region between the gauge and forecasted data products.
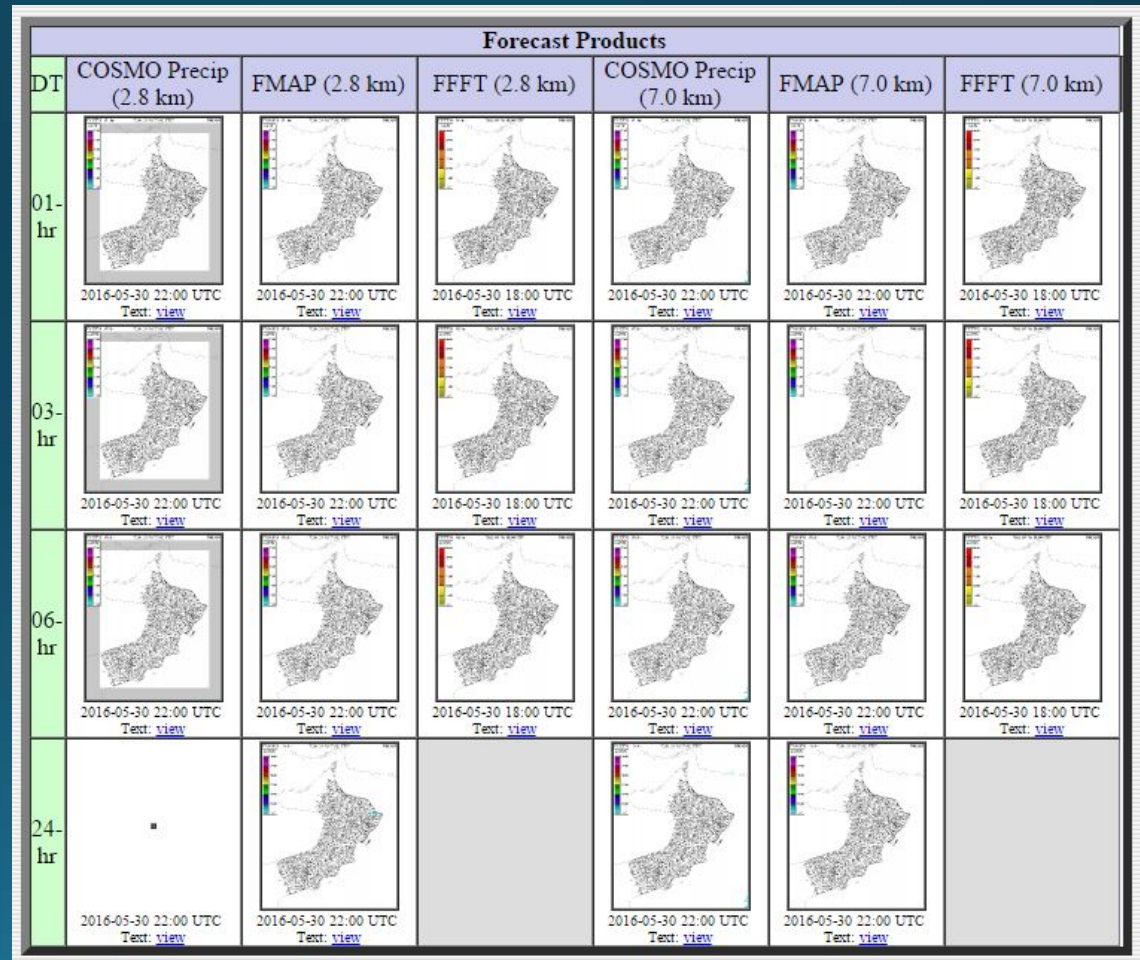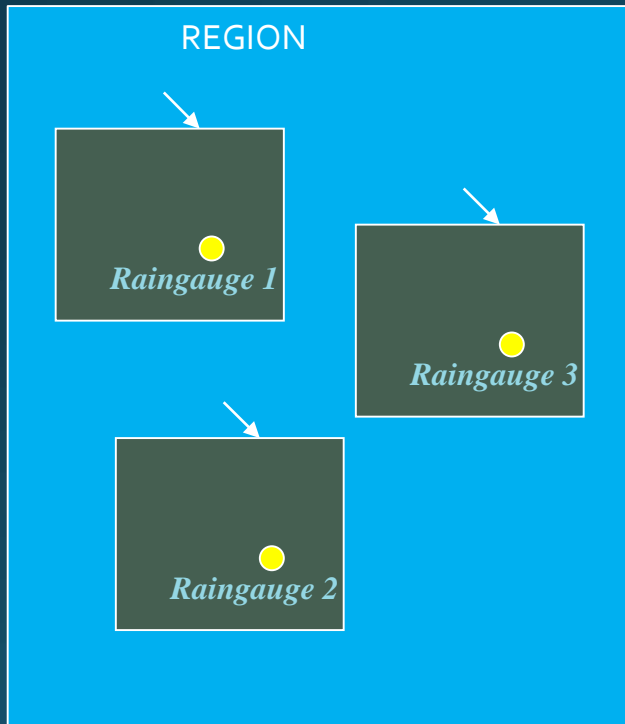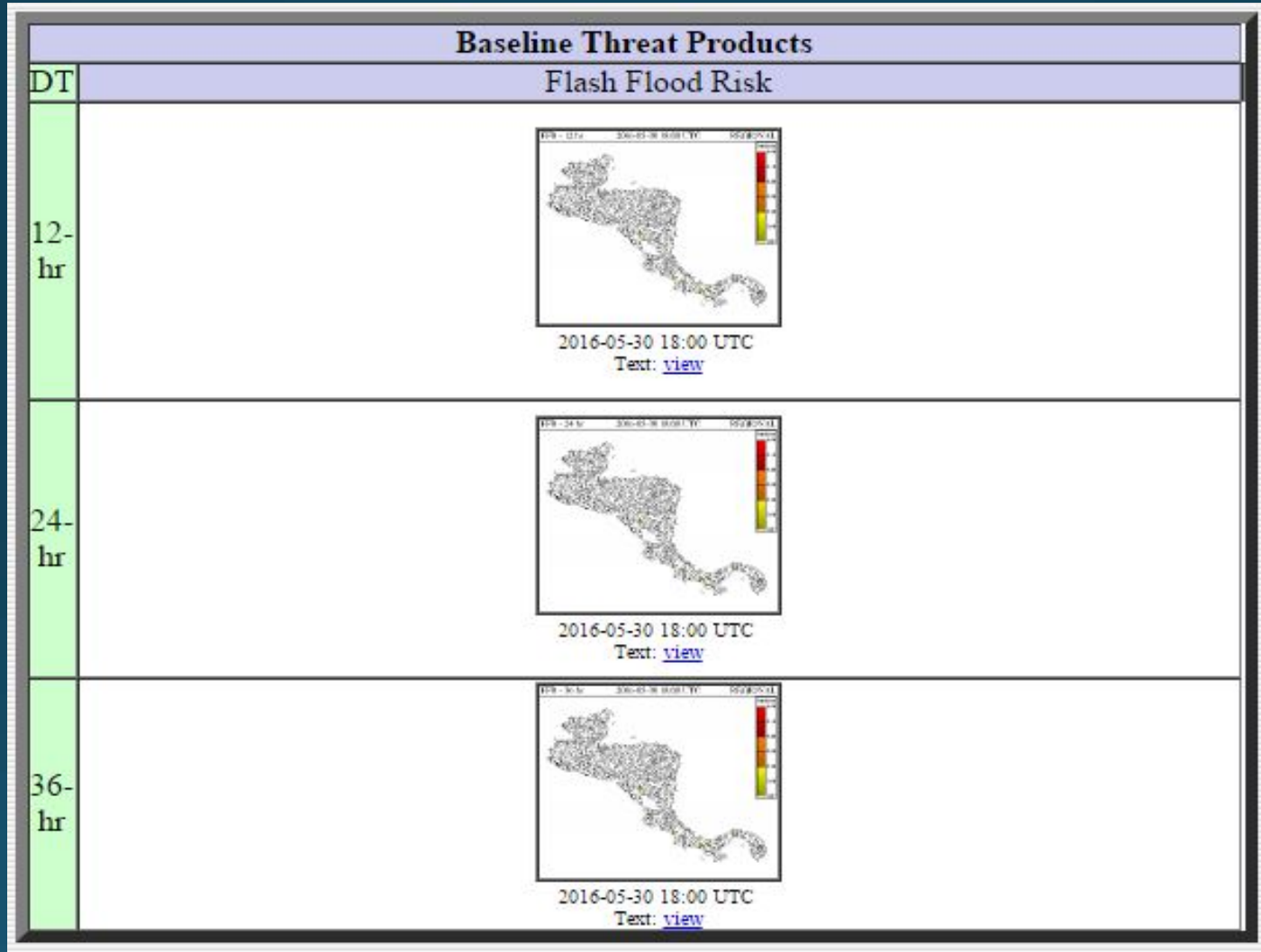
C. Flash Flood Occurrence Frequency (FFOF) products

Pseudo-IFFT of 1, 3 and 6 Hr Duration

IFFT1 – every 1 hour
IFFT3 – every 3 hours
IFFT6 – every 6 hours

36

24

12

6

3

1

HOURLY NWP FORECAST TIME AXIS

Date1 00Z   Date1 12Z   Date2 00Z   Date2 12Z   Date3 00Z

REAL TIME AXIS
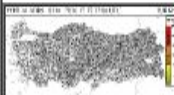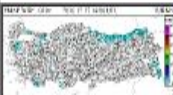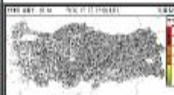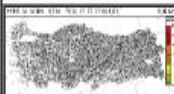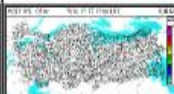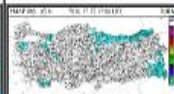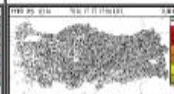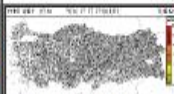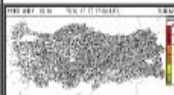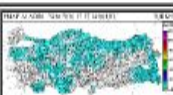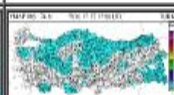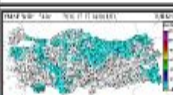
FFOF(0-24)=POS(IFFT1,IFFT3,IFFT6)/ALL(IFFT1,IFFT3,IFFT6);(for forecast time 0-24)

C. Flash Flood Occurrence Frequency (FFOF) products

D. Multiple Mesoscale Mode Input

E. On-line Training Program Enhancements

CURRENT STATUS

➢ **There are currently 5 on-line courses: Elements of Meteorology, Elements of Hydrology, FFGS Products, GIS, and Remote Sensing in three languages.**

➢ **There are approximately ~150 students that have completed or are currently participating in the on-line courses.**

➢ **Developing an advanced hydrology course.**

➢ **Developing a snow and ice hydrology course pertinent to FFGS.**

ENHANCEMENTS NEEDED

- Courses in development:
  - Mesoscale Modeling Basics and Uncertainties for FFGS
  - Fluvial Geomorphology/Landslides
  - Early Warning and Disaster Management

- Add essays to exam questions (currently only true/false answers can be given)

F. Snow Products

Gauge Mean Areal Temperature Product - provides 6-hour averages of mean areal temperature (°C) for each sub-basin. The 6-hour averages of mean areal temperature are generated from point data received through the GTS from an interpolation of hourly temperature gauge data.

The average temperature for each sub-basin is estimated
- four times per day
- over a six hour period
- ending at 00, 06, 12, and 18 UTC.

