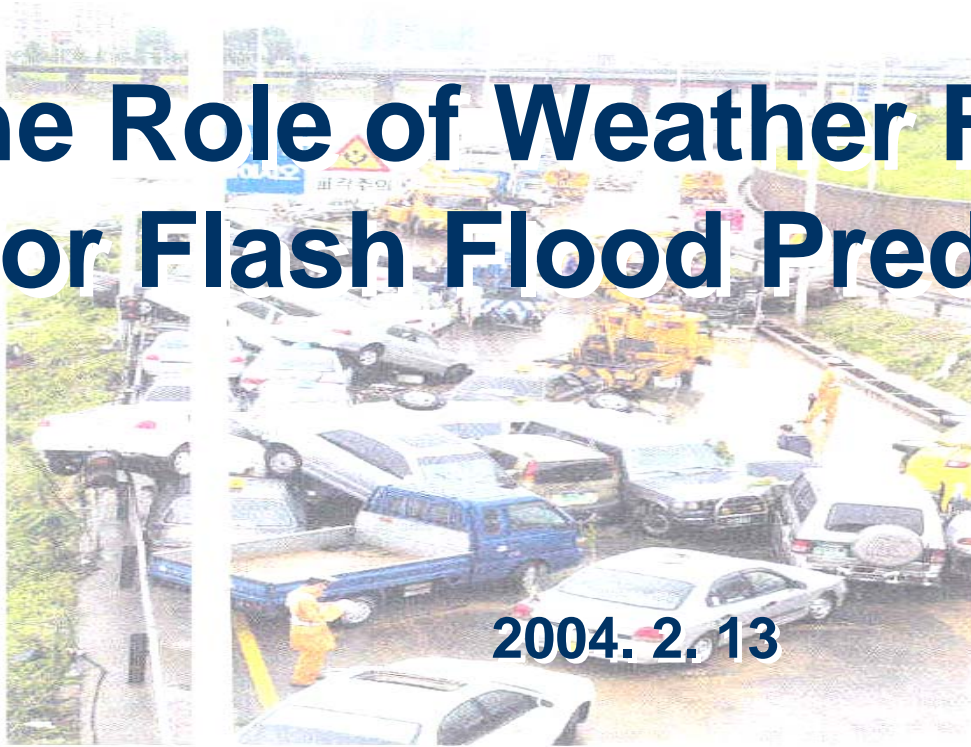
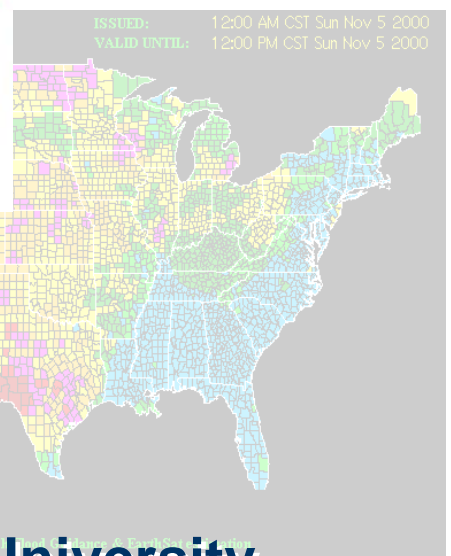


