DMIP 2 Modeling Instructions
For
Oklahoma Basins
Previous Version February 6, 2007
Latest Revision April 25, 2007 (see yellow highlights)

A. Overview

These experiments are designed to address the science questions proposed in the DMIP 2 Science Plan for the Oklahoma region. Participants are referred to the Science Plan for background information.

A.1 Mandatory and Optional Forcings
We require that all groups participating in the Oklahoma experiments use the supplied NEXRAD radar precipitation estimates. These are produced at the NWS Arkansas-Red Basin River Forecast Center for operational river forecasting. They include quality control review by Hydrometerological Analysis and Support (HAS) experts at the River Forecast Center. These data must be used to generate the simulations described below in the specific instructions.
We suggest two sources of data to estimate potential evaporation. First, we provide the climatological monthly mean Free Water Surface Evaporation estimates made available in DMIP 1.   Second, we also provide a link to the North American Regional Reanalysis (NARR) web site. DMIP 2 participants are free to extract the needed variables from the NARR data to compute estimates of potential evaporation forcing for their models.

A.2 Relation to DMIP 1 modeling instructions.
The instructions for comparing lumped with distributed models are basically the same as those we specified in DMIP 1. Since we have located additional gauged sites, we have removed the use of ungauged points in all basins accept for the Blue River, which has no gauged interior points. For new DMIP 2 participants, we have also decided to use the USGS gauge on the Illinois River at Siloam Springs, AR, as a calibration gauge rather than the gauge at Watts, OK as we did for DMIP 1. Returning DMIP 1 participants will also use the Watts, OK basin, however, for the experiments in sections A.3 and B.1.4 below.

A.3 Note to Returning DMIP 1 Participants

In DMIP 1, we forced the models with an archive of the operational NEXRAD-based gridded precipitation estimates starting in 1993. This archive of operational data was subject to time-varying biases due in part to changes and enhancements in the processing algorithms, especially before 1996. (see: "Evaluating NEXRAD Multisensor Precipitation Estimates for Operational Hydrologic Forecasting" by Young et al., July, 2000, Journal of Hydrometeorology, Vol. 1, 241-254).

In DMIP 2 we would like to avoid these bias-prone data and use a later record of the operational archive of NEXRAD radar precipitation estimates. This period will begin on October 1, 1996 and extend into 2006. DMIP 2 participants <u>must</u> use these data as the primary forcing. For DMIP 2 we are asking each participant to submit both calibrated and uncalibrated simulations based on data from this period (the new calibration period is October 1, 1996 to September 30, 2002). However, we also wish to understand the impacts of using different calibration periods. Therefore, we ask that returning participants from DMIP 1 also submit model simulations using parameters from their DMIP 1 calibrations.   After these simulations are generated, the returning DMIP 1 participants are asked to re-calibrate (if necessary) their model parameters using the new calibration period.

A.4 Model Warm-up and Calibration

Participants should use the period October 1, 1995 to September 30, 1996 as a 'warm-up' period for their models prior to the calibration period. However, no adjustments to model states using observed outflow data are allowed during this period.

Calibration will be carried out by comparing observed and simulated streamflow <u>only at the five designated basin outlets</u> (indicated in brown in Section B.1 below) during the calibration period. Even though observed streamflow data may be readily available at some interior nested locations, modelers are asked to ignore these data in the calibration process. One emphasis of DMIP is to assess how well distributed models predict streamflow at interior locations, especially at ungauged sites. One reason we don't allow the use of interior point data for calibration in these comparisons is that many forecast basins around the country do not have interior point data available. We recognize that where available, these data may be useful in improving outlet simulations. Therefore, we do not discourage independent investigation into this issue <u>apart</u> from these formal comparisons.

Modelers will be asked to generate and submit to HL two basic types of simulations at specified points. The first type of simulation will be generated using initial or uncalibrated values of the hydrologic model parameters (and any hydraulic routing parameters). This test is to determine how well so-called "physically based" models perform with parameters derived from physical data. Participants will submit their uncalibrated simulations from both the calibration and verification periods. The second type of simulation is generated after hydrologic and hydraulic model parameters are calibrated at the designated basin outlets. This simulation is meant to show how much calibration is required and what improvement in simulation accuracy is gained. Participants will submit their simulations (using calibrated parameters) for both the calibration and verification periods.