GMAT - 06 hr   2016-01-29 18:00 UTC
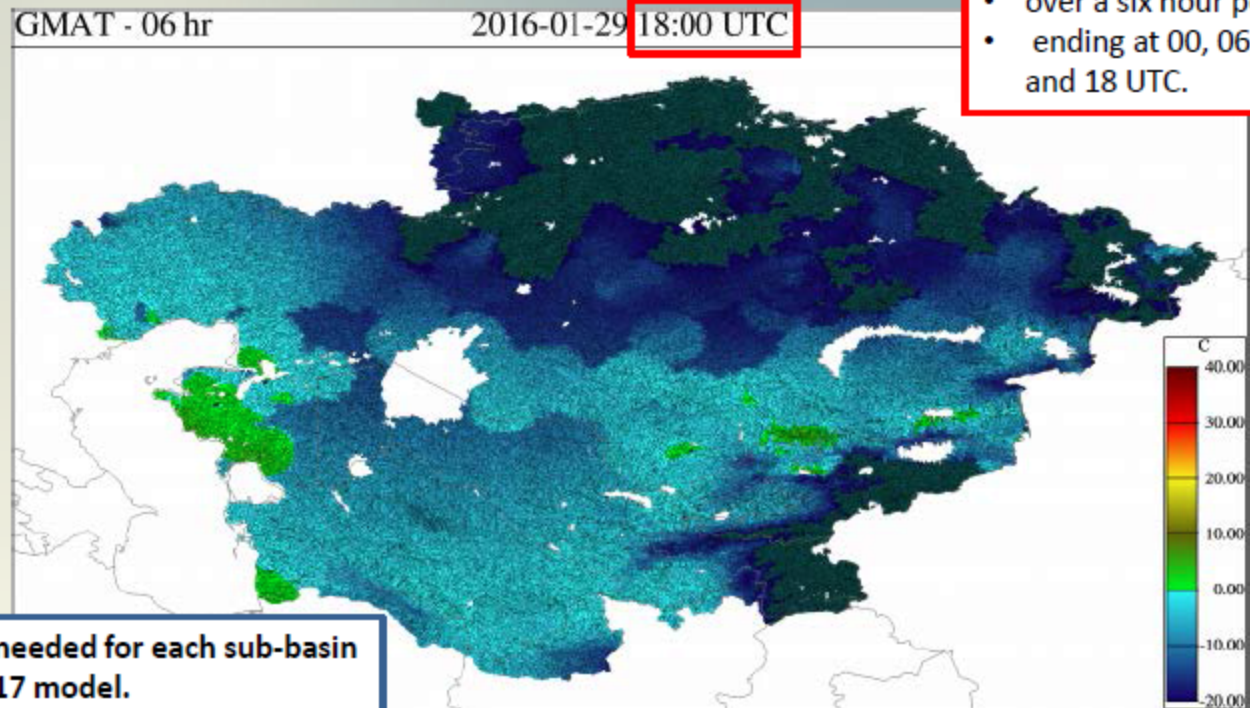
Areal temperature is needed for each sub-basin for use in the SNOW-17 model.

Snow is a crucial source of water for the member countries.

This product provides 6-hour averages of Snow Water Equivalent (SWE) in (mm) for each CARFFG sub-basin.

SWE   2016-01-29 18:00 UTC

SWE product is estimated at 00 UTC, 06 UTC, 12 UTC and 18 UTC.

mm
500.00
400.00
300.00
200.00
100.00
50.00
7.00
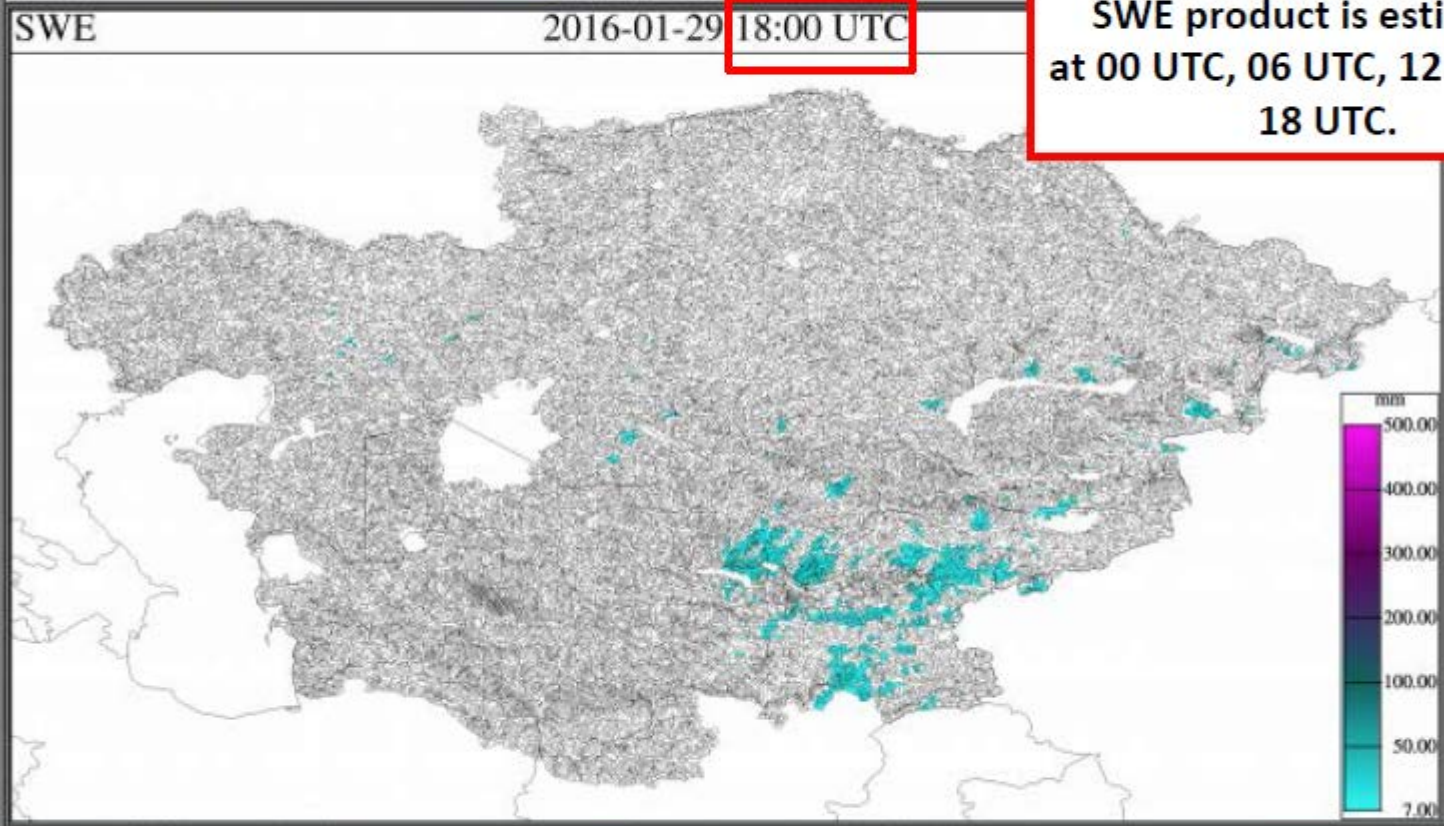
The SNOW-17 model has two input variables - gauged MAT and merged MAP and simulates the SWE and MELT products.

MELT is an estimate of ablation due to melt processes and is a direct output of the SNOW-17 model.

Single Product Text File: text

Composite Produc...

MELT - 24 hr   2016-01-29 18:00 UTC

MELT product is estimated at 00 UTC, 06 UTC, 12 UTC and 18 UTC.

mm/day
200.00
100.00
75.00
50.00
30.00
10.00
1.00

This image has been scaled to a maximum aspect of 640x480 to better fit your window.
Click an option below to view the full-size image.
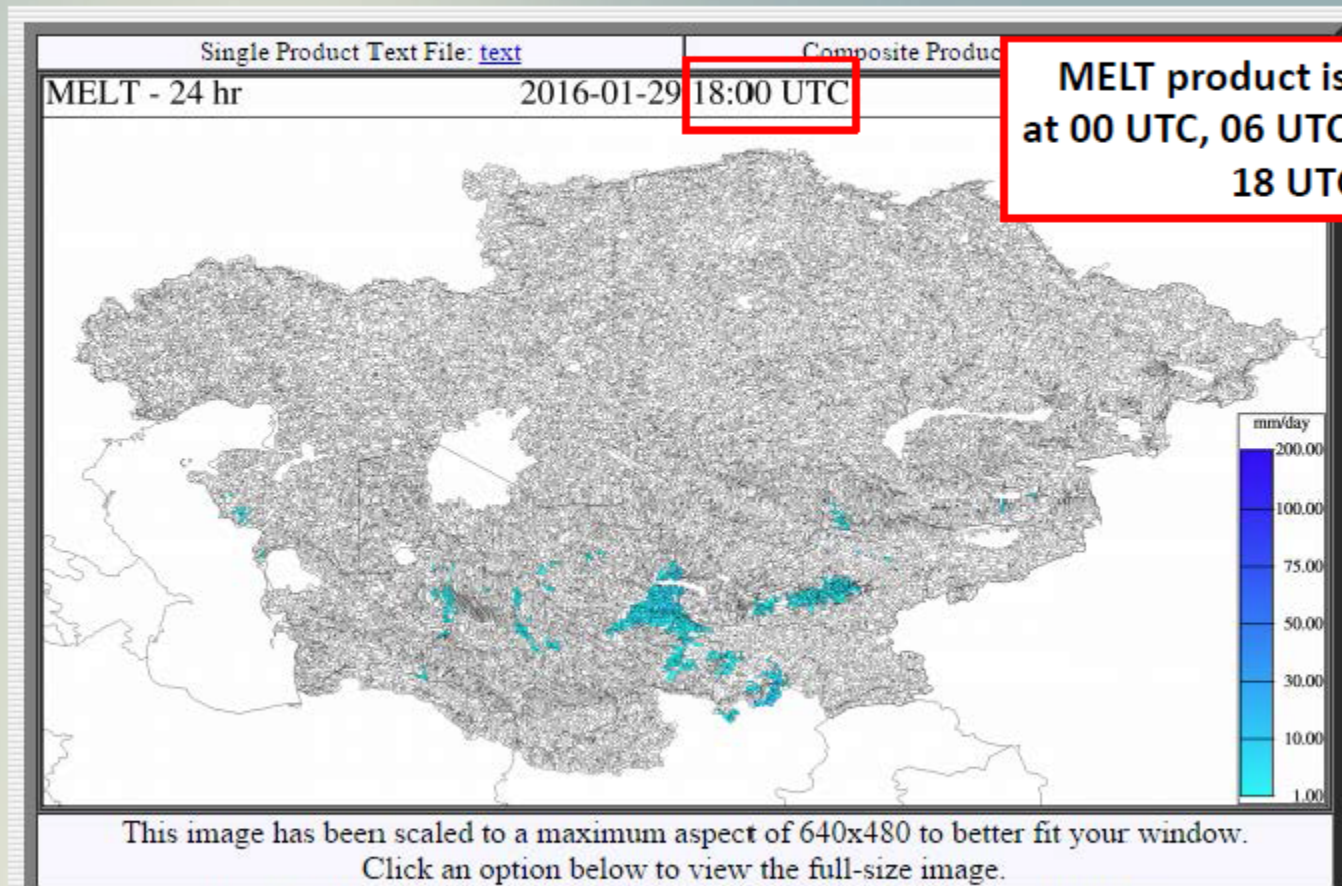
The product provides six hour cumulative melt in millimeters (MM) over periods of 24 and 96 hours.