The Role of Weather Forecast for Flash Flood Prediction



2004. 2. 13



ISSUED: 12:00 AM CST Sun Nov 5 2000
VALID UNTIL: 12:00 PM CST Sun Nov 5 2000

All Necessary
Period To
(in Inches)
0.6-3.0
1-3.5
3.6-4.0
4.0+
NO DATA

Bae, Deg-Hyo

Dept. of Civil & Env. Eng., Sejong University

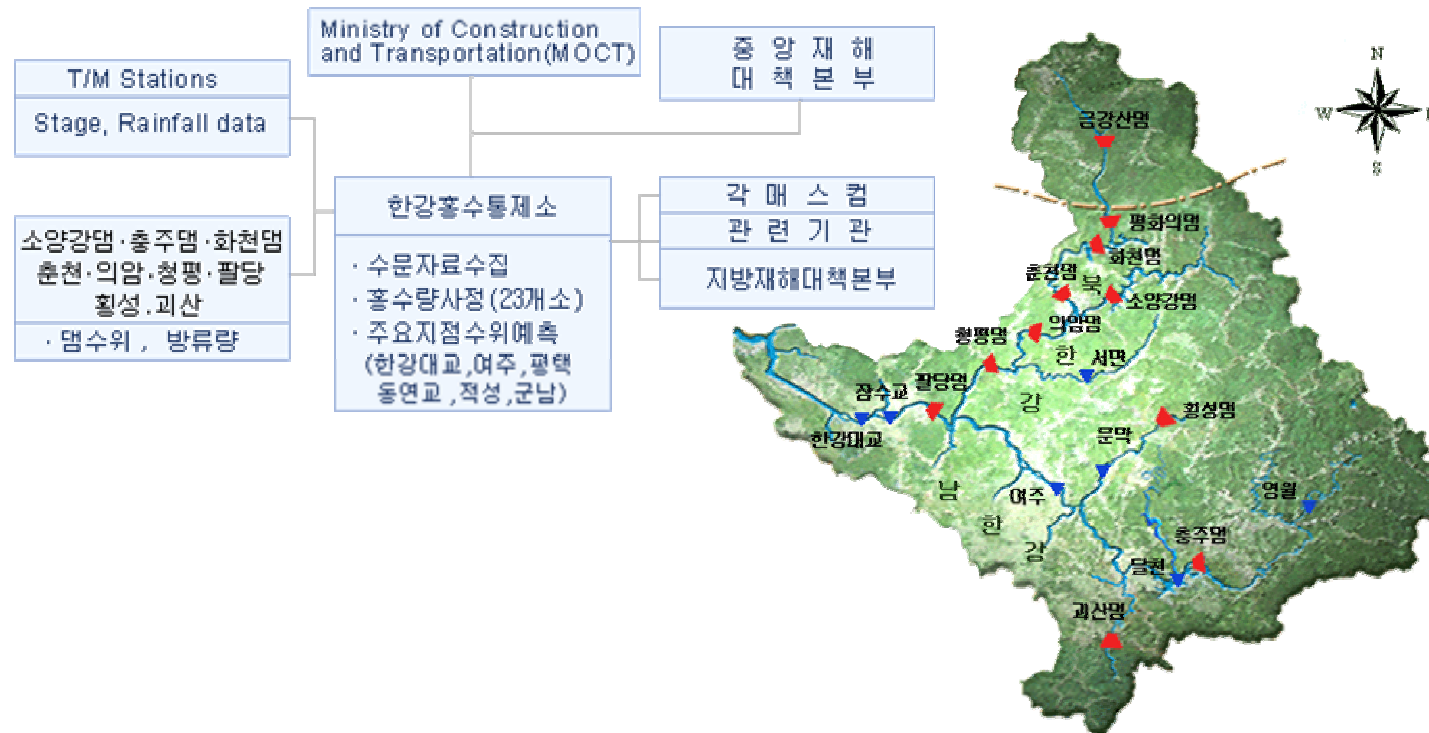
Contents



Flood Management in Korea

□ Han River Forecast Control Center

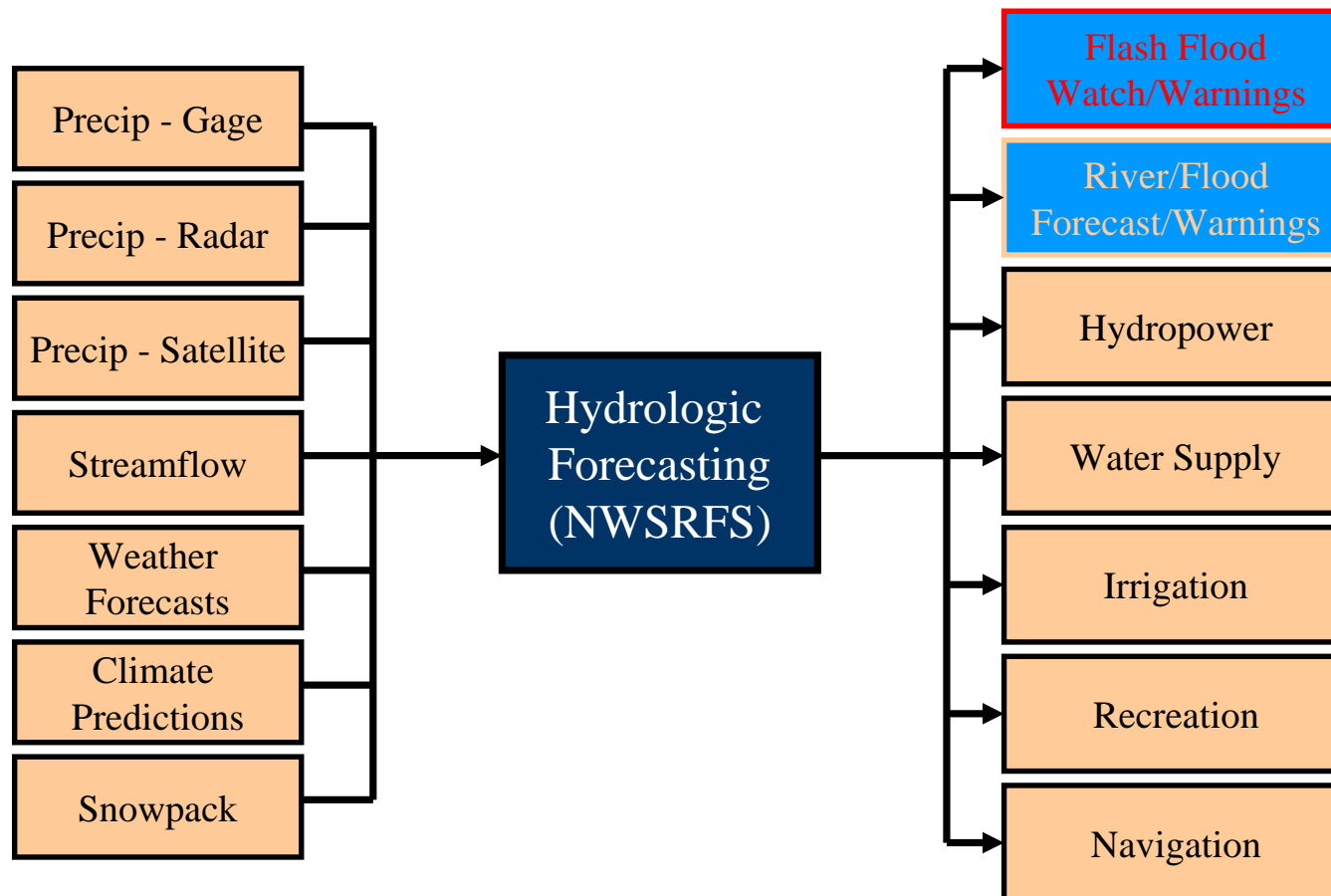
- ✓ Collect real time river stage
- ✓ Flood forecast using by Storage Function Method(SMF) model