During the same model runs to generate the basin outlet hydrographs (with both outlet calibrated and uncalibrated parameters), participants will also simultaneously generate simulations at interior points. In all basins, we have located interior points where observed streamflow data are available. As stated above, there should be no calibration using these interior observed data. These "blind" simulations will be used to assess how well interior processes can be simulated when calibration was performed using only basin outlet data.

For the Blue River basin, we specify the location of ~~two~~ one ungauged points along the main channel or a major tributary of the basin. These simulations will be analyzed by HL personnel to assess the variability of simulations from the various distributed models. See Table 1 and Figure 1 below for a more precise description of the interior point location.

Modelers will thus have to discretize their models in order to generate the interior hydrographs at the specified locations.

A.5 Stream Gauges in Oklahoma Basins

      The Illinois River flowing through Arkansas and Oklahoma presents a good opportunity for participants to test their models on 3 different scales of basins, each having observed streamflow data at interior locations. The smallest basin, Baron Fork at Eldon, OK. (see also: http://wmc.ar.nrcs.usda.gov/technical/HHSWR/Geomorphic/eldon.html) has a drainage area of 795 sq. km. (307 sq. miles) with an interior gauge on Peacheater Creek at Christie, OK. Note that for DMIP 2, we have located another gauge in the Baron Fork basin at Dutch Mills, OK. (see: http://wmc.ar.nrcs.usda.gov/technical/HHSWR/Geomorphic/dutchmills.html)

      Next to the Baron Fork basin is the Illinois River above the gauge at Watts, OK. This basin has a drainage area of 1645 sq. km (635 sq. miles) and includes the interior gauge on the Illinois River at Savoy, Arkansas. For DMIP 2, we have located three additional interior gauges in the Watts basin: Osage Creek near Cave Springs and Osage Creek near Elm Springs and the Illinois River South of Siloam Springs. The Illinois River at Watts, OK, is nested within the largest basin, the Illinois River above Tahlequah, OK, having a drainage area of 2484 sq. km (959 square miles). The Tahlequah basin also includes an interior gauge on Flint Creek at Kansas, OK (http://wmc.ar.nrcs.usda.gov/technical/HHSWR/Geomorphic/kansas.html) and two new gauges for DMIP 2 located on Flint Creek at Springtown, AR, and Sager Creek near West Siloam Springs, OK. (http://wmc.ar.nrcs.usda.gov/technical/HHSWR/Geomorphic/springtown.html) Thus, the Illinois River above Tahlequah, OK, contains eight interior gauge locations.
      For DMIP 2 we have located two interior gauges in the Elk River basin. These are located on Big Sugar Creek near Powell, MO and on Indian Creek near Lanagan, MO.
      The Blue River basin above the gauge in Blue, Oklahoma, has a USGS gauge on the main channel near Connerville, Oklahoma, with a drainage area of 419.6 sq. km. (162 sq. miles). Continuous observed streamflow data are available from this gauge starting in 2003.

Figure 1. Location of DMIP test basins and interior computational points in the Oklahoma, Missouri, and Arkansas area. Note that additional gauges have been located for DMIP 2, including gauge 1a in the Blue River Basin.

Table 1. Data for USGS Stream Gauges in the Oklahoma Region. Note that we have located additional gauges that were not used in DMIP 1. These are gauges 9-16 shaded in yellow. On April 18, 2007, we added gauge no. 1a to the list below. On April 25, 2007, we added the DMIP-2 ID to use for submitting simulations.

