A HYBRID FLOOD FORECASTING SYSTEM: INTEGRATING NWSRFS AND GEOSFM

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The National Weather Service International Activities Office (NWS-IA) and U.S. Geological Survey (USGS) are collaborating to transfer flood monitoring, forecasting, and warning technologies to Asia. Funded by the U.S. Agency for International Development (USAID) Office of Foreign Disaster Assistance (OFDA) under a programmatic initiative known as Asia Flood Network (AFN), the goal is to reduce flood-related loss of life and property via the transfer of flood-forecasting and warning technologies, developed by NOAA, USGS, and other U.S. agencies, to counterpart agencies in Asia. NOAA, USGS, and OFDA have been planning the development of a hybrid NOAA-USGS system that could benefit from integrating developments being made independently by the two science agencies and applying them in the developing world. The Hybrid Flood Forecast System is well suited for application in data sparse areas such as the Mekong River Basin.

The USGS Geospatial Streamflow Model (GeoSFM) application began as a Famine Early Warning Systems Network (FEWS NET – a USAID funded activity) project. To meet this need, GeoSFM was designed to utilize NOAA satellite rainfall estimates, rainfall forecast data from the U.S. Air Force, and potential evapotranspiration data combined with Geographic Information System (GIS) data to provide data and parameter estimates for streamflow forecast models. Figure 1 shows a schematic of the GeoSFM application.

The GIS processing in GeoSFM utilizes the following spatial datasets:

- Digital Elevation Model (DEM)
- ESRI Shape files
- Land Use/Land Cover
- Soils Data
- Satellite Rainfall Estimates
- Potential Evapotranspiration Estimates
- Precipitation Forecasts

These datasets are used to estimate hydrologic model parameters or as inputs to the models. The models perform soil moisture accounting, unit hydrograph routing, and channel routing to provide forecast hydrographs at specific points in a basin.

GeoSFM provides one ArcView interface to perform basin initialization, data preprocessing, modelling, and product generation. It was specifically designed to be applied in developing countries with a minimal amount of data for model calibration and/or for real-time forecasting.

The National Weather Service River Forecast System (NWSRFS) is a fully functional operational forecasting system that is used by the NWS. The system has been implemented in a wide range of climates in the U.S., and around the world as part of NWS technology transfer projects. The system includes: historical and real-time data processing, capabilities for performing model calibration, a Graphical User Interface (GUI) for real-time forecast adjustments, capabilities for Ensemble Streamflow Prediction and analysis, and a large suite of models that can be utilized to

model natural hydrologic and hydraulic processes, as well as regulated streamflow processes, e.g., reservoirs and diversions.

The objective of the Hybrid Flood Forecasting System is to integrate the advantages of GeoSFM (spatial data processing for model initialization and forecasting) with the more complete operational forecasting functionality of NWSRFS. Figure 2 provides a schematic of the Hybrid Flood Forecasting System.

This exhibit combines a software demonstration of the capabilities of NWSRFS with a poster presentation describing the vision of the Hybrid Flood Forecasting System.