G. Forecaster interface enhancements

Mapserver Interface Prototype (Proof-of-concept)

- ### Multi-layer image display (toggle on/off)

  - Basemaps: Open Street Maps, SRTM DEM (15-sec, 3-sec)
  - Raster Products: GHE, MWGHE, …
  - Basin Products: MAP, ASM, FFG, FFT, FMAP, …
  - Overlays: Basin product values and IDs (when sufficiently zoomed), Gauge Stations, Custom pre-loaded feature layers (provincial boundaries, districts, municipalities, roads, etc., as provided), Lat-Lon graticules

- ### Interactive panning and zooming

- ### Point-click information query: basin product values and station data

Mapserver Interface Prototype (Proof-of-concept)
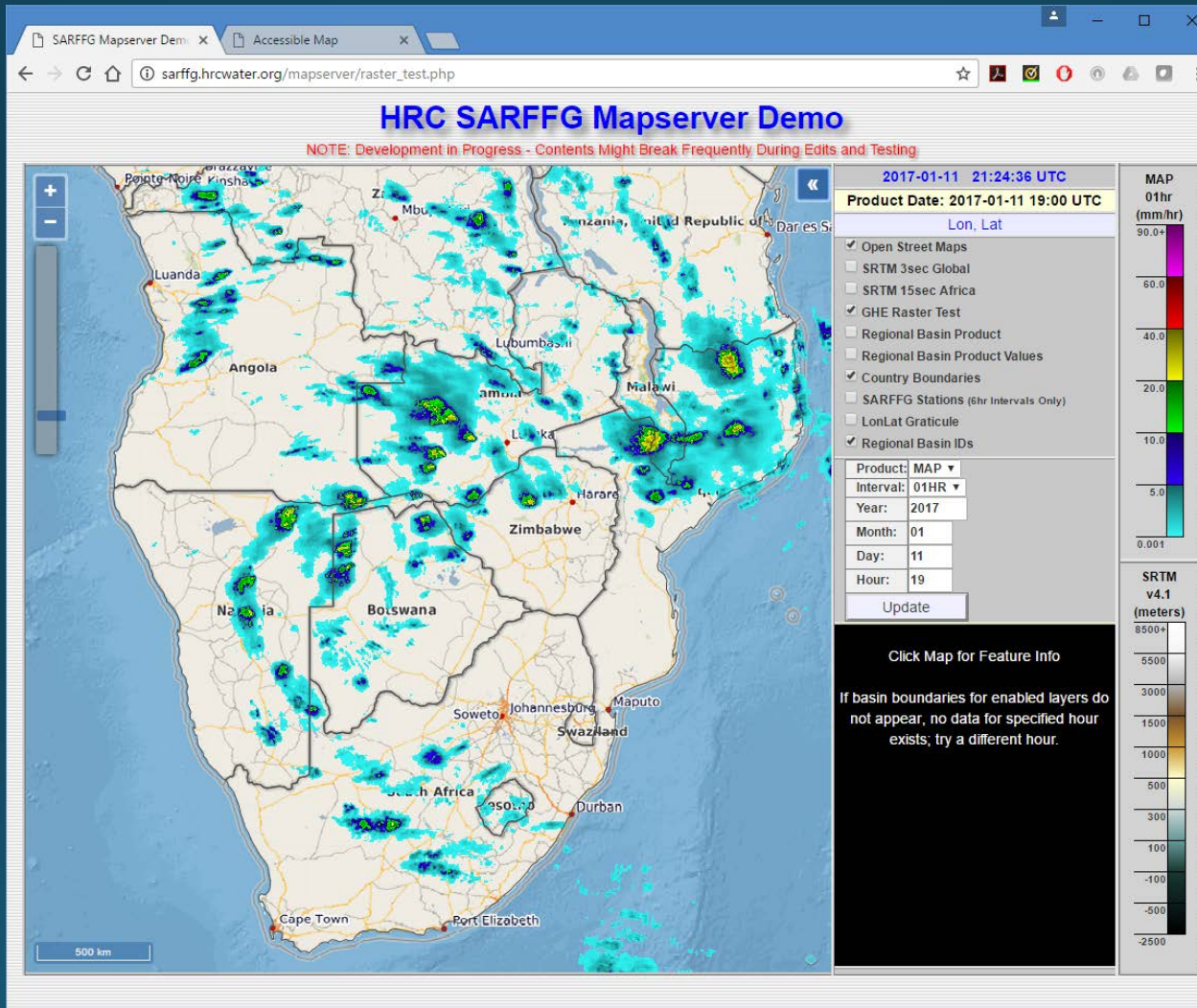
New raster product display capability – GHE Product shown

Mapserver Interface Prototype (Proof-of-concept)
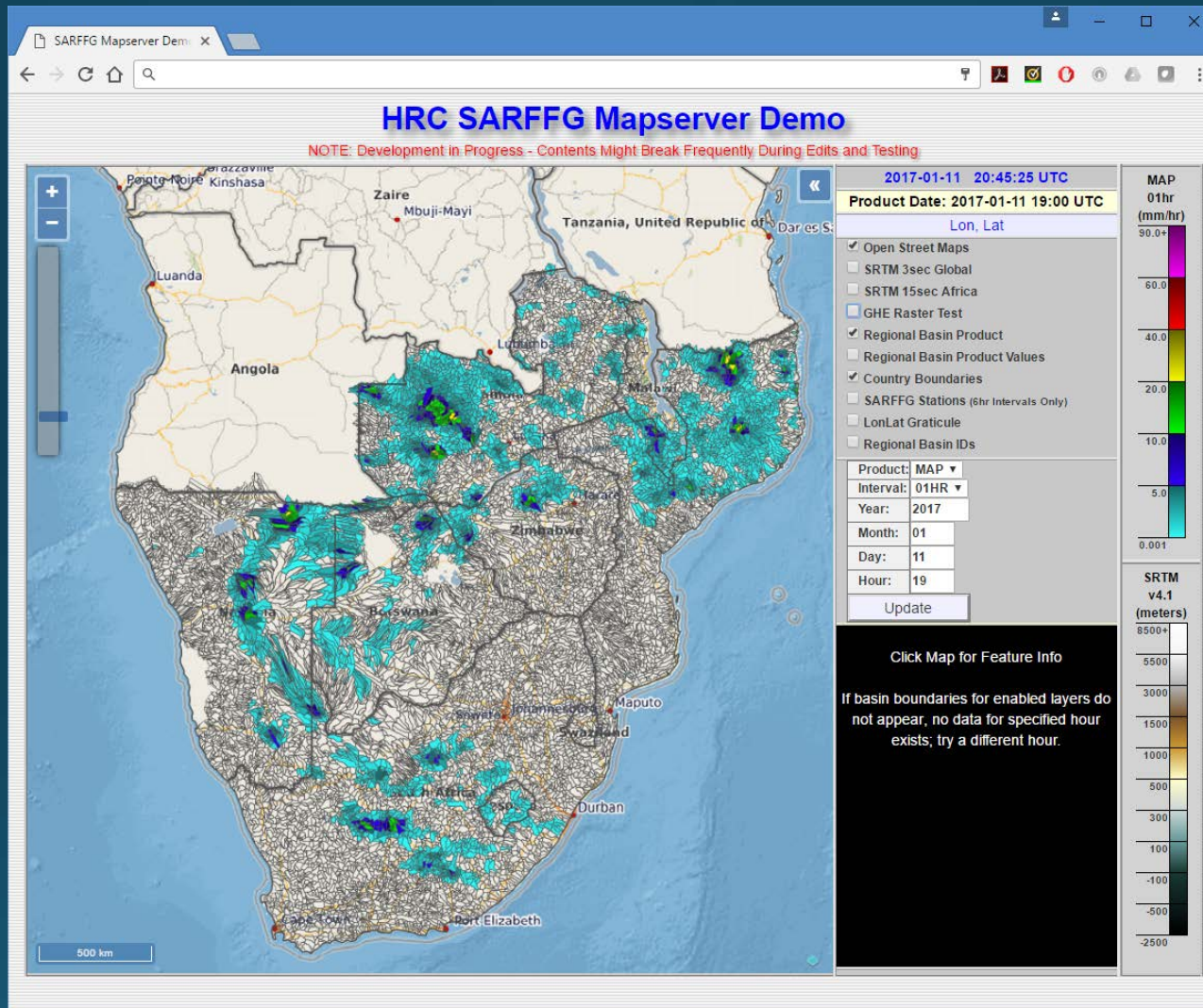
In this image the raster product layer and turned on the basin product layer – showing the corresponding basins values for the same precipitation after FFGS process and bias adjustment, etc.
- Some differences are expected due to use of MWGHE and bias adjustment in the basin product.

Mapserver Interface Prototype (Proof-of-concept)
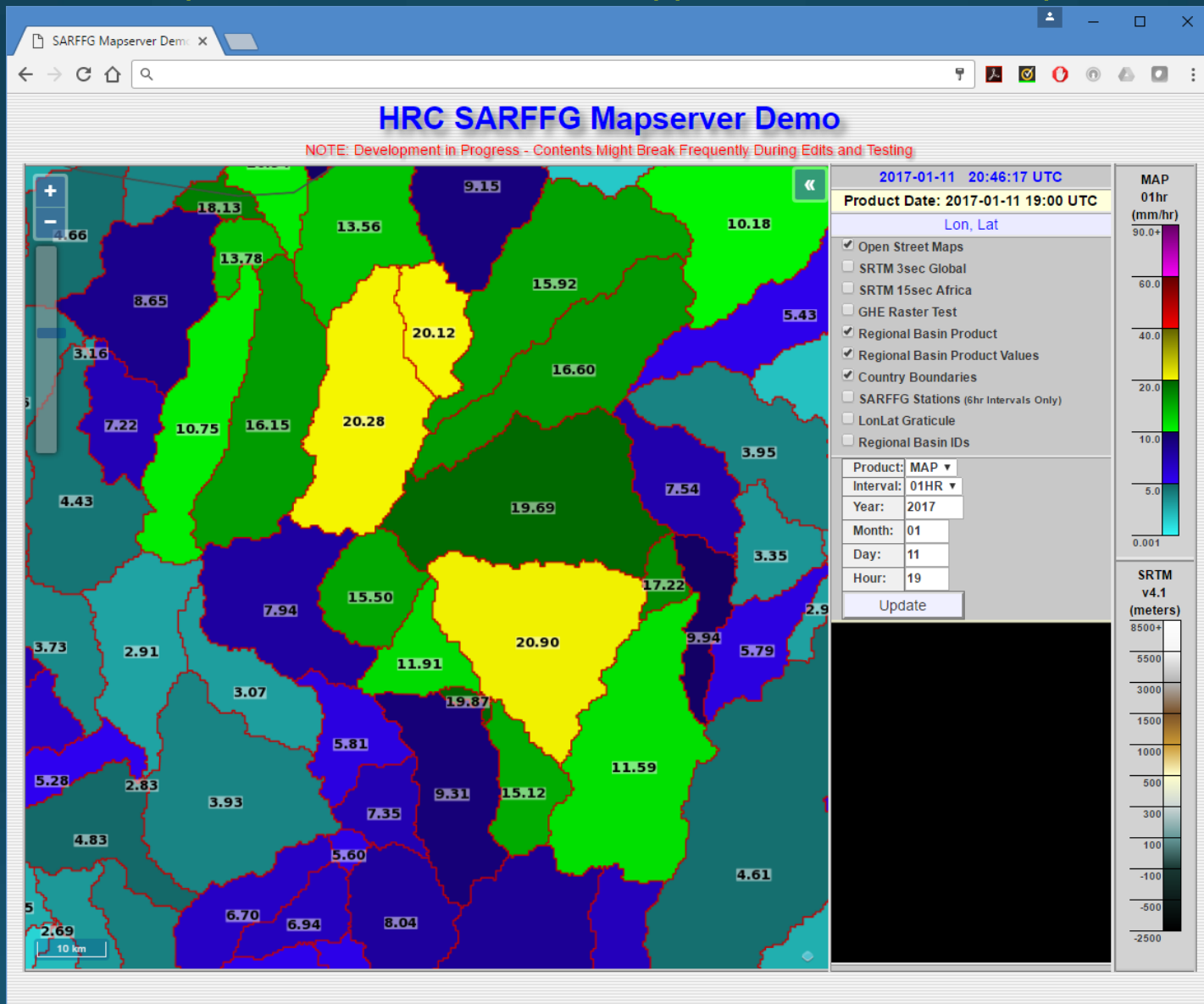
By zooming in close enough the Basin values layer display option will turn the basin outlines red, as an indicator that direct labeling is now available.
By checking the box for the basin product values, the precipitation values appear over their respective basins