No	USGS No	Name	DMIP-2 ID	Latitude (degrees)	Longitude (degrees)	Area(km2)
1	7332500	Blue R. nr Blue, OK	bluo2	33.99694	-96.24803	1233
1a	7332390	Blue R. near Connerville, OK	connr	34.38333333	-96.60027778	419.6
2	7196500	Illinois River near Tahlequah OK	talo2	35.92286889	-94.9235658	2484
3	7197000	Baron Fork at Eldon OK	eldo2	35.92120028	-94.8385633	795
4	7196973	Peacheater Creek at Christie OK	peach	35.95480806	-94.6963369	65
5	7196000	Flint Creek near Kansas OK	knso2	36.1864725	-94.7068914	285
6	7195500	Illinois River near Watts OK	wtto2	36.13008	-94.57216	1645
7	7194800	Illinois River at Savoy AR	savoy	36.10313567	-94.34437763	433
8	7189000	Elk River near Tiff City Mo	tifm7	36.63146139	-94.5868886	2258
9	7188653	Big Sugar Creek near Powell MO	powel	36.615872	-94.182222	365
10	7188885	Indian Creek near Lanagan MO	lanag	36.599275	-94.44965	619
11	7194880	Osage Creek near Cave Springs AR	caves	36.28146623	-94.22798384	90
12	7195000	Osage Creek near Elm Springs AR	elmsp	36.22202302	-94.28854149	337
13	7195430	Illinois River South of Siloam Springs AR	sloa4	36.10869244	-94.53355206	1489
14	7195800	Flint Creek at Springtown AR	sprin	36.25563475	-94.43394	37
15	7195865	Sager Creek near West Siloam Springs OK	wsilo	36.2017483	-94.6052206	49
16	7196900	Baron Fork at Dutch Mills AR	dutch	35.880092	-94.486606	105

B. Modeling Instructions for the Oklahoma Experiments.

B.1. Comparison of Lumped and Distributed Simulations

B.1.1   Model Run Periods

1. 'Warm-Up' Period: October 1, 1995 to September 30, 1996.

2. Calibration period: October 1, 1996 to September 30, 2002

3. Verification period: October 1, 2002 to September 30, 2006

Note that we will make the 2006 data available as soon as possible.

B.1.2 Time Zone and Time Step:
Participants are requested to generate simulations in Z time (GMT). Simulations should have an <u>hourly</u> time step or have an ordinate spacing that includes hourly values to facilitate comparison to the USGS observed hourly discharge data. The USGS hourly discharge data is supplied by HL in Z time to correspond to the time stamp of the radar precipitation data.

B.1.3 Model "Warm-Up Period"
Participants are encouraged to use the period October 1, 1995 to September 30, 1996 as a 'warm up' period prior to the designated calibration period. However, no adjustments to model states are allowed in this period. If needed, modelers are permitted to extend the warm-up period by repeating the data for a second year.

B.1.4 Simulations to Submit

NOTE: Experiment for Returning DMIP 1 Participants: Hydrologic impacts of a new calibration period compared to that used in DMIP 1.
Here, we propose to assess the impacts of known biases in the archive of NEXRAD precipitation records on calibrated model results.   Returning DMIP 1 participants are asked to generate the hourly discharge simulations described in the DMIP 1 modeling instructions using their <u>calibrated</u> models developed in DMIP 1. These simulations should use the DMIP 2 NEXRAD precipitation estimates and should span the DMIP 2 calibration and verification periods. These simulations should be easy to generate given that the DMIP 1 participants have already set-up and calibrated their models using in DMIP 1. For this experiment, returning DMIP 1 participants should follow the DMIP 1 file name conventions for calibrated simulations on the DMIP 1 web page:
http://www.nws.noaa.gov/oh/hrl/dmip/file_names.html
with one exception: please add an underscore and the number '1' to each name so we can easily identify it from other simulations. An example follows:

eldo2_calib3_sqin.ohd_1

After that, returning DMIP 1 participants should re-calibrate their models using the DMIP 2 calibration period and data. Also, returning DMIP 1 participants should note a slight change in the DMIP 2 calibration instructions: They should calibrate their models using the USGS gauge on the Illinois River at Siloam Springs, Arkansas instead of the USGS gauge at Watts, OK as noted below in B.1.4.2.