Flood Management in NWS, USA

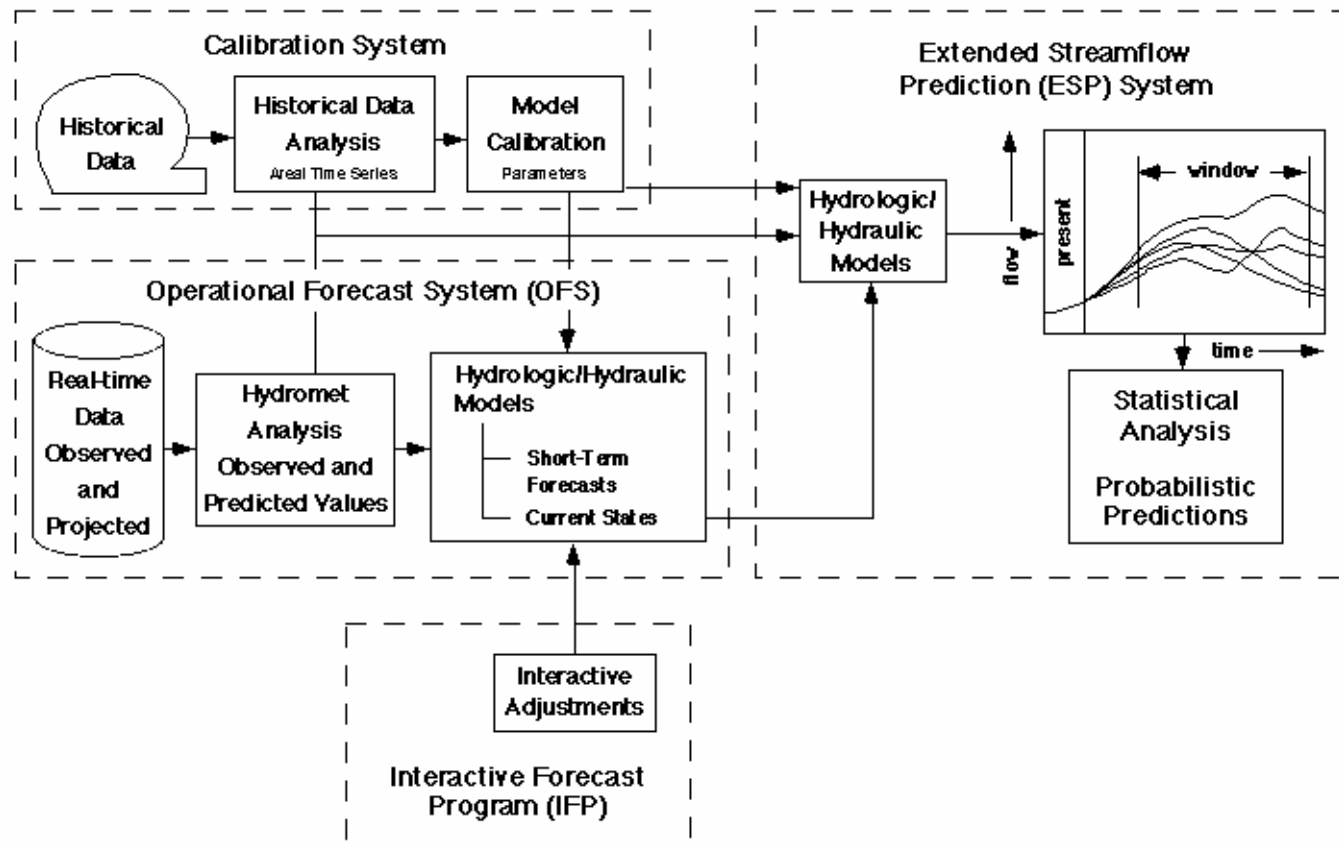
☐ NWSRFS:

✓ Hydrologic Forecasting Data Inputs and Applications



Flood Management in NWS, USA

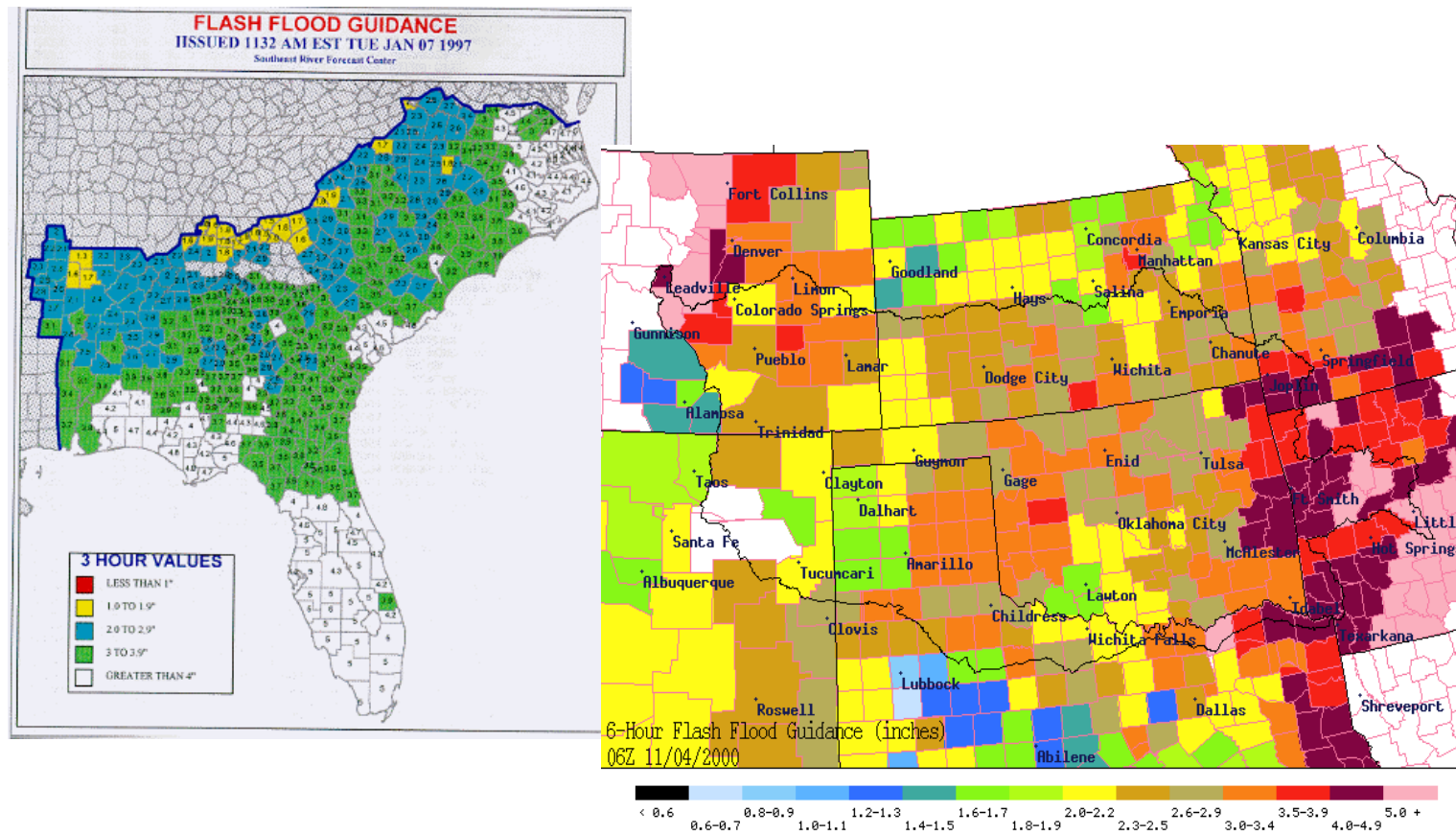
□ NWSRFS: Component



Flood Management in NWS, USA

☐ NWSRFS: Examples

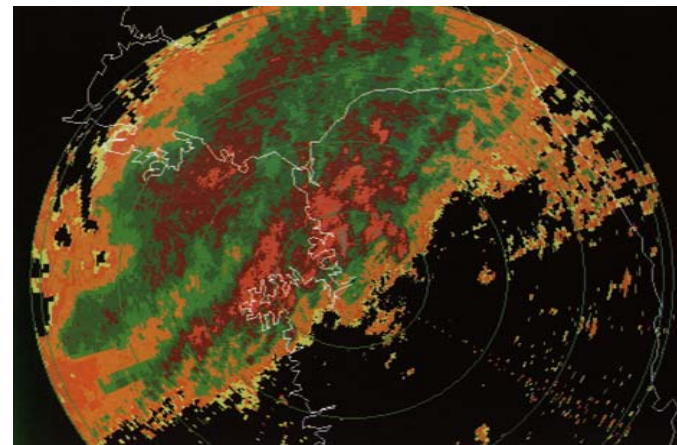
✓ Flash Flood Watch/Warnings



Flash Flood Guidance

❑ What is FFG ?

FFG is the amount of rainfall needed in a specified period of time to initiate flooding on small streams



❑ Where ?

FFG is computed for small ungaged areas (grids, zones, counties)

Flash Flood Guidance



□ Use ?

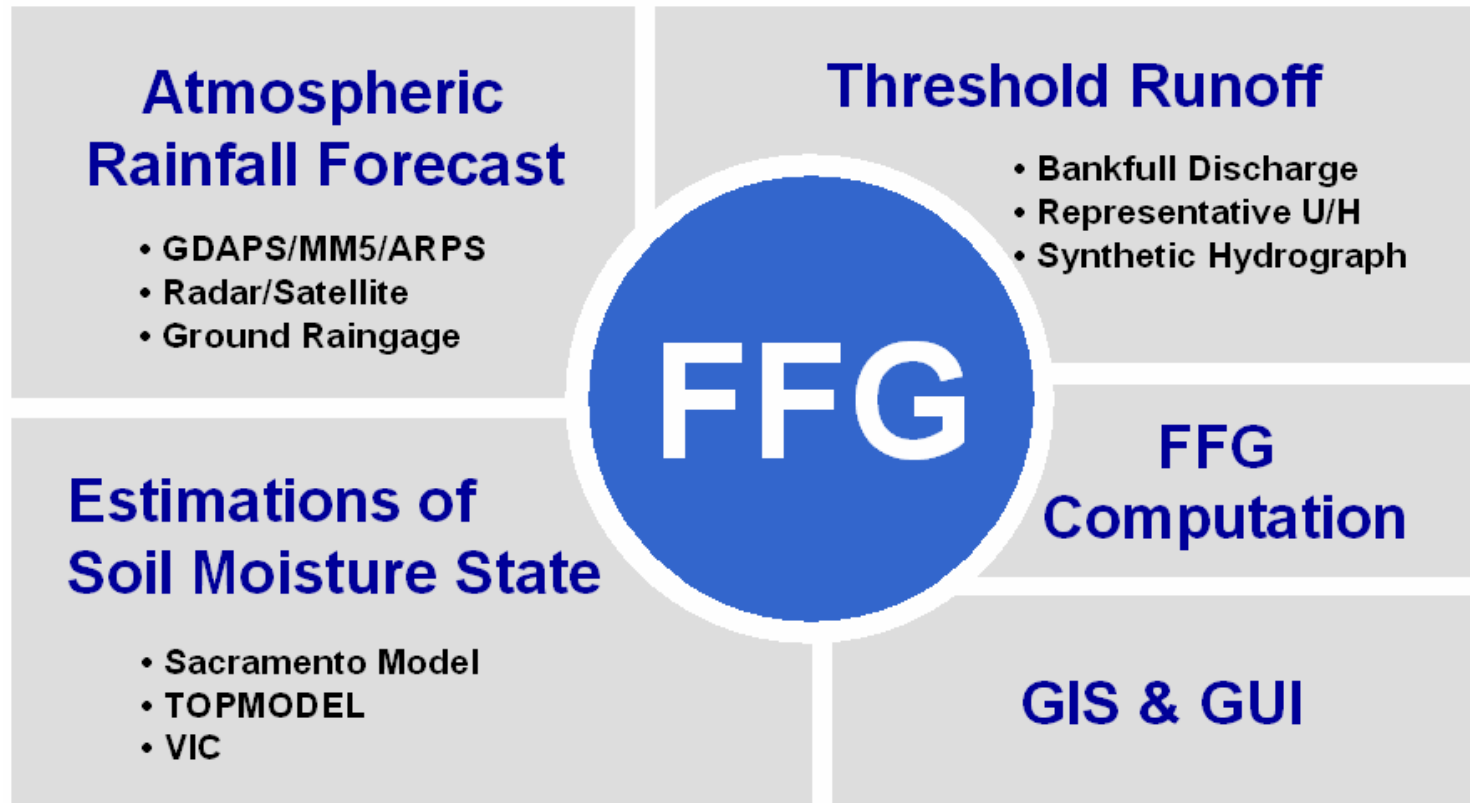
WFO use zone/county
and headwater FFG for
issuing FF watched and
warnings

□ Forecast Lead Time ?

