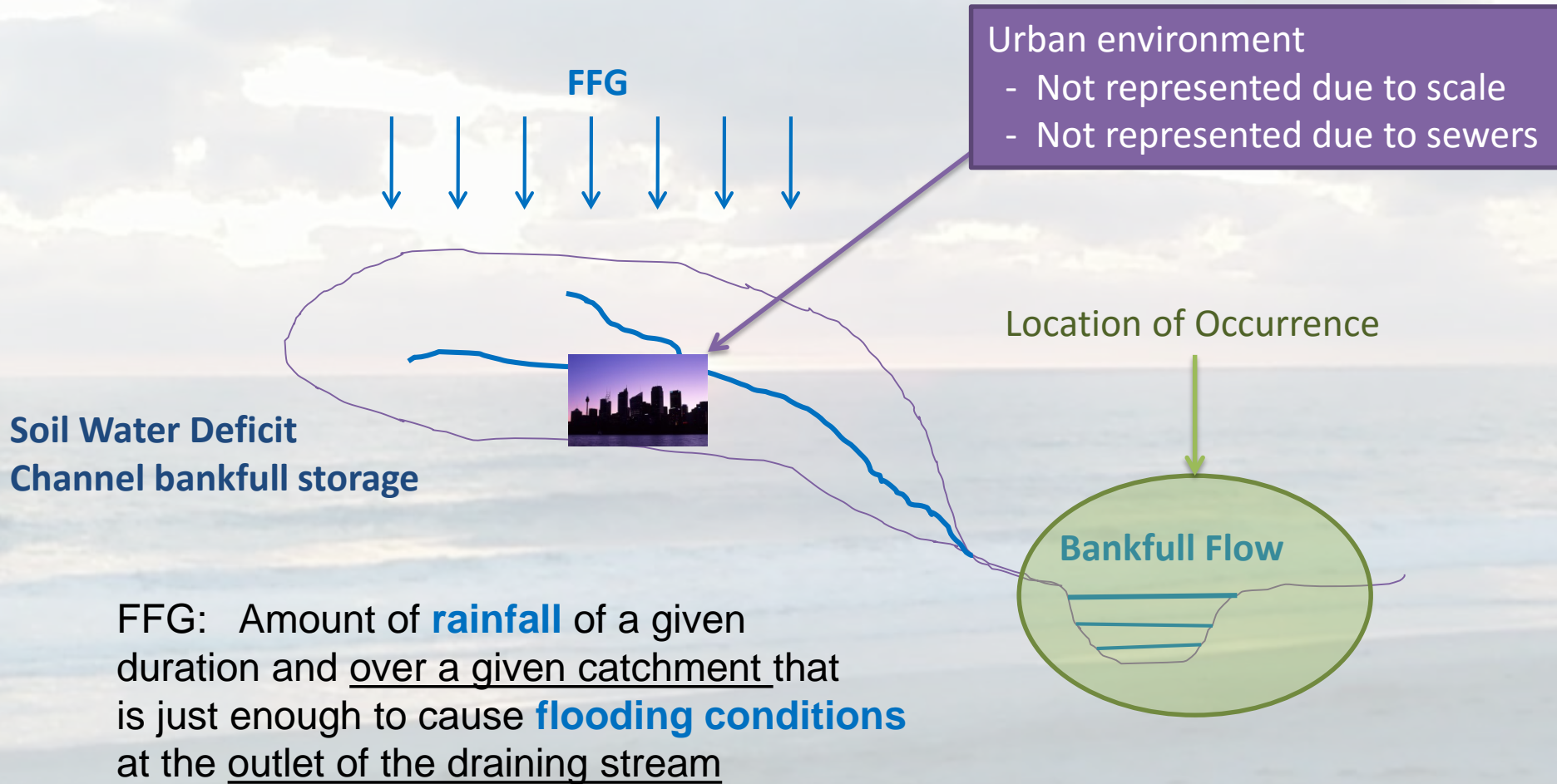


SEEFFG Component Validation

HYDROLOGIC RESEARCH CENTER