B.1.4.1. Illinois River Basin: Baron Fork with basin outlet at USGS gauge 07197000 at Eldon, Oklahoma. Drainage area 795 sq. km. USGS gauge on downstream left abutment of bridge on State Highway 51, 0.644km (0.4 miles) southeast of Eldon, Oklahoma. See: http://wmc.ar.nrcs.usda.gov/technical/HHSWR/Geomorphic/eldon.html for additional basin and gauge information and site photos. Only observed streamflow data from this USGS gauge is permitted when calibrating the Baron Fork.

a. Generate 2 simulations at the basin outlet that span both the calibration and validation periods:

> 1. with uncalibrated/initial parameters
> 2. with calibrated parameters

b. While generating the 2 basin outlet simulations, compute interior simulations at:

1. Peacheater Creek at USGS gauge 07196973 at Christie, Ok., drainage area 65 sq. km (25 square miles). Gauge located 0.6436 km (0.4 miles) upstream of junction of Peacheater Creek with Baron Fork.
2. Baron Fork at USGS gauge 7196900 at Dutch Mills, Oklahoma, drainage area 105 square km. see http://wmc.ar.nrcs.usda.gov/technical/HHSWR/Geomorphic/dutchmills.html
NOTE: No calibration is allowed using observed streamflow data for simulations in 1 and 2 above. They are to be "blind" simulations.

B.1.4.2. Illinois River Basin: Illinois River with basin outlet at USGS gauge 7195430 South of Siloam Springs, AR. Drainage area 1,489 sq. km. (574 sq. mi.) Only observed streamflow data from this USGS gauge is permitted when calibrating models for this basin. Note: this basin will be used in DMIP 2 instead of the Illinois River at Watts, OK which was used in DMIP 1. This is to avoid any complications that may arise from the small reservoir known as Lake Francis upstream of the Watts, OK gauge but downstream of the USGS gauge at Siloam Springs, AR. See description, maps and photos at: http://www.nws.noaa.gov/oh/hrl/dmip/2/docs/watts%20lake%20francis.ppt

a. Generate 2 simulations at the basin outlet that span both the calibration and validation periods:

1. with uncalibrated/initial parameters
2. with calibrated parameters

b. While generating the 2 basin outlet simulations, compute interior simulations at:

1. Illinois River at USGS gauge 07194800 at Savoy, Arkansas. Drainage area 433 sq. km (167 sq. miles).
2. Osage Creek at USGS gauge 7194880 at Cave Springs, Arkansas. Drainage area 90 sq. km.
3. Osage Creek at USGS gauge 7195000 at Elm Springs, Arkansas. Drainage area 337 sq. km.

NOTE: No calibration is allowed using observed streamflow data in simulations 1-3. These are to be "blind" simulations.

B.1.4.3. Illinois River Basin: Illinois River with basin outlet at USGS gauge 07196500 at Tahlequah, Oklahoma. Drainage area: 2484 sq. km. Gauge 0.32 km (0.2 miles) downstream from U.S. Highway 62, 3.54 km. (2.2 miles) northeast of Tahlequah.

a. Generate 2 simulations at the basin outlet that span both the calibration and validation periods:

1. with uncalibrated/initial parameters
2. with calibrated parameters

b. While generating the 2 basin outlet simulations, compute simulations at:

1. Illinois River at USGS gauge 7195500 in Watts, OK. Drainage area 1,645 sq. km (downstream point)
2. Illinois River at USGS gauge 7195430 South of Siloam Springs, AR. Drainage area 1,489 sq. km. (574 sq. mi.)
3. Illinois River at USGS gauge 07194800 in Savoy, Arkansas.
4. Osage Creek at USGS gauge 7194880 at Cave Springs, Arkansas. Drainage area 90 sq. km
5. Osage Creek at USGS gauge 7195000 at Elm Springs, Arkansas. Drainage area 337 sq. km.
6. Flint Creek at USGS gauge 07196000 in Kansas, OK. Drainage area 285 sq. km (110 sq. miles). Upstream from bridge on U.S. Highway 412. See:
   http://wmc.ar.nrcs.usda.gov/technical/HHSWR/Geomorphic/kansas.html
7. Flint Creek at USGS gauge 07195800 in Springtown, Arkansas. Drainage area 37 sq. km. See:
   http://wmc.ar.nrcs.usda.gov/technical/HHSWR/Geomorphic/springtown.html
8. Sager Creek near West Siloam Springs OK, USGS gauge 7195865, 49 km^2

Note: no specific calibration using observed streamflow at these points, even though calibration was performed for the Illinois River at the USGS gauge south of Siloam Springs, AR for the runs in item B.1.4.2 above.