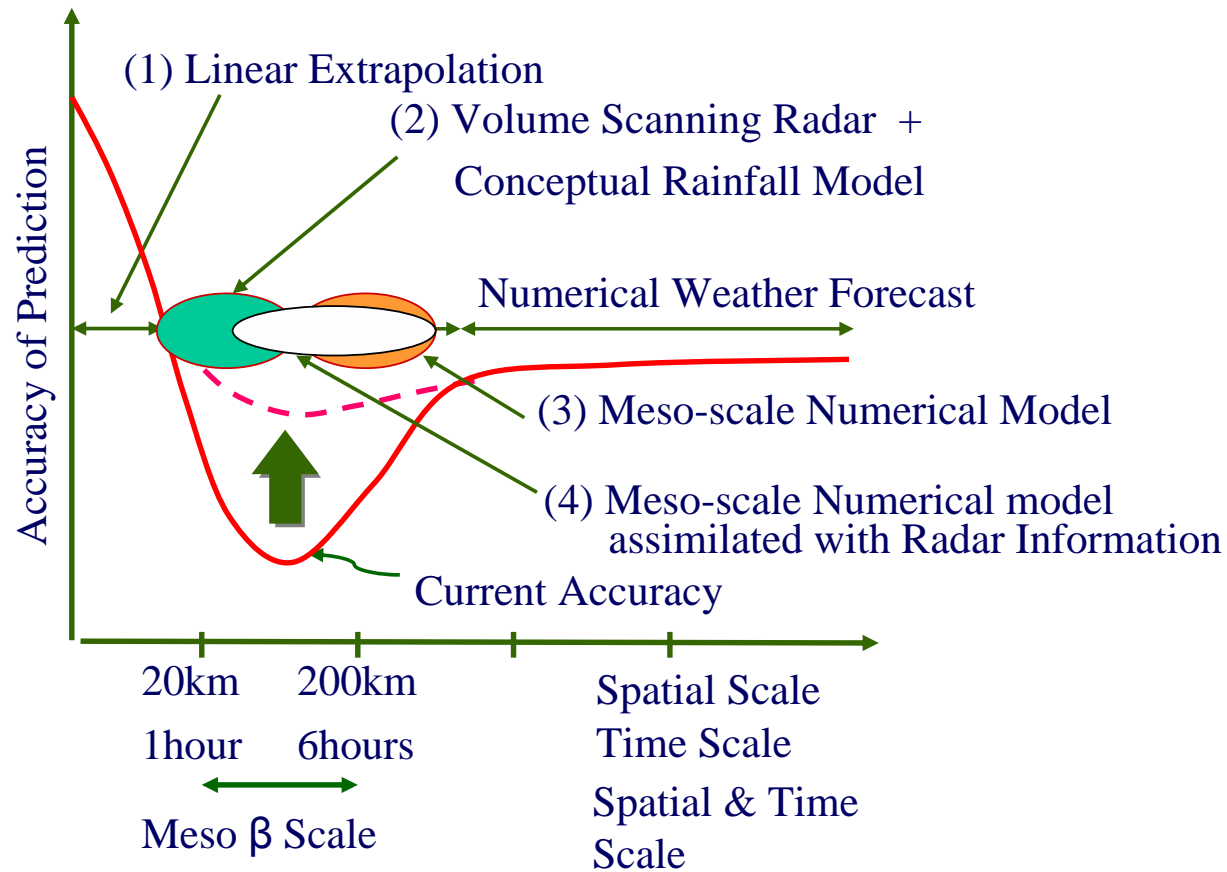
FFG is computed for 1-,
3-, and 6-hour durations
optionally for 12-, 24-
hour durations