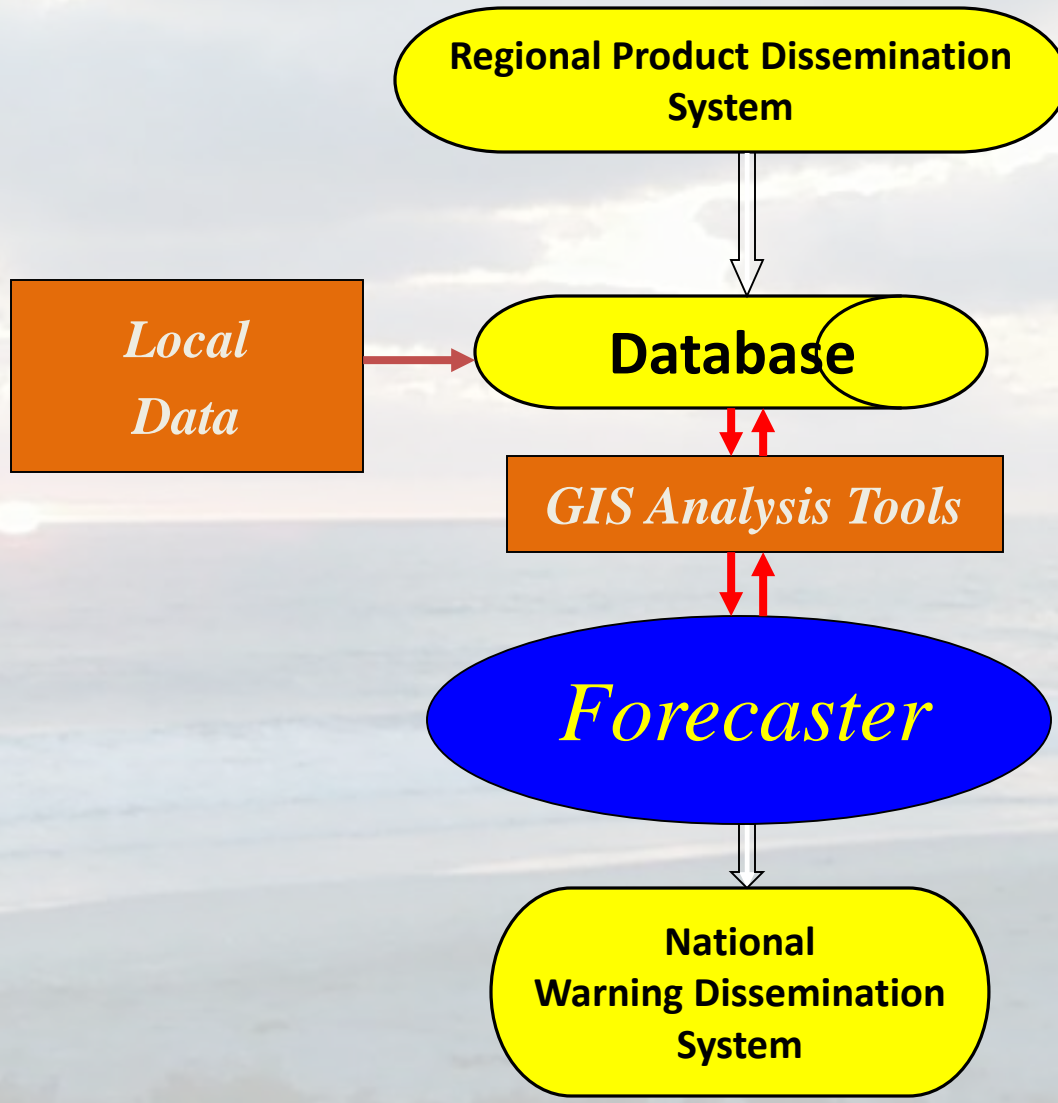
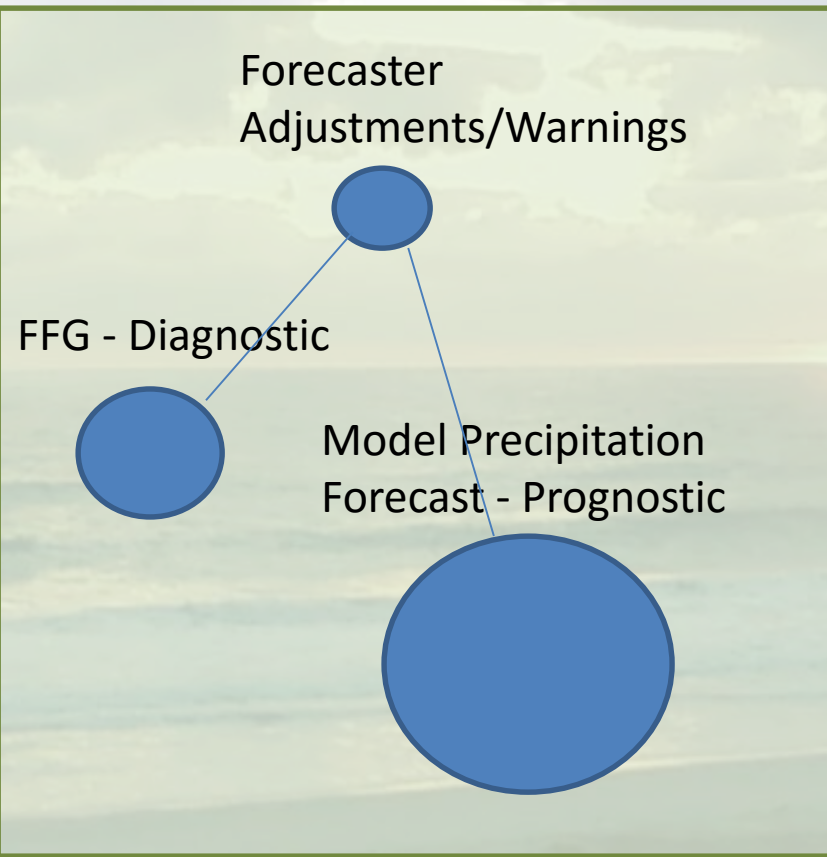
28 April 2016