B.1.4.4. Elk River with basin outlet at USGS gauge 07189000 in Tiff City, Missouri.

Drainage area 2258 sq. km. (872 sq. miles). Gauge located on bridge on State Highway 43, 4.83 km (3.0 miles) southeast of Tiff City.

a. Generate 2 simulations at the basin outlet that span both the calibration and validation periods:

1. with uncalibrated/initial parameters
2. with calibrated parameters

b. While generating the 2 basin outlet simulations, compute interior simulations at:
1. Big Sugar Creek at USGS gauge 7188653 near Powell, Missouri. Drainage area: 365 sq. km.
2. Indian Creek at USGS gauge 7188885 near Lanagan, Missouri. Drainage area: 619 sq. km.
 NOTE: No calibration is allowed using observed streamflow data in simulations 1-2. These are to be "blind" simulations.

B.1.4.5. Blue River with designated basin outlet at USGS gauge 07332500 in Blue, Oklahoma. Drainage area 1,232.3 sq. km. (476 sq. miles). Gauge location: on bridge on U.S. Highway 70, 1.6 km (1.0 mile) west of Blue, Oklahoma.

a. Generate 2 simulations at the basin outlet that span both the calibration and validation periods:

1. with uncalibrated/initial parameters
2. with calibrated parameters

b. While generating the 2 basin outlet simulations, compute interior hydrographs at

1. Ungauged location on main channel of the Blue River at Lat. 34.50667, Lon. -96.675, drainage area 153.1 sq. km (59.15 sq. miles).
2. Ungauged location on main channel of the Blue River at Lat. 34.444167, Lon. -96.625 drainage are 302.56 sq. km (116.87 sq. miles). NOTE: As of April 18, 2007, this location is withdrawn given its proximity to the recently found gauge in number 3 below.
3. USGS gauge 07332390 on main channel of the Blue River near Connerville, Oklahoma. Latitude: 34.38333333, Lon. -96.60027778; drainage area 419.6 sq. km (162 sq. miles).

B.2 Modeling Instructions for the Oklahoma Mesonet Soil Moisture Experiment

B.2.1 Model Run Periods

1. Warm up period: ~~January 1, 1996~~ October 1, 1995 to Dec. 31, 1996

2. Run Period: January 1, 1997 to December 31, 2002

B.2.2 Model "Warm-Up Period"

The 'warm up' period is allowed so that participants can let their models 'equilibrate'. However, participants are not allowed to adjust their model states during this period.

B.2.3. Instructions

Participants are asked to set-up and run their <u>uncalibrated</u> models over the entire Oklahoma Mesonet domain. Models can be set up at any resolution, but must convert computed soil moisture (daily average) and runoff (*not routed cumulated water depth*) estimates to the HRAP grid scale (4x4 km). Participants are asked to generate HRAP-resolution daily grids of these two quantities. We expect to analyze soil moisture at 0-5 cm, 0-25 cm, and 25-75 cm soil layers. However, participants can generate soil moisture only for some of these layers if desired.

We propose to conduct soil moisture tests using data commonly and widely available for operational hydrologic forecasting. As such, we select the CONUS-scale STATSGO data for model parameterization. A dominant soil texture grid was derived at the HRAP resolution from the CONUS STATSGO data set. Vertically, the dominant texture is representative of the upper zone of the Sacramento model, which most often corresponds to a physical depth somewhere between 0-20 and 0-30 cm. This data set as well as the two derived soil properties 1) saturation volumetric water content (porosity) and, 2) residual volumetric water content (wilting point), are provided via the "STATSGO Soil Data for Oklahoma Soil Moisture Experiment" link on the DMIP2 "Data" web page. The porosity and wilting point data were derived using the method of Cosby et al. (1984). We request that participants use these data sets to drive their models if at all possible.