Figure 1. GeoSFM Application Schematic

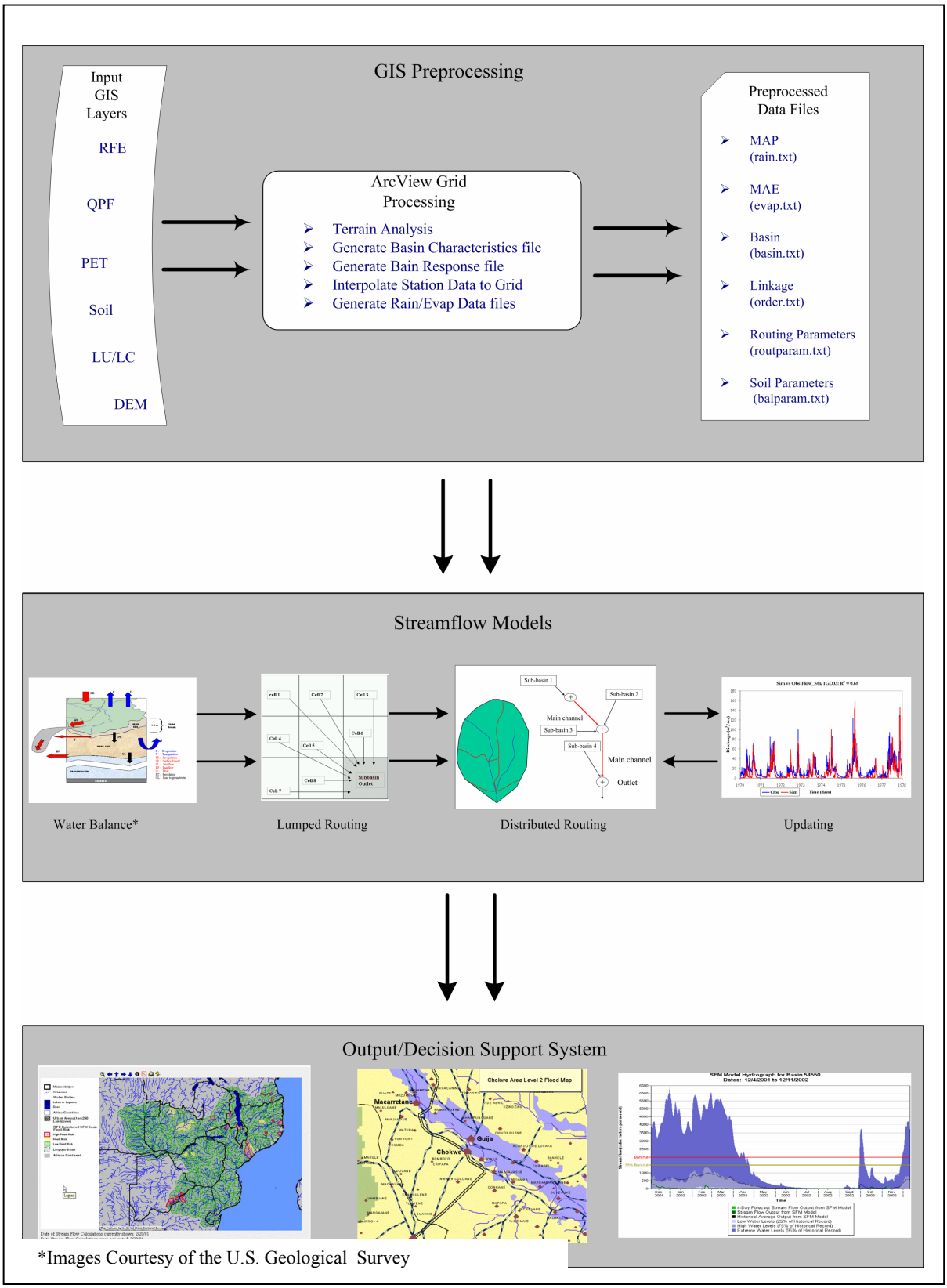
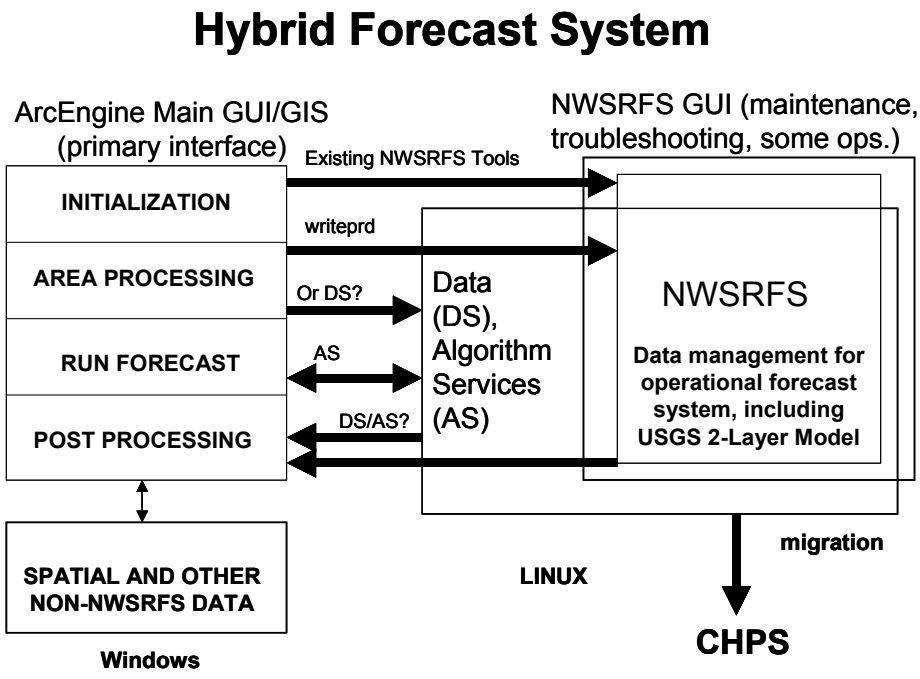


Figure 2. Hybrid Flood Forecast System Schematic


Hybrid Forecast System
ArcEngine Main GUI/GIS
(primary interface)
NWSRFS GUI (maintenance,
troubleshooting, some ops.)
Existing NWSRFS Tools
INITIALIZATION
writeprd
AREA PROCESSING
Or DS?
Data
(DS),
Algorithm
Services
(AS)
NWSRFS
Data management for
operational forecast
system, including
USGS 2-Layer Model
RUN FORECAST
AS
POST PROCESSING
DS/AS?
migration
SPATIAL AND OTHER
NON-NWSRFS DATA
LINUX
CHPS
Windows