BSMEFFG Fundamental Concepts



Threshold exceedance concept to estimate occurrence only!

BSMEFFG Validation



Validation – FFG Diagnostic

- Mean Areal Precipitation over basins against raingauge-based estimates for basins with dense raingauge networks
- Average Soil Water in Upper (0-20 cm) and Lower (20 – 150 cm) Soil Zone (model against neutron probes, well calibrated sensors in various depths)
- If persistent biases are found in certain regions correct by post-processing the system results before deciding whether to issue warning or not.

Validation – Mesoscale Model

- Forecast precipitation averaged over basins (MAP) against radar/sat/gauge merged MAP product (Frequency of Occurrence of Prec > Threshold over historical record) for rainfall durations of 1, 3, 6, 24 hours.
- If persistent bias is found for certain regions apply post processing bias adjustment before estimating FFFT.

Validation - Warnings

- Determine occurrence of flash floods from local data and information near outlets of basins from events that cover most of the basin area.
- Compare to warnings issued (POD, FAR, PM, etc.) for the basins in the region.
- Examine closely individual case studies to find causes of success or failure in the warning process and to correct in the future.

Performance Evaluation - Warnings

$P_D = Prob[Z \geq p^* | P \geq p^*]:$ Probability of Detection (POD)

$P_F = Prob[P < p^* | Z \geq p^*]:$ False Alarm Rate (FAR)