Statistical analyses will be conducted over watershed scales and not at specific points. Comparison analyses will be performed on a soil moisture saturation ratio calculated as:

$$SR = \frac{\theta - \theta_r}{\theta_s - \theta_r}$$

where θ is volumetric water content, θ_r is residual volumetric water content (or wilting point), and θ_s is the saturation volumetric water content (or porosity).

If modelers perform soil moisture simulations using their own soil property data, they should submit HRAP grids of their soil moisture saturation ratio *SR* instead of the volumetric soil moisture content. In this case, they should also provide HRAP grids of their soil properties porosity and wilting point.

We expect to perform two types of analyses:

1) Compare computed soil moisture and runoff integrated over a number of river basins (over 70 basins with drainage areas from 25 sq. km to 10,000 sq. km) to available measurements.
2) Compare computed daily grids (at a few levels of spatial and temporal averaging) to corresponding averages of observed data. We will examine consistency of computed and observed spatial patterns of soil moisture as well as consistency between different models. In addition, the spread between the models will be compared to differences between simulated and observed variables.

Domain window: Lat.-Lon. coordinate extents: 33.0333 to 39.35; -104.25 to -93.05
       HRAP coordinate extents: rows 270 to 419; columns 419 to 650

Location of
Oklahoma
Mesonet Stations: See: http://www.nws.noaa.gov/oh/hrl/dmip/2/data_link.html

Figure 2 below provides a description of the domain for which we are requesting data for the soil moisture experiments. The smaller box in black is the domain requested for soil saturation submissions. HRAP coordinate (419, 270) is the **lower-left corner of the lower-left cell in this box.** We request data for 232 columns and 150 rows. This makes the coordinate of the **lower-left corner of the upper-right box** equal to (650, 419). Latitude and longitude coordinates corresponding to the referenced HRAP coordinates are provided in the figure below. Also for reference, the bigger red box is the domain of the input precipitation files covering the entire ABRFC.
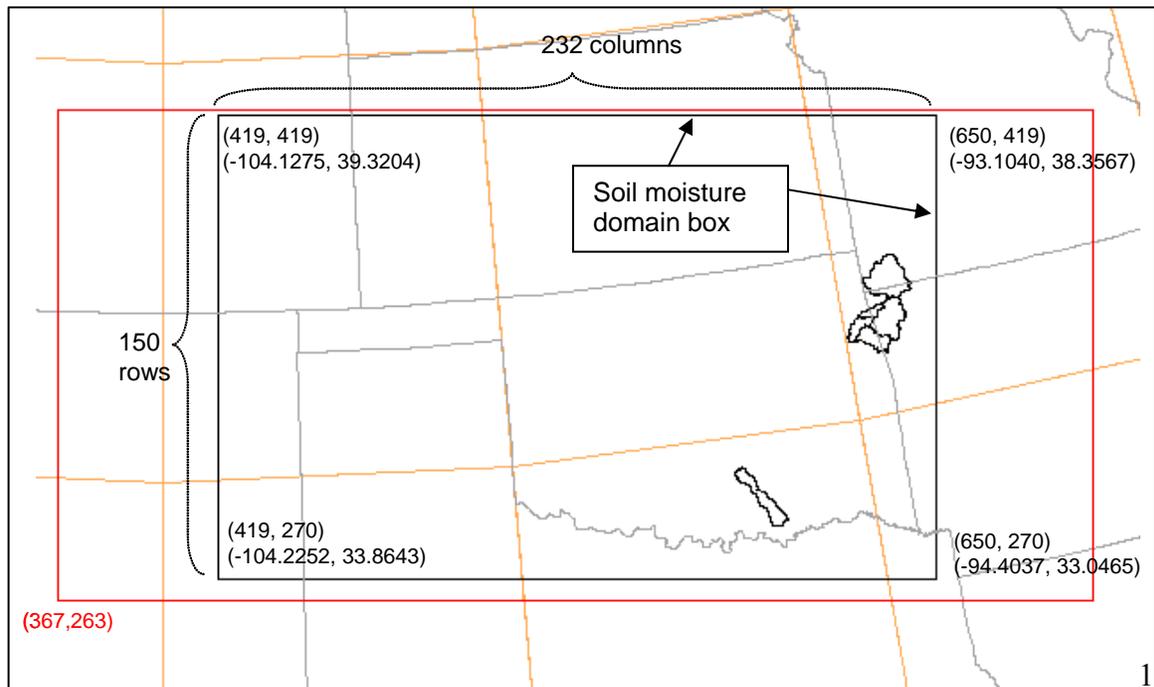
Figure 2 (Previous page). Domain of the soil moisture experiments. The box in red is the extent of the radar precipitation files provided for DMIP 2. The black box is the domain for the soil moisture experiments.