Mapserver Interface Prototype (Proof-of-concept)
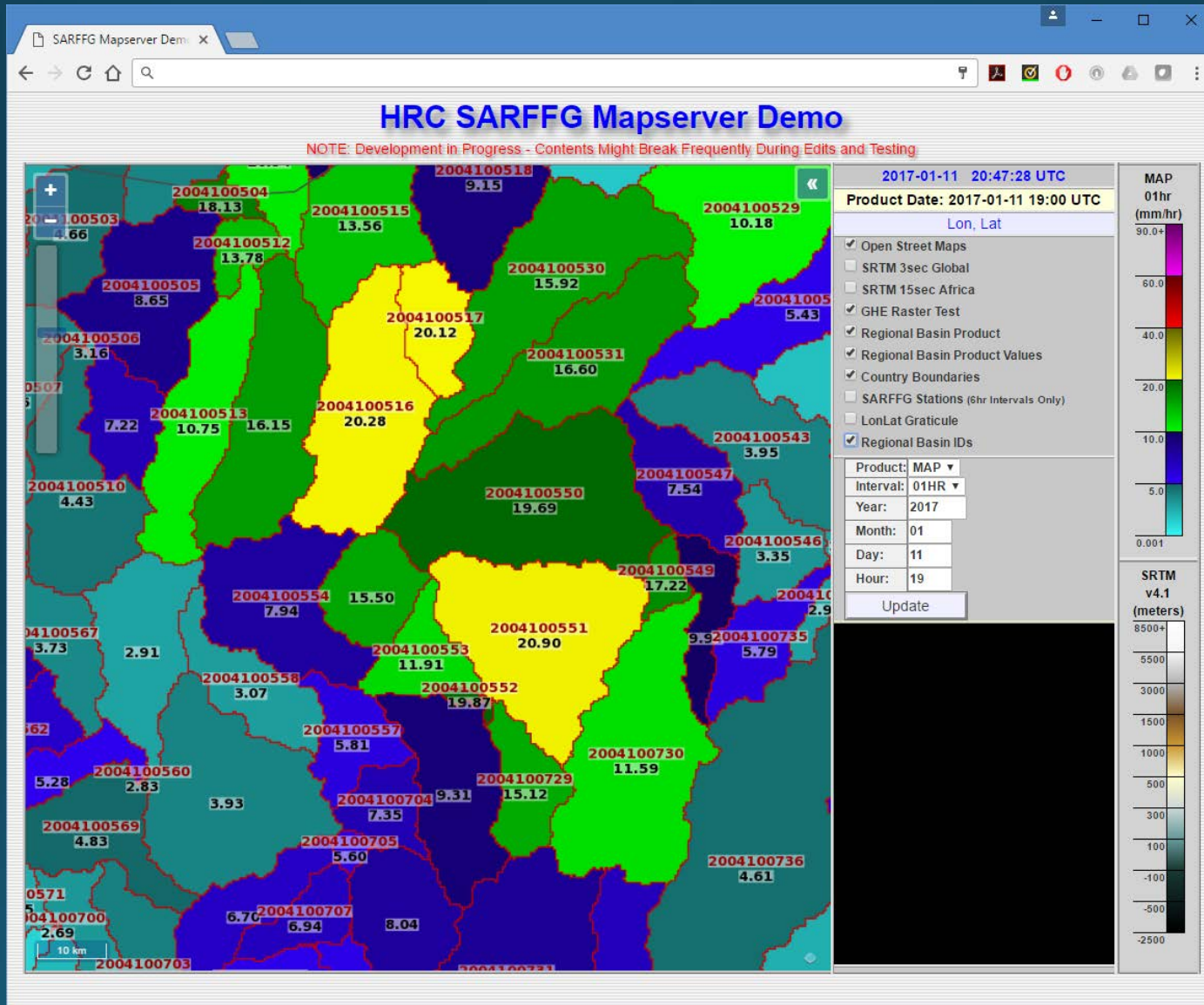
Basin IDs layer display option at sufficient zoom

Mapserver Interface Prototype (Proof-of-concept)
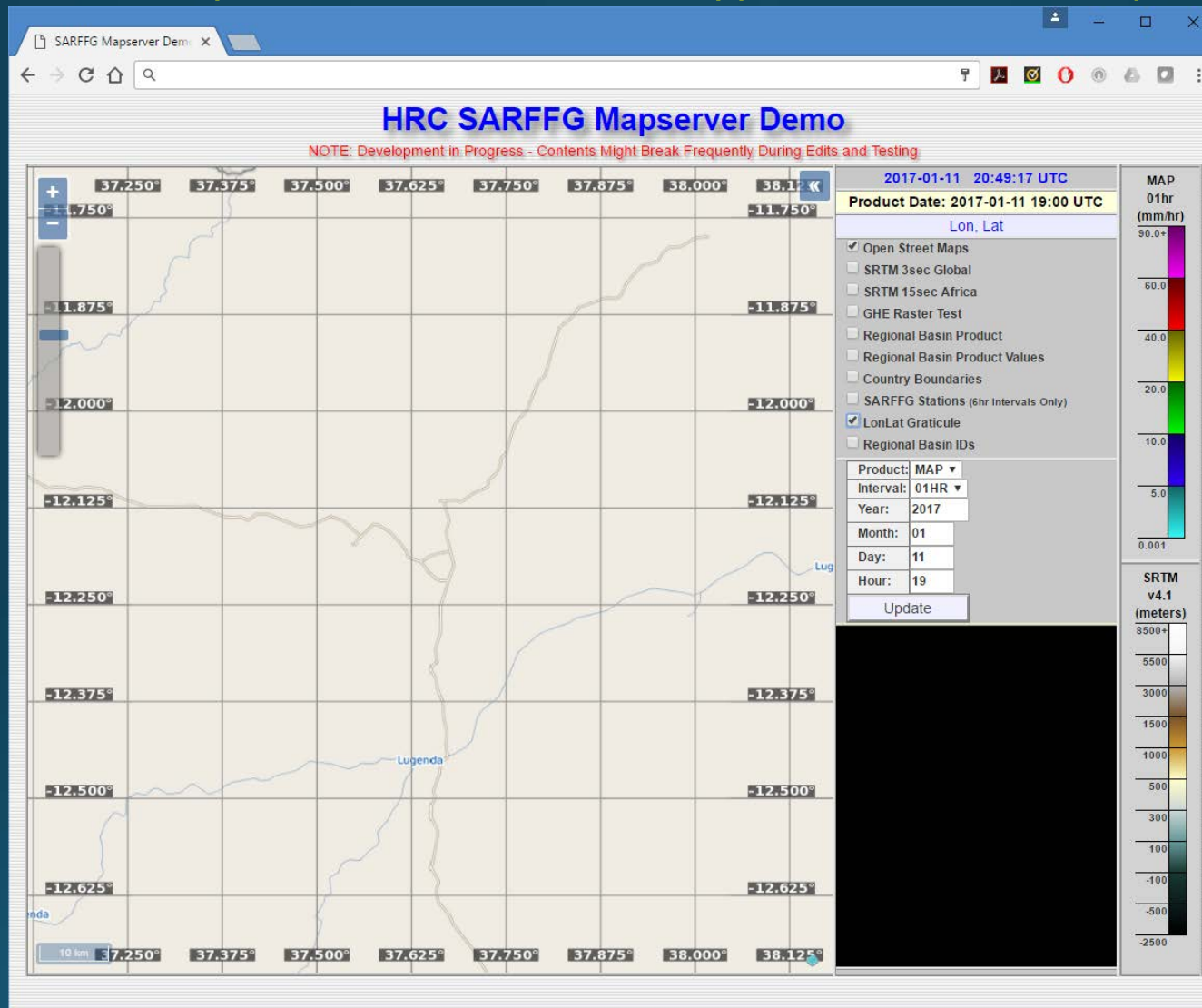
Toggle off basin product and label layers to underlying base map
Note that the graticules (lines showing parallels of latitude and meridians of longitude for the earth) have also been turned on (optionally).

Mapserver Interface Prototype (Proof-of-concept)
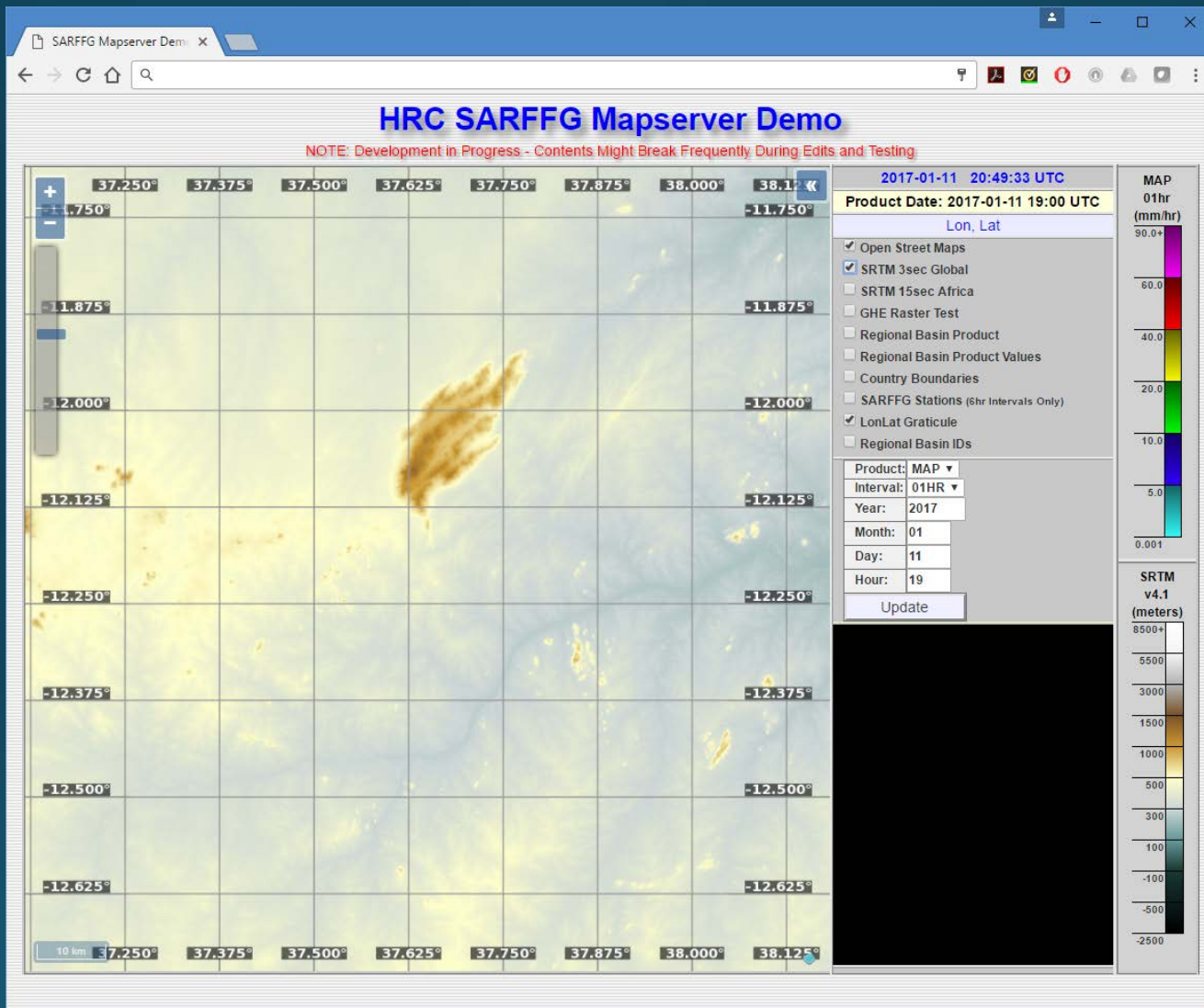
Toggle on Shuttle Radar Topography Mission (SRTM) layer to
display digital elevation information