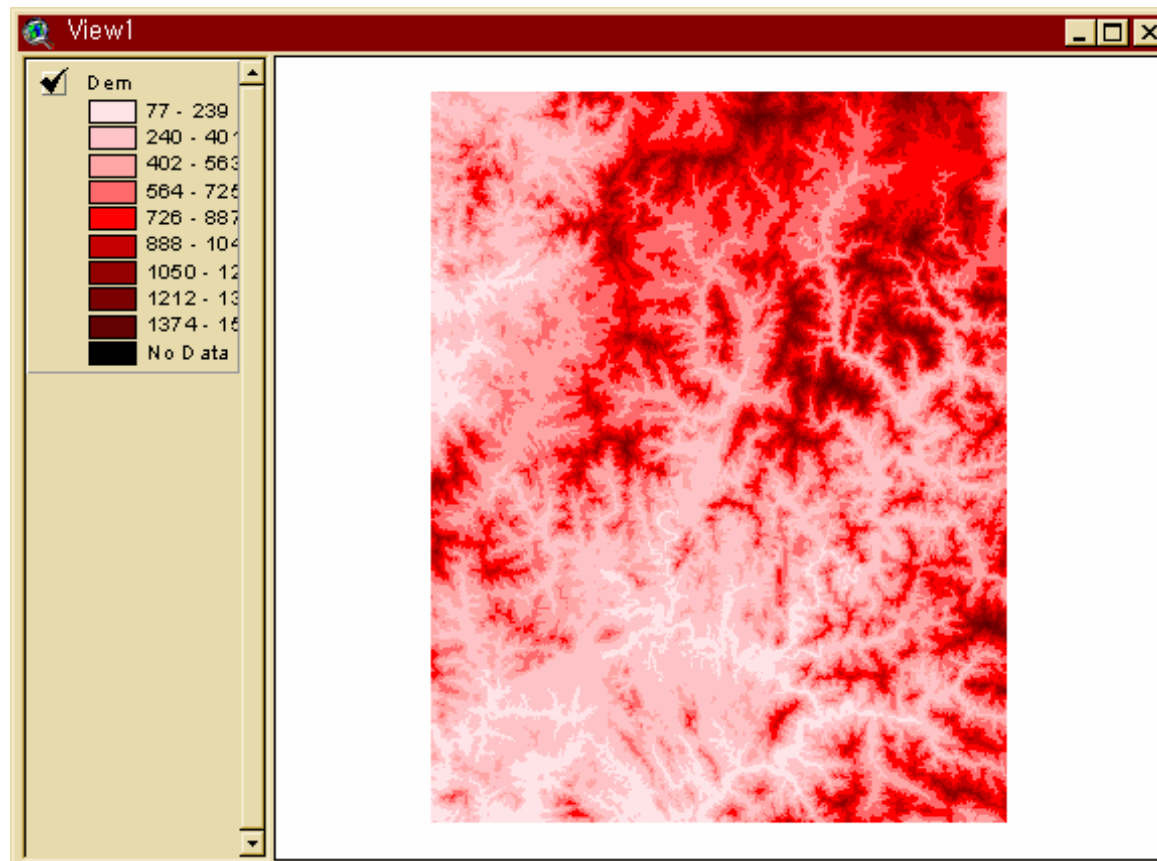
Component of FFG System



Accuracy of Precipitation Forecast

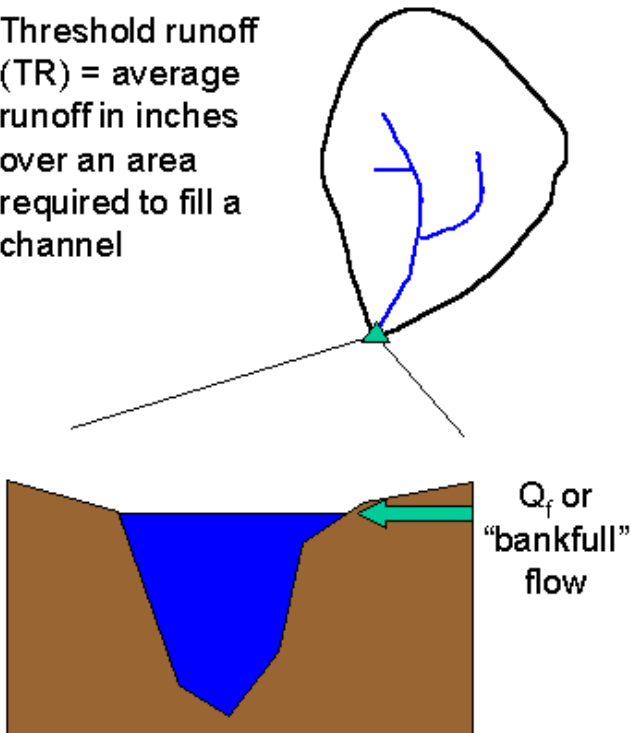


GIS/GUI Implementation



Threshold Runoff

Threshold runoff (TR) = average runoff in inches over an area required to fill a channel



$$T.R = \frac{Q_p}{q_{PR} \cdot A}$$

Where, Q_p is bankfull flow [cms]
 q_{PR} is unit hydrograph peak flow [cms/cm]

Estimation method of Q_p

- (1) Manning's method
- (2) Two-year return period flow

Estimation method of q_{PR}

- (1) Snyder's synthetic unit hydrograph
- (2) GIUH

Soil Moisture Estimation

- Equation for watershed groundwater depth (\bar{z}) and water table depth (z_i)

$$f(\bar{z} - z_i) = \left[\ln \frac{a}{\tan \beta} - \frac{1}{A} \sum_i \ln \frac{a}{\tan \beta} \right] - \left[\ln T_0 - \frac{1}{A} \sum_i \ln T_0 \right]$$

where, a : upslope area per unit contour length

$\tan \beta$: gravitational gradient

T_0 : lateral transmissivity when soil is just saturated

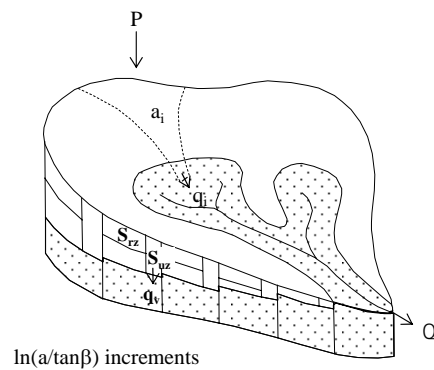


Fig. Schematic representation of storage element

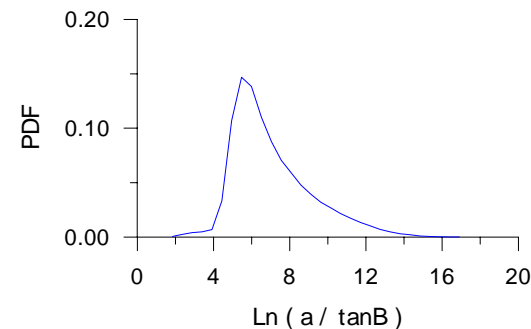
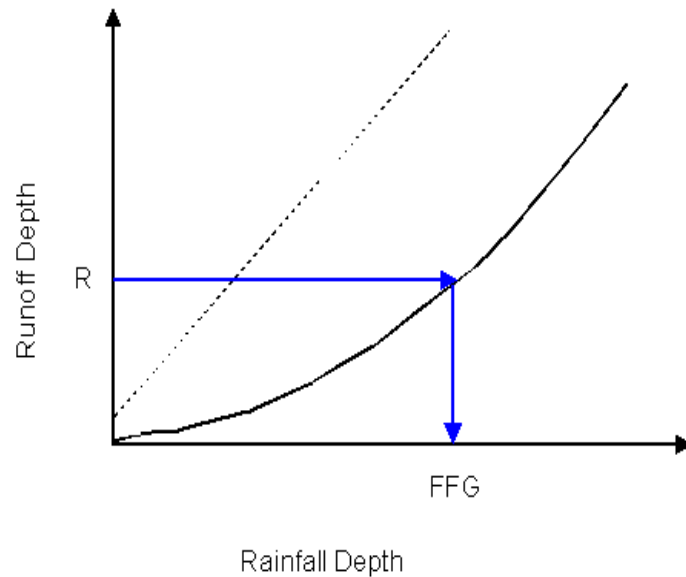


Fig. Distribution function of topo index

Rainfall-Runoff Curve in a Time



- ❑ **Threshold runoff (R) is fixed in time**
- ❑ **FFG depends on current rainfall-runoff curve**