Although we prefer submissions in the XMRG binary file format, we will also accept submissions in the following Grid ASCII format commonly used in GIS software (specifically ESRI software). Note that the rows of data in this standard ASCII format are arranged from north to south while this is not the case for the XMRG binary format. Please use gzip to compress any ASCII files before submission! An ASCII file for soil saturation submissions would look as follows:

> *ncols 232*
> *nrows 150*
> *xllcorner 419*
> *yllcorner 270*
> *cellsize 1*
> *nodata_value -1.0*
> *<data line 1 is the northernmost row with 232 values>*
> *<data line 2 is the second northernmost row with 232 values>*
> *.*
> *.*
> *.*
> *<data line 150 is the southernmost row with 232 values>*

We request a separate binary or ASCII file for each day, each element. Grid file names should be as follows (very similar to the routing experiment definition):

<Participant acronym> <grid type> MMDDYYYYTTz

where <Participant acronym> is a three letter code- click http://www.nws.noaa.gov/oh/hrl/dmip/2/docs/group_codes.pdf for the list; <grid type> defines information type: 'trunoff' for total daily runoff in mm, 'sr00-05' for daily SR average over 0-5 cm layer, 'sr00-25' for daily SR average over 0-25 cm layer, 'sr25-75' for daily SR average over 25-75 cm layer; TT for this experiment equals 24, and z is acronym of GMT time.

B. 3 Routing Experiments.

These experiments are designed to address science question V on page 8 of the DMIP 2 Science Plan. Here, we propose to route participants gridded runoff volumes through a common channel routing algorithm.

We propose to use a kinematic routing scheme to move water overland and through channel networks. There will be no direct use of channel cross-section measurements. Channel morphometric relationships will be defined on the 4 km HRAP grid as an analytical approximation based on channel network structure law. This

approach is used in the current HL-RDHM routing scheme (Koren, et al., 2004).   OHD will perform routing simulations for all participants who can provide the required input grids. Because of time constraints, this test will be performed on a relatively short time period and limited number of DMIP 2 basins.

Participants are asked to generate HRAP grids of hourly surface and subsurface runoffs as outputs from their calibrated water balance models. If some participants run their models at time and spatial resolutions different from 1-hr and HRAP scales, we ask them to perform any needed spatial-temporal averaging or interpolation. Using HL-RDHM, we will rout participants' surface runoff using overland routing before it enters the channel; we will assume that participants' subsurface runoff enters directly into channel. For models that do not have two runoff components, routing can be performed as only surface or subsurface runoff depending on the participant's desire. Participants are asked to specify which routing they prefer if they submit a combined runoff value. We ask that the participants generate an **average runoff per hour [mm/hr] for each cell.** Grid file names should be as follows:

<Participant acronym><Basin acronym><grid type>MMDDYYYYTTz

where <grid type> defines information type: 'surface' for surface runoff, and 'subsurf' for subsurface runoff, MM, DD, YYYY are month, day and year, "TT" corresponds to the hour in Z (GMT) time from 00 to 23, <Participant acronym> is a three letter code-click http://www.nws.noaa.gov/oh/hrl/dmip/2/docs/group_codes.pdf for the list; and <Basin acronym> refers to bluo2 or talo2 for the Blue and Tahlequah river basins, respectively.