Mapserver Interface Prototype (Proof-of-concept)
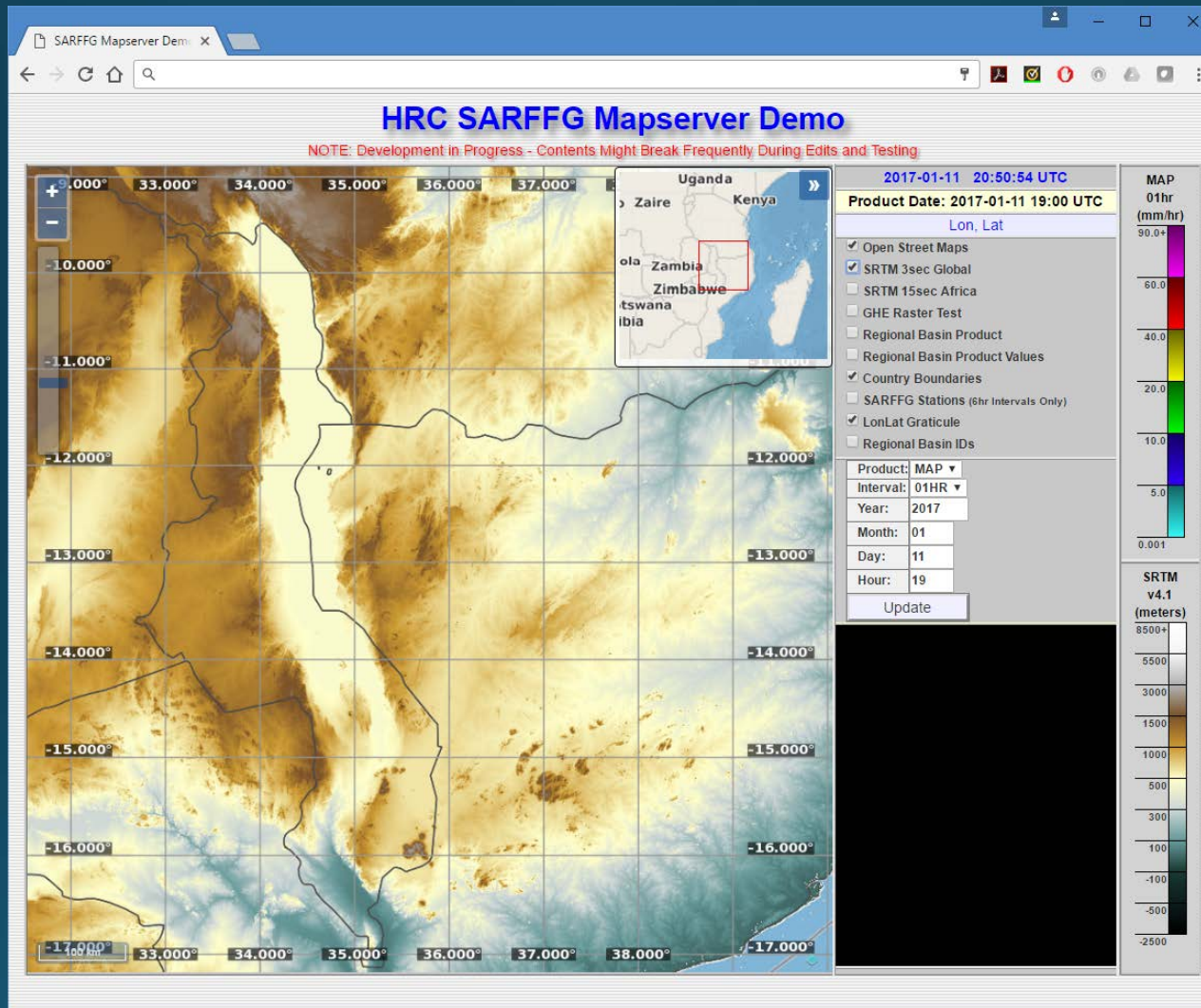
Country boundaries can be turned on for reference (since base map isn't visible with SRTM turned on).

A reference mini map is opened for broader geographic context of zoomed area

Mapserver Interface Prototype (Proof-of-concept)

Close inspection of raster products with zooming
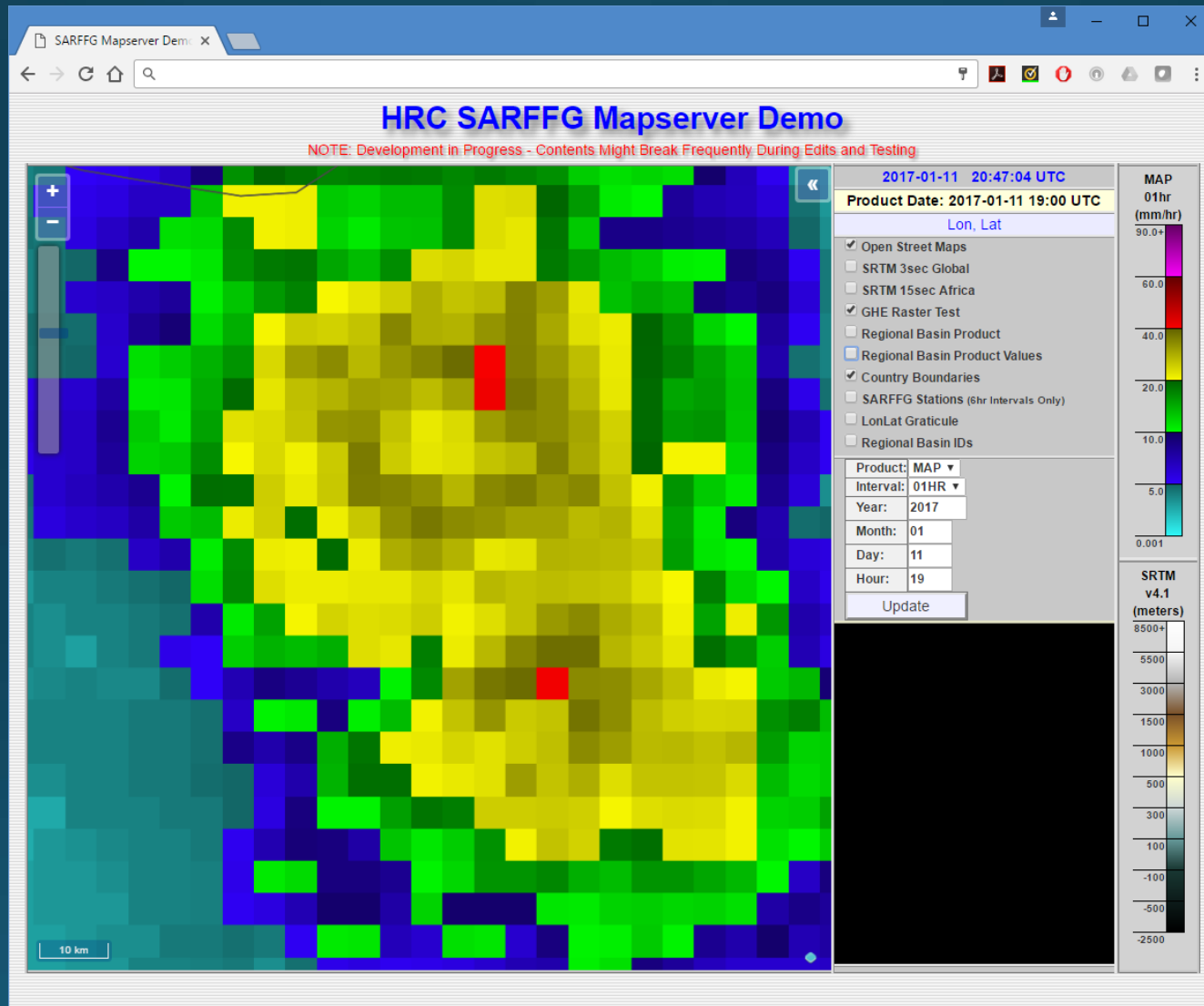
Mapserver Interface Prototype (Proof-of-concept)
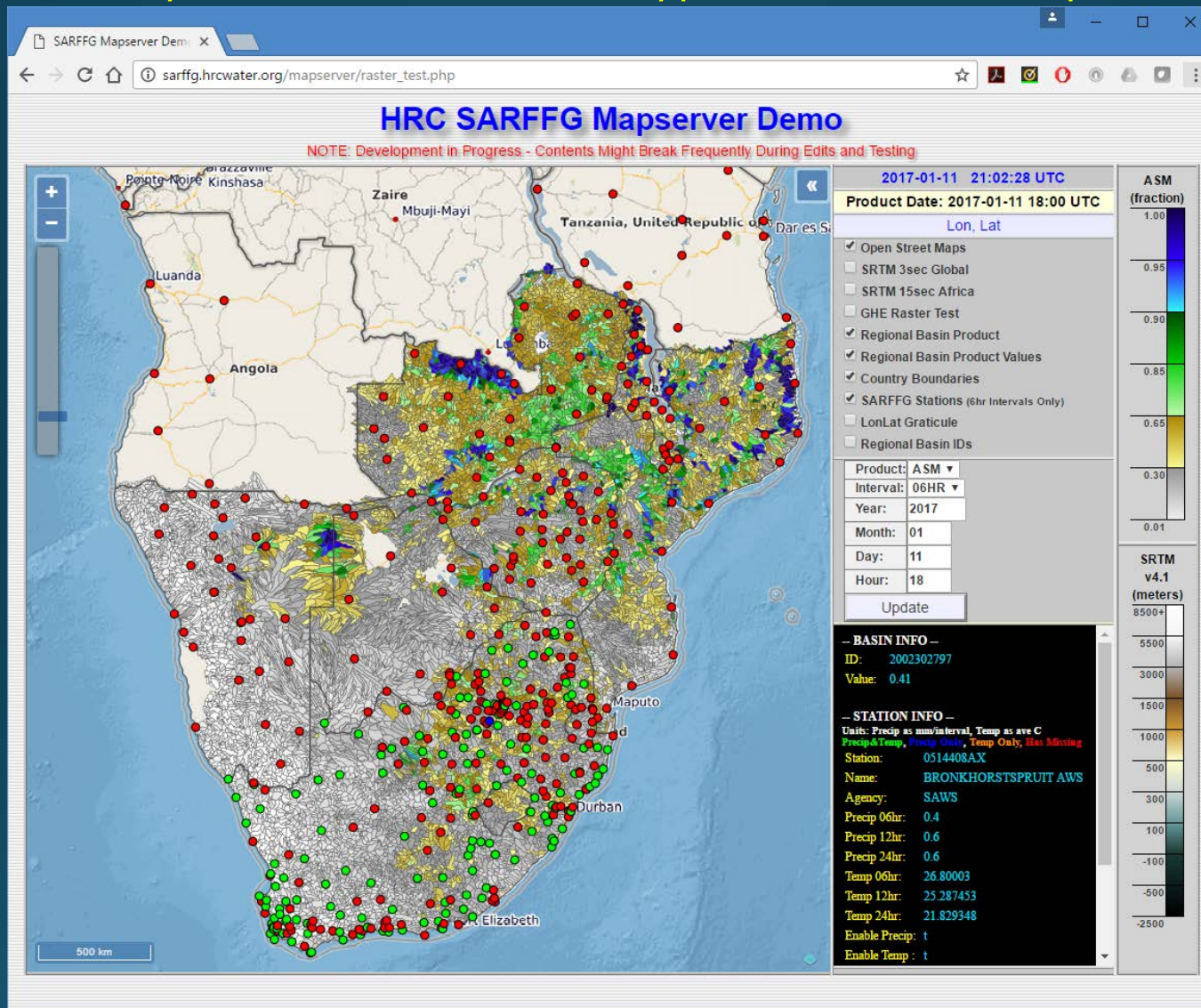
Here we have selected the soil product and turned on the stations
- Stations are green when data for that hour has been reported for both precip and temp (available on 00, 06, 12, 18 for SARFFG) (Mouse-click on a basin or station location to get info)
- Other station color codes are blue for precip report only, orange for temp report only, red for missing