FFG Precaution System

Meteorological Analysis

- Preci. Forecast & Analysis



Hydrologic Analysis

- TR Estimation
- FFG Estimation



- Comparison between Fore. Preci. and FFG

Fore. Preci. > FFG : Flash Flood Watch

Fore. Preci. < FFG : Flash Flood Warning

Fore. Preci. << FFG : Flash Flood Cancellation

FLOODTHREAT

ISSUED: 12:00 AM CST Sun Nov 5 2000
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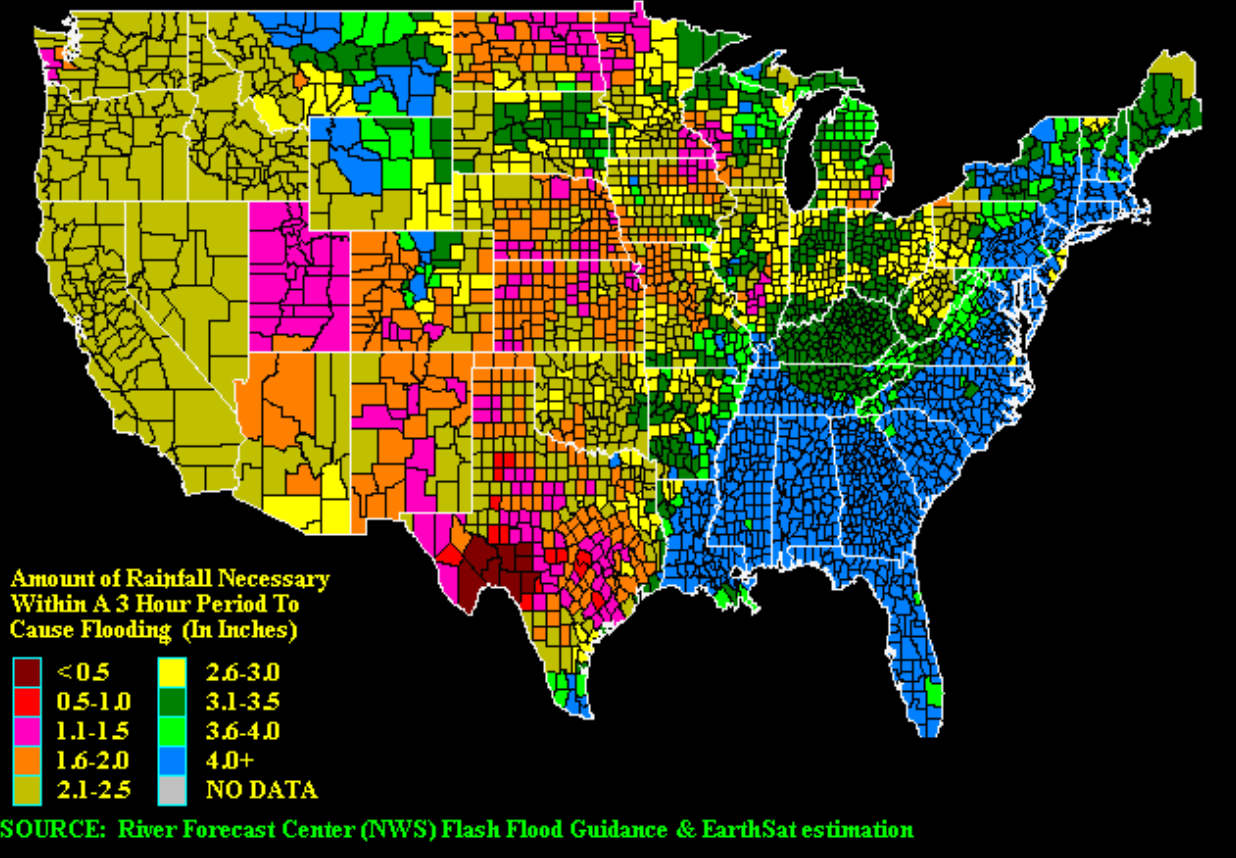


Fig. Example of Flood Threat in USA

FFG Development in Korea

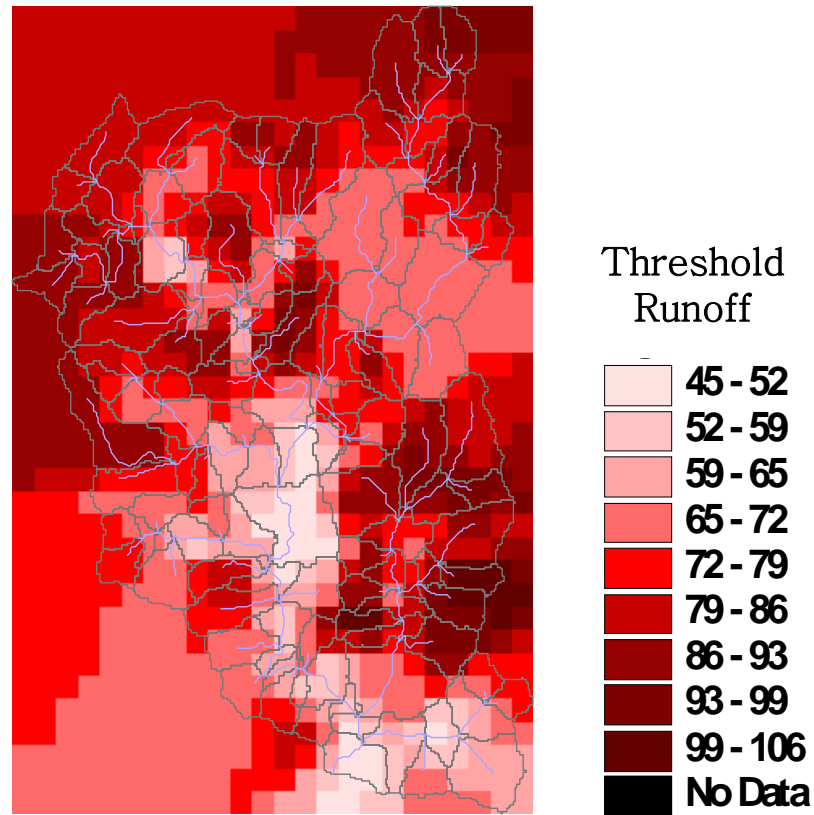
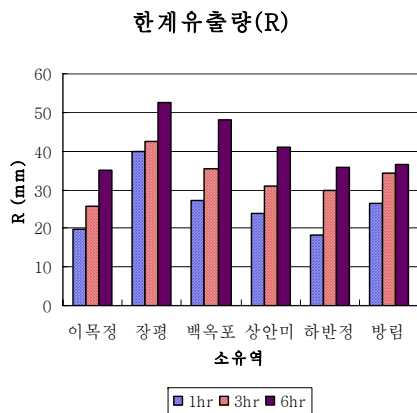
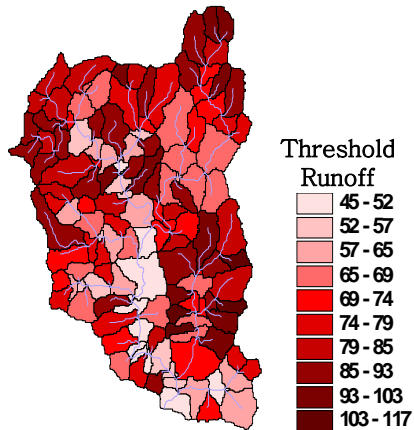
GIS/GUI Implementation

