Spatial Datasets at NSSL to Support NWS Flash-Flood Operations

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Since the late 1990s, the National Severe Storms Laboratory (NSSL) has been actively involved in developing, maintaining, and serving spatial data to National Weather Service (NWS) users in support of flash-flood operations. One of the first and largest spatial data efforts at NSSL was the creation of a national seamless dataset of flash-flood-scale basins. These basins provide the spatial framework for calculations of average basin rainfall rate and accumulation in the Flash Flood Monitoring and Prediction[1] (FFMP) program used at the NWS Weather Forecast Offices (WFOs). During the past decade, the dataset has been updated and enhanced with features such as seamless hydrologic-connectivity attributes that allow downstream tracing of flow and upstream drainage area selection. This dataset is currently served to users through NSSL's National FFMP Basin Repository and FFMP Basin Customization Repository websites.
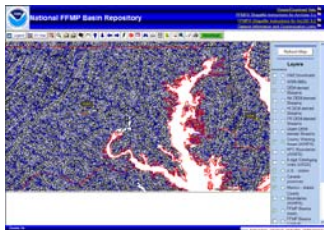

Flash-flood-scale DEM-derived basins and streams in shapefile format can be downloaded from the FFMP Basin Repository.

The repository also contains links to an ArcGIS geoprocessing toolbox and detailed instructions for preparing the basin and stream shapefiles for AWIPS and FFMP.
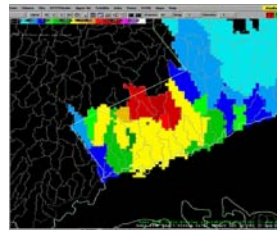
The AWIPS-ready shapefiles are used by FFMP for computing basin-averaged rainfall amounts and rates from precipitation estimates.
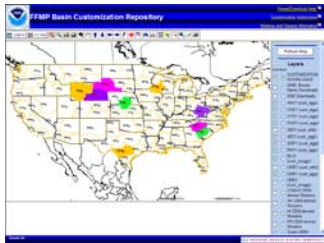
FFMP datasets that have been customized locally at the WFOs can be shared between neighboring offices via the FFMP Basin Customization Repository.

The repository also contains links to detailed procedures for customizing the FFMP datasets using ArcGIS.


A sample customization procedure document. Available procedures include tasks such as stream name editing/verification, merging basins, subdividing basins, manually editing basin boundaries, and masking water bodies.

As a result of recent NWS Advanced Hydrologic Prediction Service (AHPS) funding, a new repository is being developed to store and serve spatial datasets and other information related to the Gridded Flash Flood Guidance[2] (GFFG) product, which is produced by NWS River Forecast Centers (RFCs). Base data such as DEMs, soils, and land use/cover will be organized into hydrologic units for easy download and application in any type of hydrologic project. GFFG-related datasets derived at the RFCs such as curve number, peak flow, critical flow, and others will also be included in the repository along with GFFG documents, scripts, presentations, and training materials.

The GFFG Base/Derived Datasets Repository. Yellow features indicate the relatively large hydrologic units by which the datasets will be organized and downloadable, and blue features represent the RFC boundaries.

NSSL's Next-Generation Quantitative Precipitation Estimate[3] (Q2) products are now available upon request in a spatially-referenced image format for use in GIS. Animated loops of these images overlaid on Google Maps can also be viewed in real-time at http://nmq.ou.edu/.
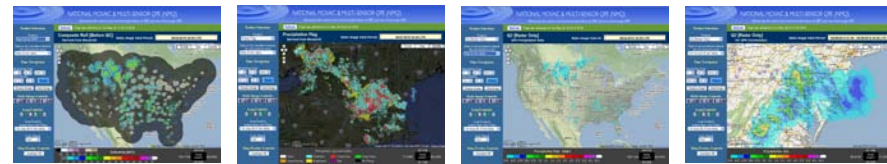
Q2 products such as Composite Reflectivity, Precipitation Flag, and Q2 rates and accumulations can be animated in real-time. Images are available for the past 72 hours.

A recent unfunded project involves the development of a spatial database of U.S. wind farm locations and associated radar wind turbine clutter (WTC). WTC is a growing issue and area of concern in relation to accurate radar-derived precipitation estimates. Determining wind turbine locations and the occurrence of wind turbine clutter is the first step in the process of developing a WTC mitigation algorithm for NSSL's Next-Generation Quantitative Precipitation Estimate[3] (Q2) products. The wind turbine spatial dataset will also be provided to NWS forecasters at the WFOs and RFCs as another source of information to potentially improve situational awareness.

Wind turbines can been seen in ESRI's ArcGIS Online imagery.

Wind turbines can also be seen in Google Maps imagery.
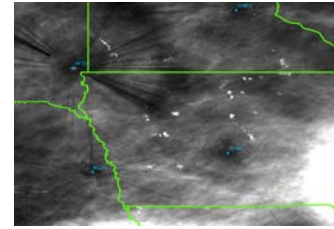
Areas of potential wind turbine clutter can be identified from "hot spots" in a 12-month Q2 precipitation estimate accumulation.

Red polygons delineate Q2 hot spot areas that coincide with large wind farms. Note that highways can also be a source of radar interference.

Related Websites
FFMP Basin Repository: http://nmqxrt-29.nssl.noaa.gov/Website/ffmp_nbr (restricted by IP address)
FFMP Basin Customization Repository: http://nmqxrt-29.nssl.noaa.gov/Website/ffmp_cust (restricted by IP address)
GFFG Base/Derived Datasets Repository: http://nmqxrt-29.nssl.noaa.gov/Website/gffg (restricted by IP address)
National Mosaic and Multi-Sensor QPE (NMQ): http://nmq.ou.edu (go to the NMQ/Google Maps-Animation Loop Page link)

References
[1]Filiaggi, M., M. Churma, S. Smith, L. Xin, and M. Glaudemans, 2002: Flash Flood Monitoring and Prediction Version 2.0: Continued AWIPS Modernization. *Preprints 18th Conference on IIPS*, Orlando, Amer. Meteor. Soc., **J7.7**.
[2]Schmidt, J., A. J. Anderson, and J. H. Paul, 2007: Spatially-variable, physically-derived flash flood guidance. *Preprints 21st Conference on Hydrology*, San Antonio, Amer. Meteor. Soc., **6B.2**.
[3]Vasiloff, S., D.J., Seo, K. Howard, J. Zhang, D. H. Kitzmiller, M. G. Mullusky, W. F. Krajewski, E. A. Brandes, R. M. Rabin, D. S. Berkowitz, H. E. Brooks, J. A. McGinley, R. J. Kuligowski, and B. G. Brown., 2007: Q2: Next generation QPE and very short-term QPF. *Bull. Amer. Met. Soc.* **88**, 1899-1911.