Mapserver Interface Prototype (Proof-of-concept)
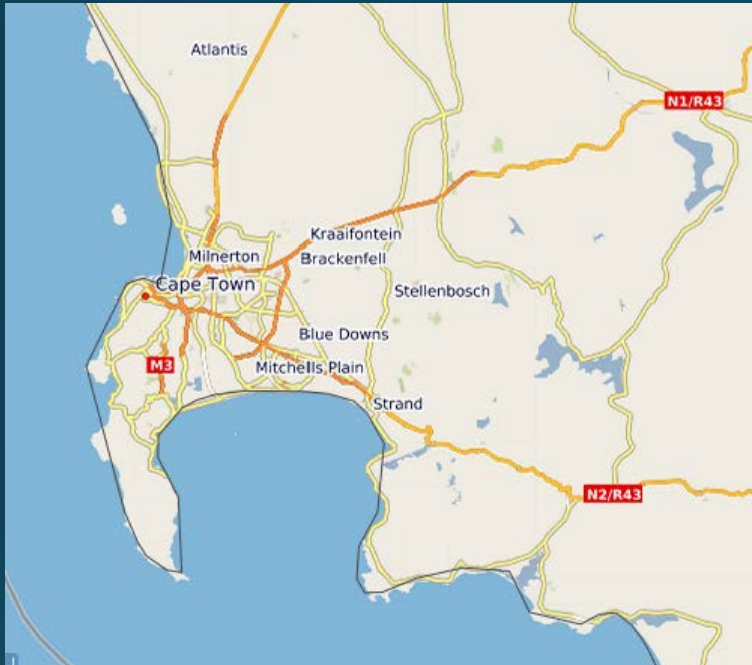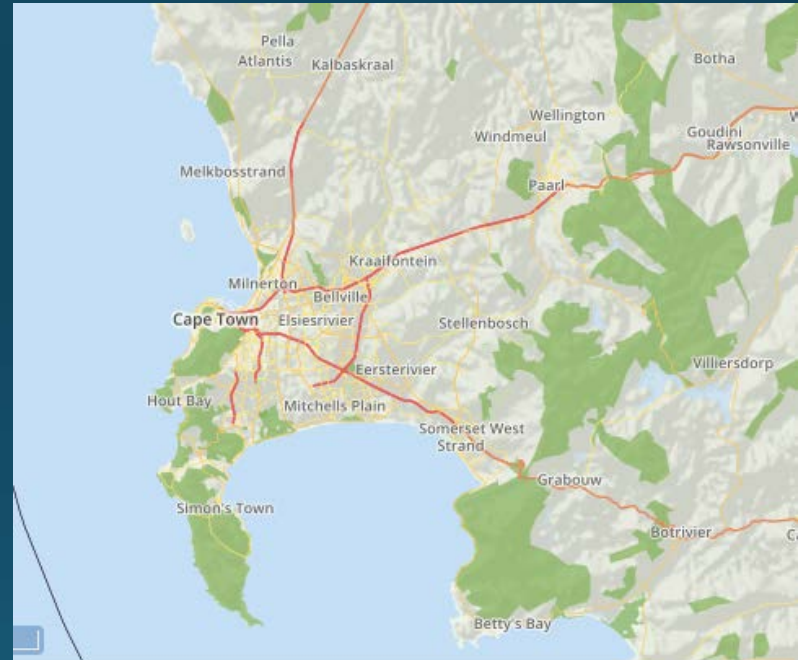

Public OSM server at Terestris (Germany)

New, local and customizable OSM server at HRC
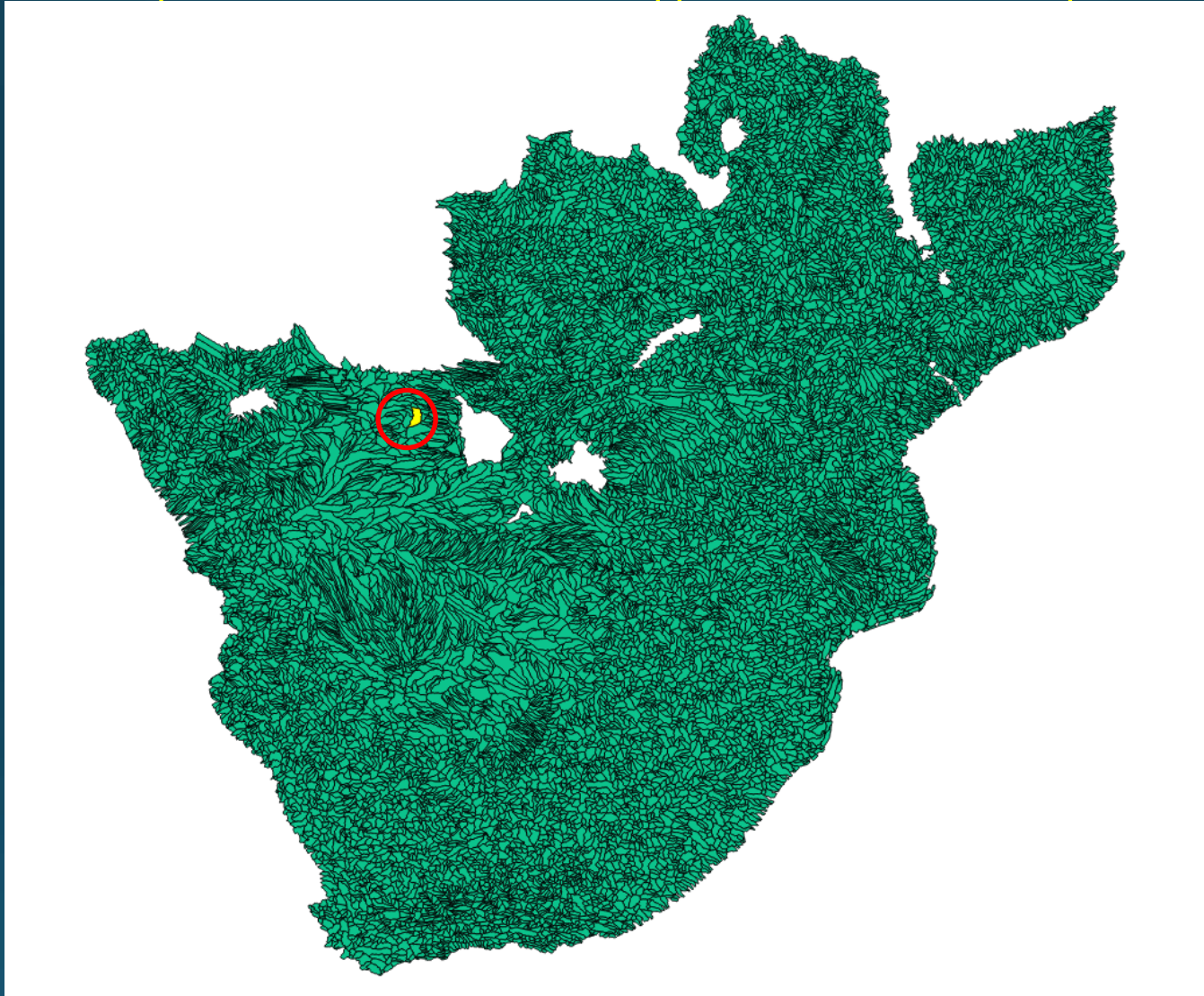
Integration of the new open street map service into the FFGS server is the next step now that we have a local instance of the content proven.

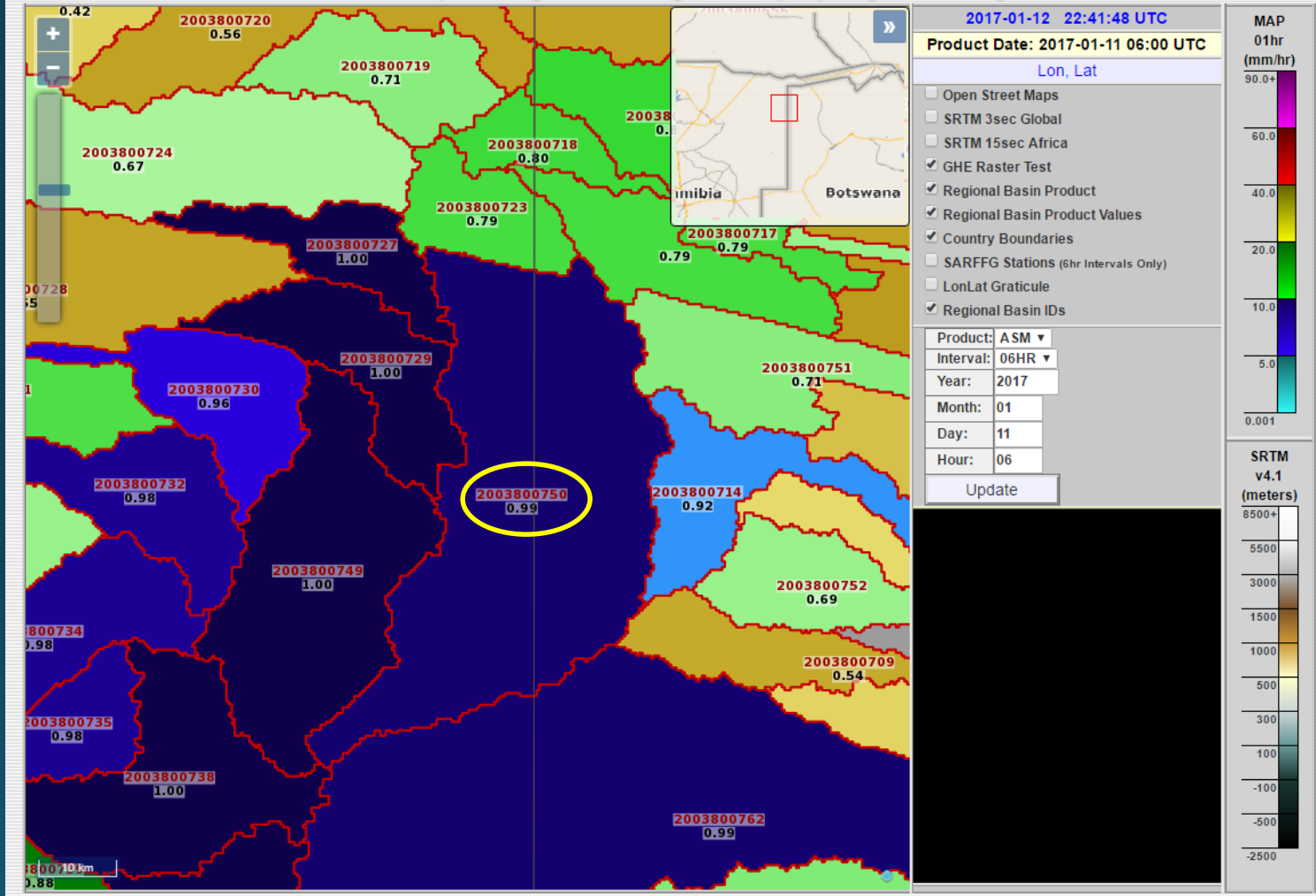Additional work will be in tailoring the OSM style to suit FFGS application best.

Basin for data plotting examples highlighted in yellow.

Subsequent slides will feature time series data for a basin where PFFT hits occurred recently.