The image displays four screenshots of a GIS/GUI interface, each with a blue callout box indicating a specific feature or stage:

- Input data(DEM):** Shows a red DEM map with a legend on the left. The legend includes values: 726 - 887, 888 - 104, 1050 - 12, 1212 - 13, 1374 - 14, and No Data.
- Delineate Subbasins:** Shows a map with a grid of purple dots and a subbasin delineated in pink. The legend on the left includes: Stro1.shp, Shd1.s, Duto1.shp, Shdgri1, Strg1, Regions.shp, Rf1.shp, Hrappts.shp, and Analy.s.
- Initial Screen:** Shows a map with a grid of purple dots and a subbasin delineated in grey. The legend on the left includes: Regions.shp, Rf1, Hrappts.shp, Analy.shp, Slopepct, Fld, Fa, Fd, and Dem.
- Control Panel:** A dialog box titled "소유역 매개변수 설정" (Subbasin Parameter Setting). It contains various input fields and checkboxes for configuring the analysis. The "소유역 생성 방법" (Subbasin Generation Method) section has radio buttons for "모든 매개변수 설정" (All parameters set), "기본 매개변수 설정" (Basic parameters set), and "USGS Regression 매개변수 설정" (USGS Regression parameters set). The "고급 옵션" (Advanced Options) section includes checkboxes for "Make Calcs for Heads Only", "Do NOT Compute Length to Centroid (for non-headwaters)", "Do NOT compute USGS Slope (for non-headwaters)", and "No stateabbr, region, or reg_fract". The "입력 데이터" (Input Data) section includes fields for "입력 데이터" (Dem), "방향 격자" (Fd), "흐름누적 격자" (Fa), "하류방향 흐름길이" (Fld), "하천 그리드" (Strg1), "소유역 그리드" (Shdgri1), "소유역 폴리곤" (Shd1.shp), "분석대상지역 주제도" (Analy.shp), and "경사 그리드" (Slopepct). Buttons for "시작" (Start) and "닫기" (Close) are at the bottom.

FFG Development in Korea

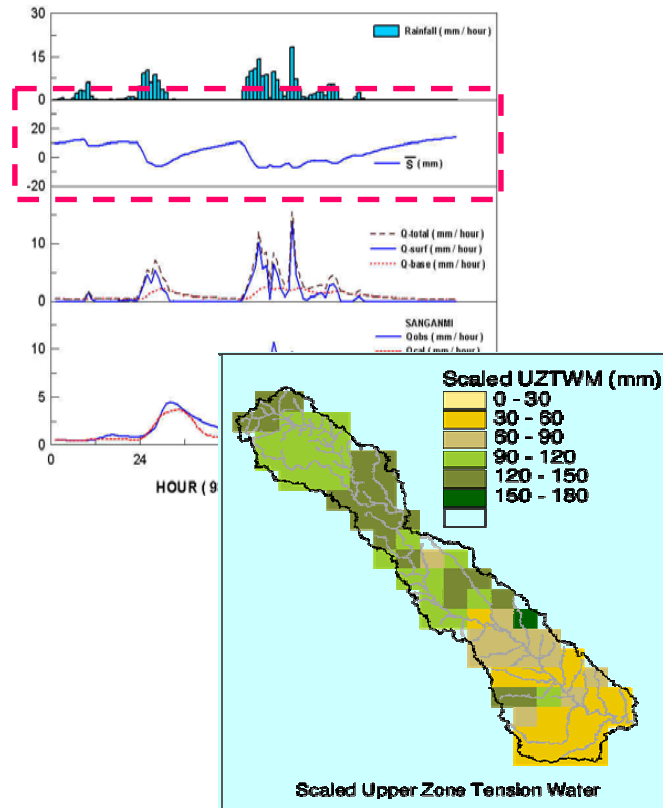
Estimation of Grid-based Threshold Runoff



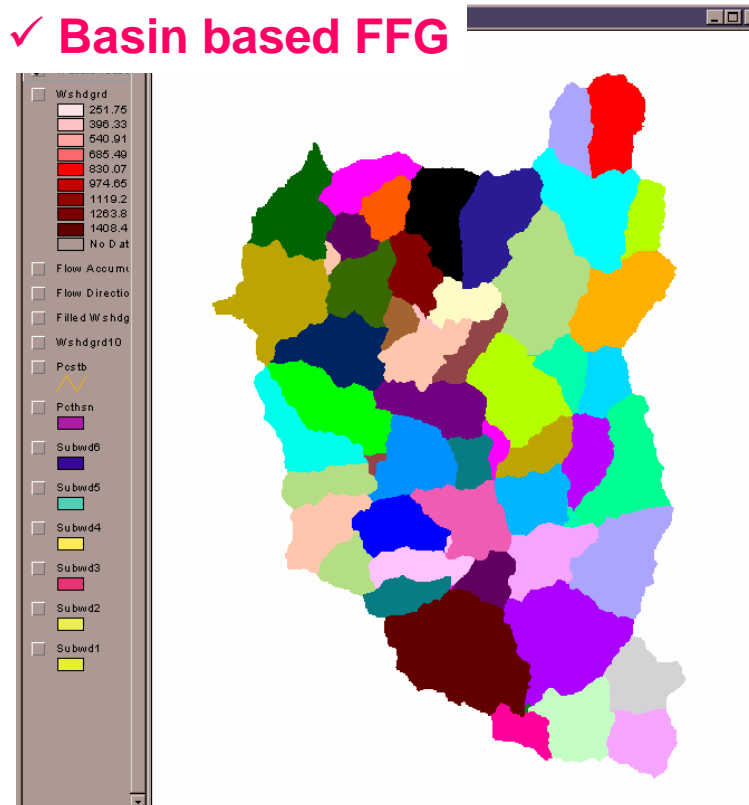
FFG Development in Korea

□ Estimation of Soil Moisture and Basin Based FFG

✓ Soil Moisture



✓ Basin based FFG



Concluding and Remarks