Note that the time stamp information for these files is exactly the same as that for the xmrg NEXRAD precipitation data. The date-time stamp is for the end of the hour for which the quantity is recorded. Therefore, one detail to keep in mind is that the values in a file with the hour stamp '00' correspond to the runoff depth for the last hour of the previous day, even though the day DD increments to the next day in the file time stamp, as shown below in Figure 3:
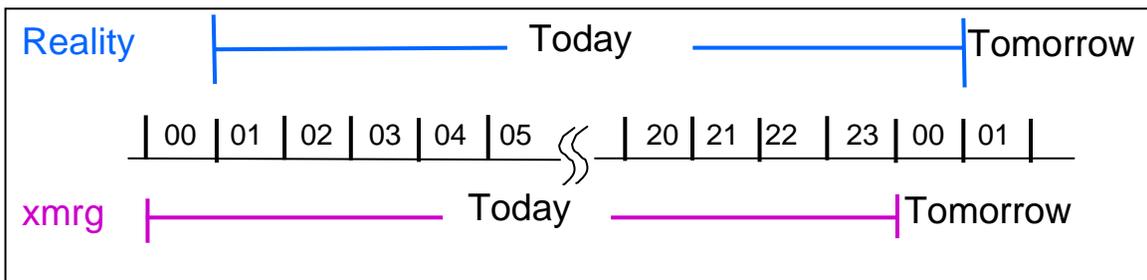

Figure 3. Comparison of XMRG time stamp and 'reality' clock time.

Good candidates for this test are the Blue and Tahlequah River basins. DMIP 1 experience suggests that Blue River routing may significantly affect the resultant hydrograph at the USGS gage at Blue, Oklahoma. The Tahlequah River has a number of interior basins for tests. We selected rather short time periods which cover a number of flood events of different amplitudes:

Blue River: from 10/10/2000 to 03/20/2001
Tahlequah River: from 04/25/2000 to 07/31/2000.

Participants are requested to generate these simulations in Z time (GMT). Simulated grids should have an <u>hourly</u> time step.

As with the soil moisture data, we prefer submissions in the XMRG binary file format, but we will also accept submissions in the Grid ASCII format as described in the soil moisture modeling section.

The grids submitted should cover at least the rectangular domains defined below. Not all of the grid cells in these rectangular domains intersect the target basins. The HL-RDHM routing model we will use includes 151 HRAP pixels upstream of Tahlequah, OK, and 78 HRAP pixels upstream of Blue, OK. We do not require that other models will have domain boundaries precisely matching ours.

We ask that the participants generate an **average runoff per hour [mm/hr] for each HRAP cell in their basin model and assign -1 to all cells outside of this domain in the submitted files.**

If converting runoff from sub-basins or other model elements that only cover part of an HRAP cell at the basin boundary, we suggest reducing the runoff depth by the ratio of your model area in that cell to the HRAP cell area so that we can produce the correct volume for that cell. Our routing model will assume that the runoff is averaged over the entire cell.

It is possible that the participant HRAP domain may be slightly different than ours. In this case, we will make simple scalar adjustments so that the total volume of runoff generated by each participant model will be preserved (e.g. If a participant model includes an HRAP cell outside of our domain, we will add that runoff to a pixel or pixels that are inside the routing domain).

Although we do not require participants to submit runoff for pixels that exactly match our modeling domain, we do provide the list of HRAP pixels in our modeling domain for reference.

http://www.nws.noaa.gov/oh/hrl/dmip/2/docs/bluo2hrap.txt

http://www.nws.noaa.gov/oh/hrl/dmip/2/docs/talo2hrap.txt

Minimum Rectangular Domain for the Illinois River at Tahlequah

ncols 20
nrows 18

xllcorner 622
yllcorner 345
cellsize 1
nodata_value -1.0

Example blank file with values all set to -1:
http://www.nws.noaa.gov/oh/hrl/dmip/2/docs/talo2domain.asc

Minimum Rectangular Domain for the Blue River:

Ncols 19
nrows 21
xllcorner 585
yllcorner 286
cellsize 1
nodata_value -1.0

Example blank file with values all set to -1:
http://www.nws.noaa.gov/oh/hrl/dmip/2/docs/bluo2domain.asc

B.4 Forecast Experiments: Modeling instructions coming later.