Mapserver Interface Prototype (Proof-of-concept)

Example basin: 2003800750 (center of map)

Mapserver Interface Prototype (Proof-of-concept)
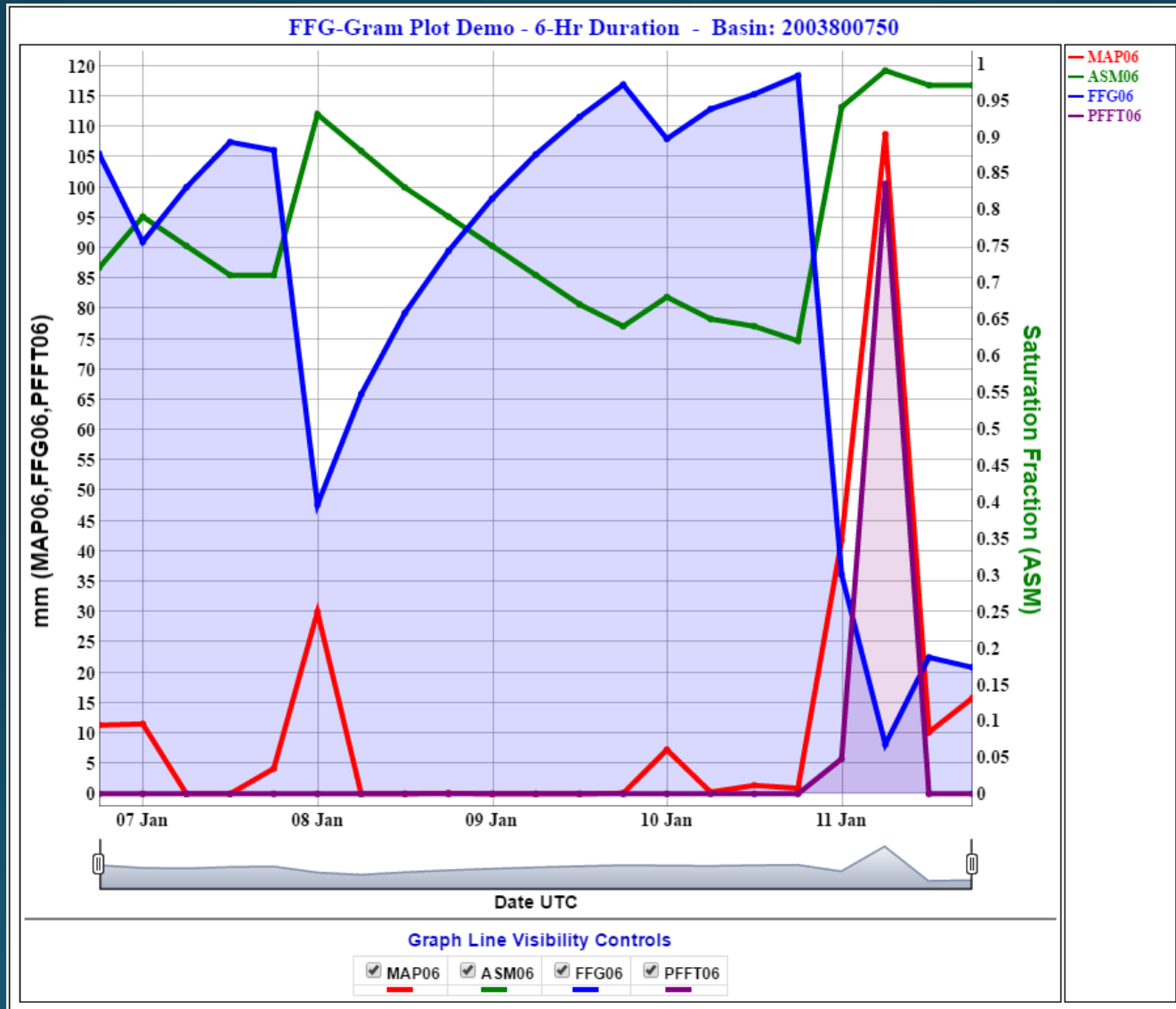
Interactive plots for time series data

Mapserver Interface Prototype (Proof-of-concept)

Zoomed to time of interest with mouse over lowest FFG value

Mapserver Interface Prototype (Proof-of-concept)
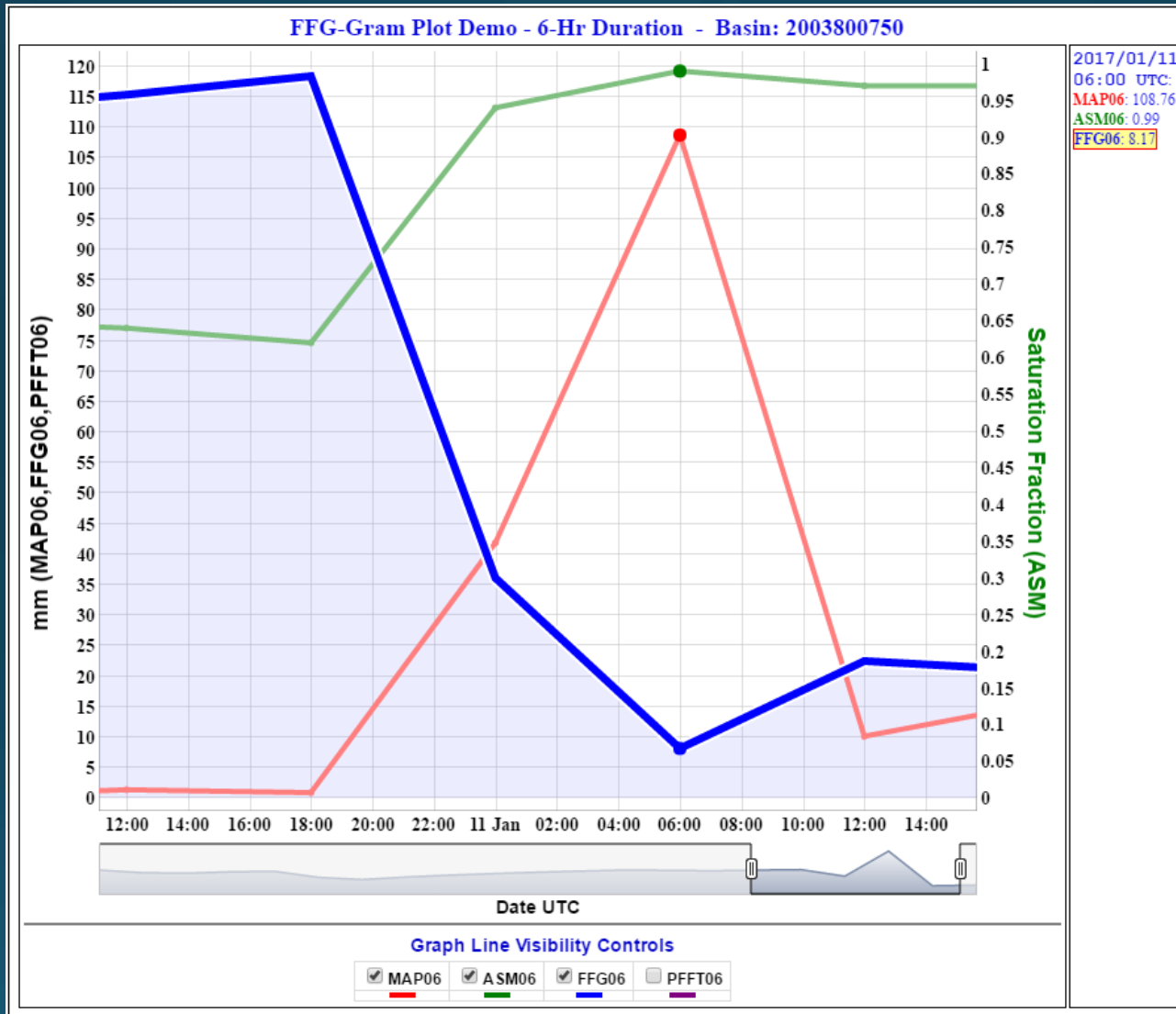
PFFT plot line hidden using visibility controls

Mapserver Interface Prototype (Proof-of-concept)
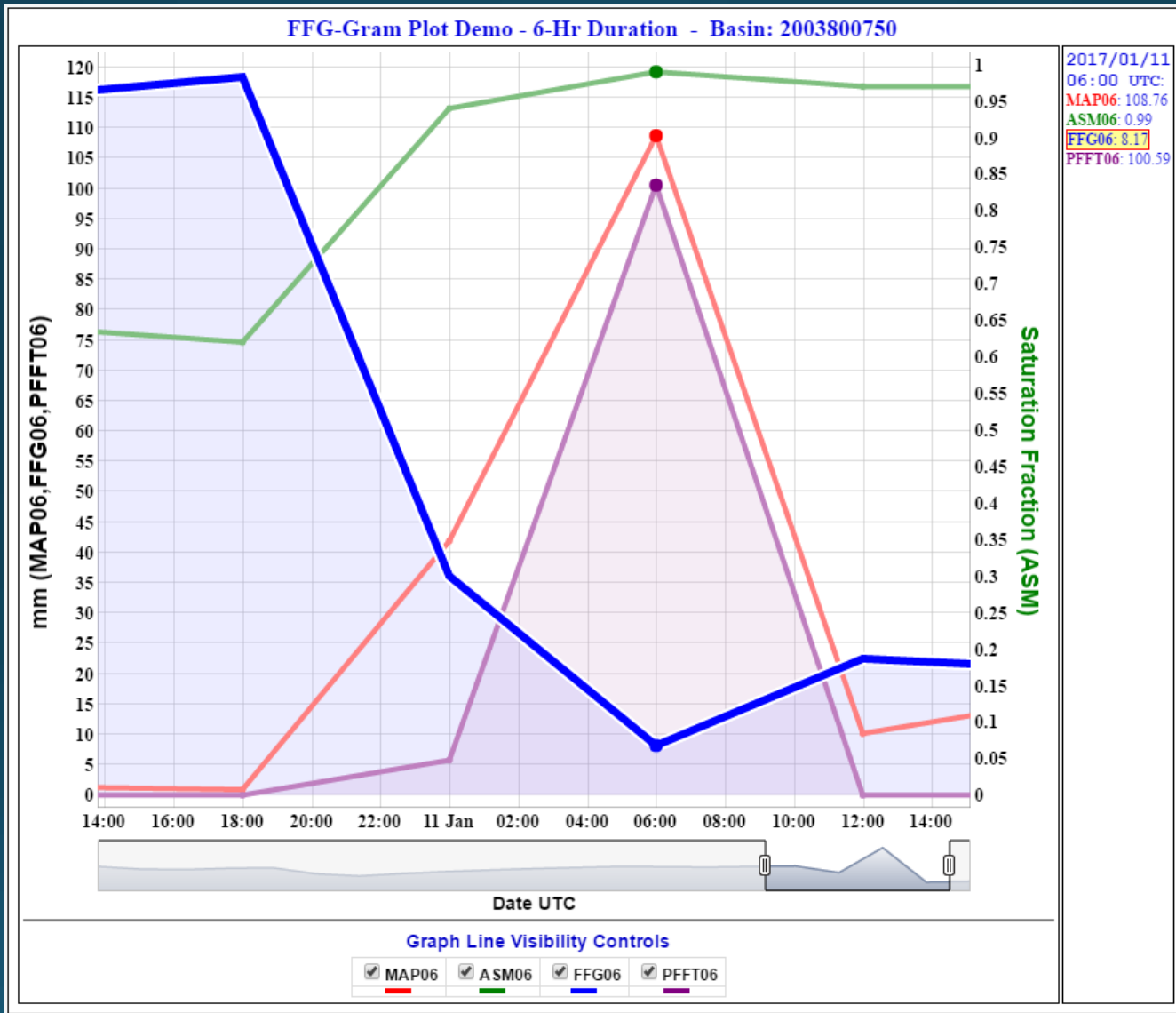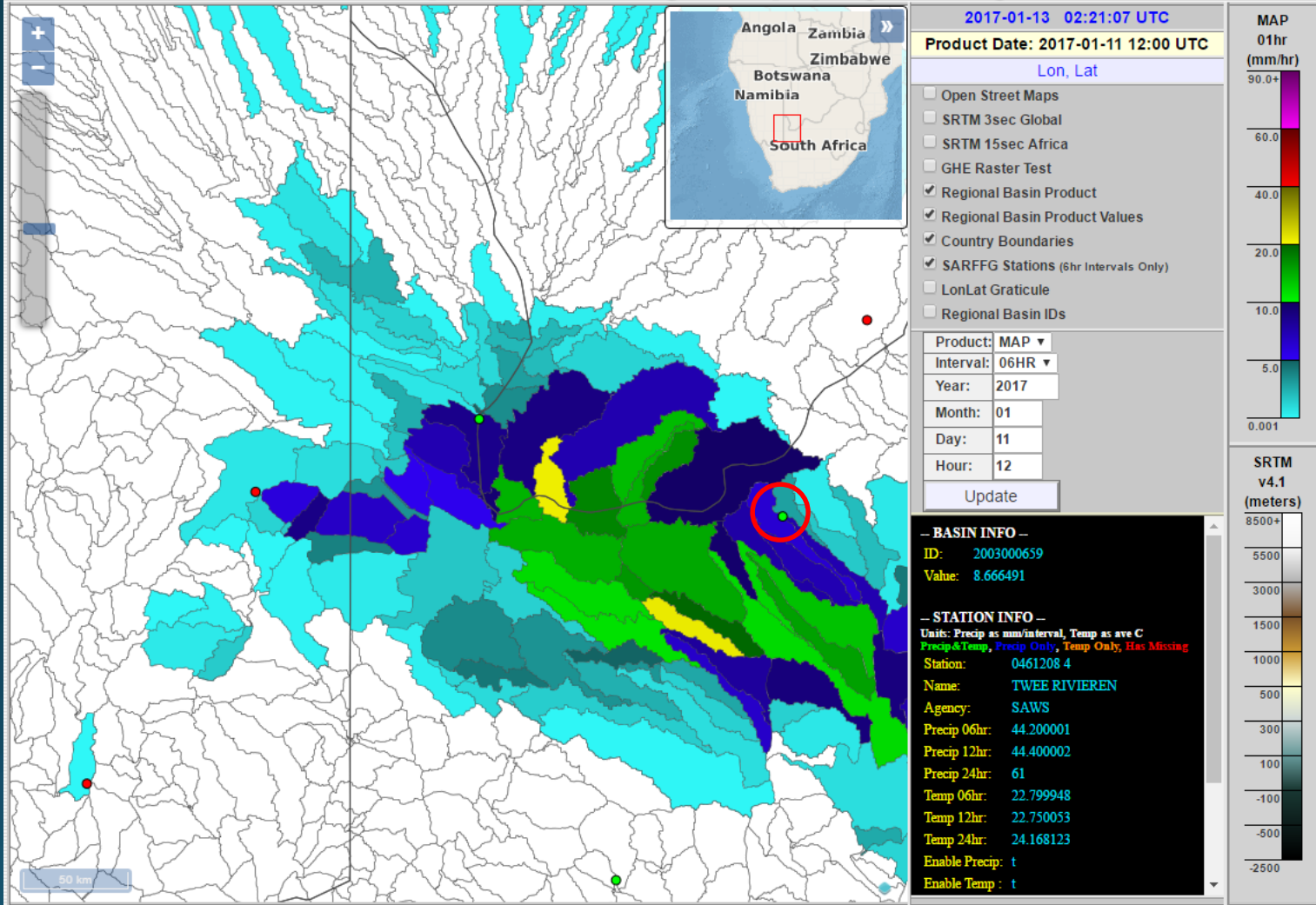

