# EF5 — Ensemble Framework for Flash Flood Forecasting

A MODELING TOOL FOR LARGE SCALE HYDROLOGIC FORECASTING

EF5 is a raster-based hydrologic modeling platform, originally developed with the goal of simulating surface water flows at continental and global scales for early warning applications. The main target has been the representation of physical processes including rapid hydrologic responses to rainfall, typical of flash floods. Initial support for the development of EF5 was provided by the National Aeronautics and Space Administration - *NASA* - and the National Oceanic and Atmospheric Administration - *NOAA* - to researchers at The University of Oklahoma and National Severe Storms Laboratory. EF5 is the core hydrologic modeling framework of the Flooded Locations And Simulated Hydrographs - *FLASH* -, a suite of forecasting tools that are used operationally by National Weather Service - *NWS* – forecasters in the United States of America. EF5 has also been used for research and applications across different regions of the world.
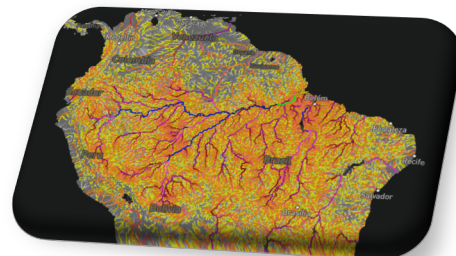
FLEXIBLE ARCHITECTURE FOR MULTIPLE PHYSICS REPRESENTATIONS

EF5 features multiple representations of the macro-physical processes of the water cycle. In its current version (v1.2.3), it includes physics from the following three surface water balance modules handling the vertical fluxes of water in the soils and surface runoff generation: Coupled Routing and Excess Storage (CREST), Sacramento Soil Moisture Accounting (SAC-SMA), and Hydrophobic (HP). It also includes two options for flow routing of water across the landscape and into the drainages following flow paths defined by a digital elevation model: linear reservoirs, and the kinematic wave approximation of the 1-D Saint-Venant Equations of open channel flow. Additionally, a snowmelt module based on the SNOW-17 model and a heuristic algorithm for inundation mapping are included. EF5 has been designed as a modular architecture, which facilitates the addition of new physical representations as well as pre- and post-processing routines.
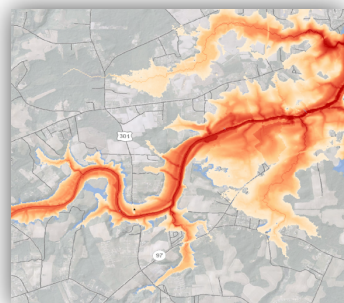
EF5 IN ACTION

Training material is available on EF5's official website at http://ef5.ou.edu. To learn more about the FLASH project, visit https://blog.nssl.noaa.gov/flash/ and http://flash.ou.edu. A demonstration system for global flood forecasting is at http://floods.global.

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