Selected station for data plot examples (green center-left dot)
Info box shows basin value for product selection (MAP o6hr) and station values with station meta data and parameters.

Mapserver Interface Prototype (Proof-of-concept)
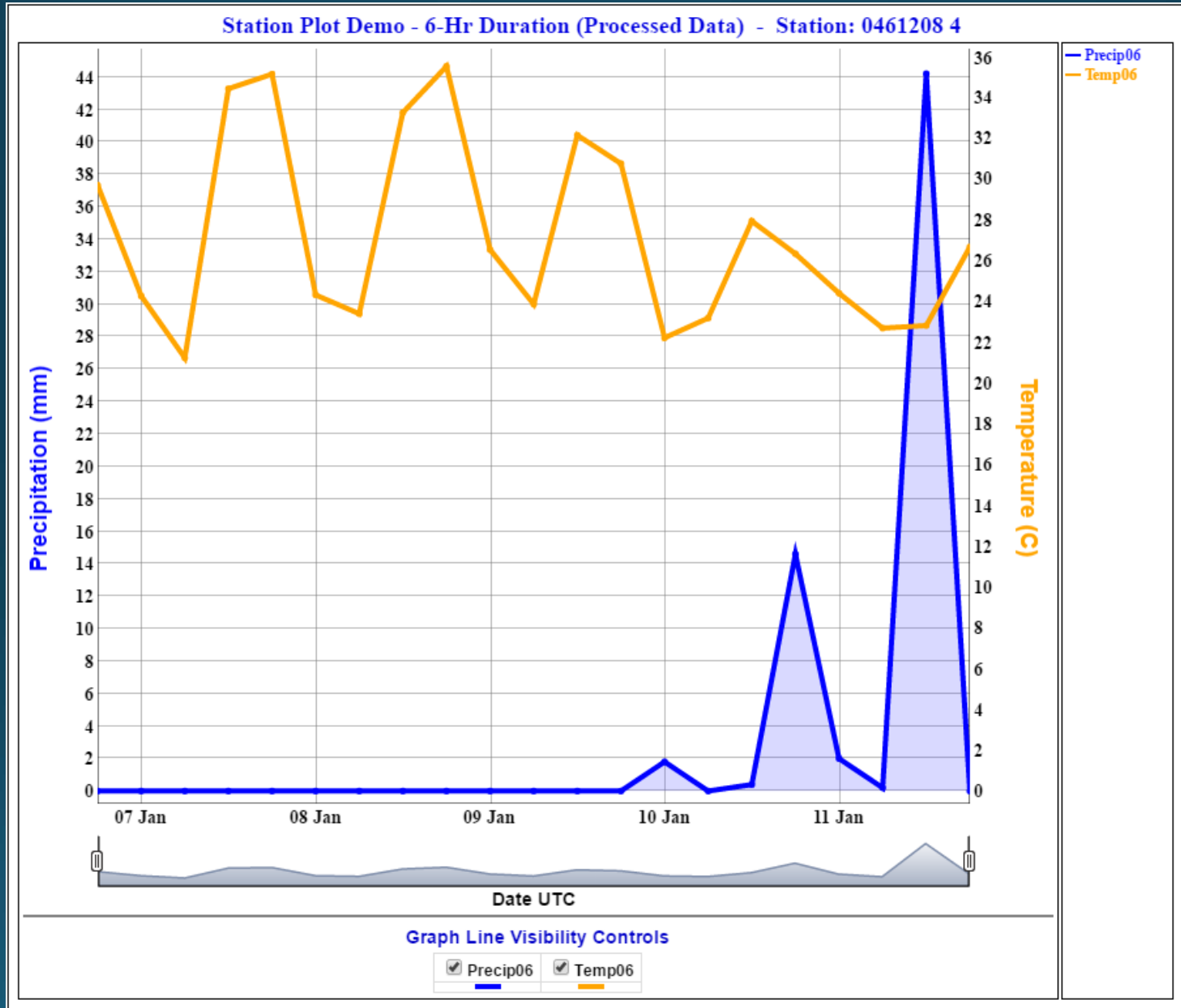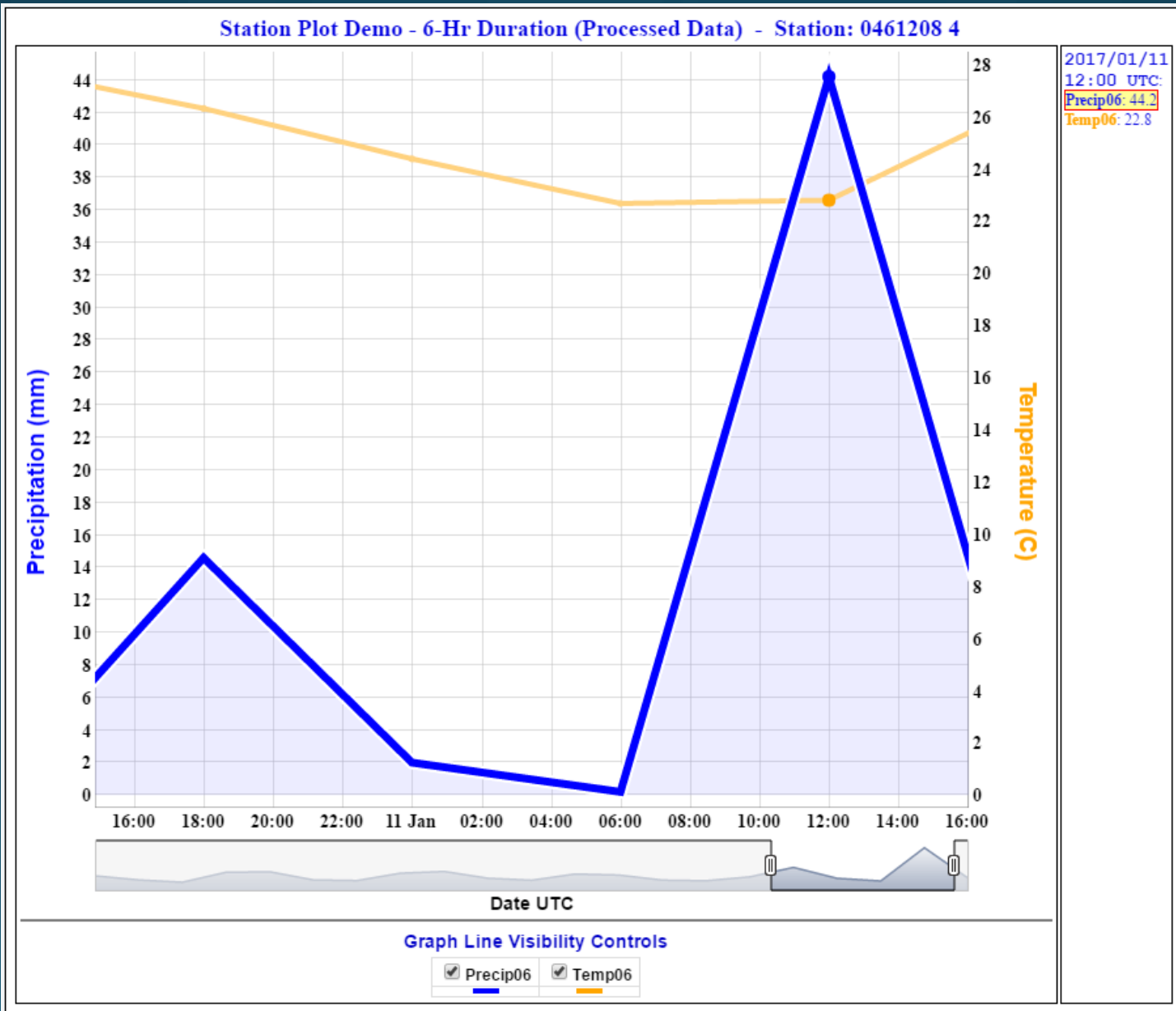
Mapserver Interface Prototype (Proof-of-concept)

Mapserver Interface Prototype (Proof-of-concept)

- Next Steps: Interface enhancement development activities currently underway
  - General integration of local/internal Open Street Map content hosting
    - No remote internet content requirements for OSM base layer
    - All content hosted directly from regional FFGS server
    - Customizable OSM styles and layers (shaded relief) to better suit FFGS applications
  - Layer transparency controls
  - Improved product selection and date selection
  - Time series plotting – FFG-grams and Station data
  - Summary-style "quick maps" for potential risk/impact areas
  - Integrate the basin time-series plotting to click-query results
  - Zoom-to-country buttons and basin-location tool to zoom to basin with ID input
  - Multi-pan, synchronized comparison maps for simultaneous, interactive inspection of multiple product layers.
  - Exploring possibility of including animation capability for raster/basin product layers