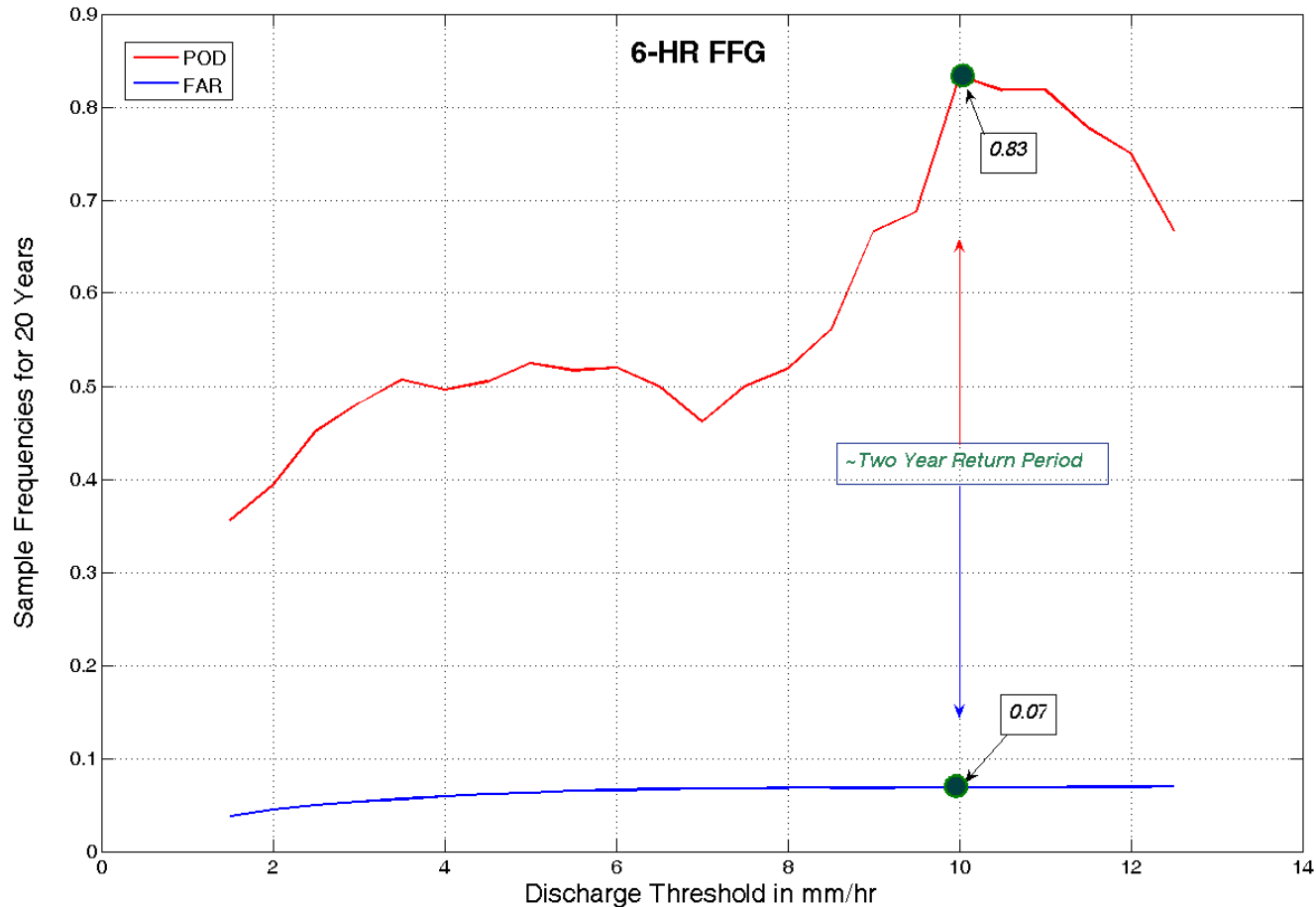
Actual Precipitation

FFG

Estimated Precipitation

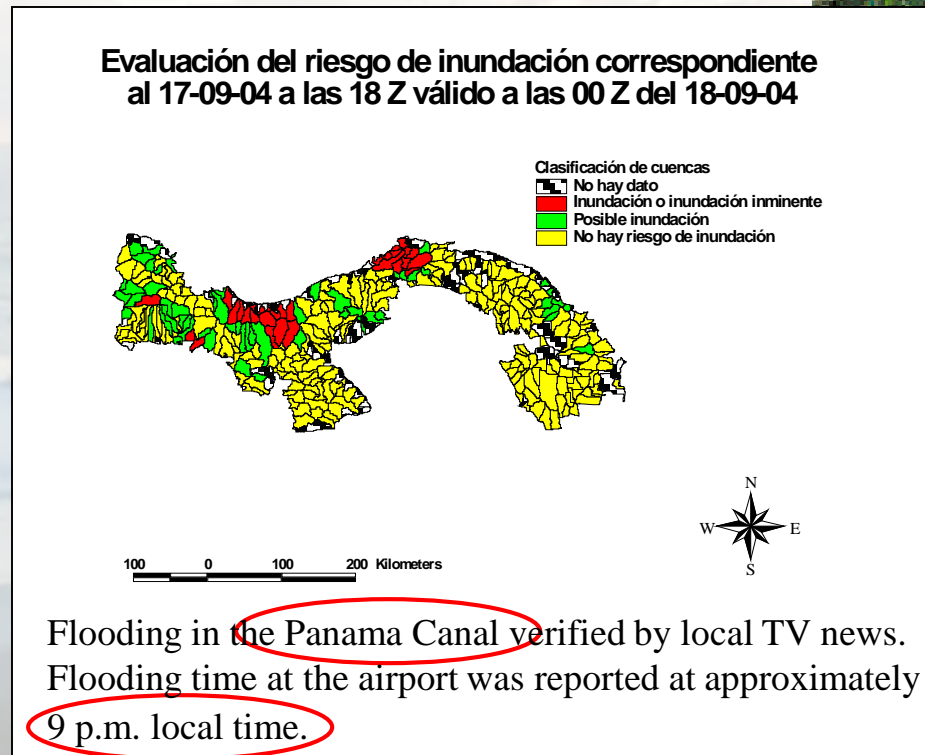
Single Data-Rich Basin Validation

Rio Chagres, Panama



Example of Warning Validation

System operators from Costa Rica and El Salvador were in daily communication with Country Agencies to receive community information regarding local flooding



3-Hourly FF Threat (*adjst*):
Hits: 57% (63 – 100%)
False: 30% (0 - 21%)
Misses: 13% (0 - 16%)

Second Example of Warning Validation - Turkey

cy (AFAD) and Turkish State Meteorological Agency table.
Service (TSMS). TSMS reports flash floods

| | Observations (Flash Flood Reports: TSMS+DSI+Press) | | | |
|--|---|--------------|--------|----------|
| | | Y | N | Σ |
| Bulletin (21 May 2012 - 17 June 2013) | Y | 43 (a) | 25(b) | 68 |
| | N | 18 (DSI) (c) | 306(d) | 324 |
| | Σ | 61 | 331 | 392 |

Figure-105 Contingency table of FF Bulletins for Turkey

| | |
|-------------------------------------|------|
| Hit Rate (POD): $a / (a+c)$ | 0.70 |
| False Alarm Ratio(FAR): $b / (a+b)$ | 0.36 |
| False Alarm Rate (POFD): $b/(b+d)$ | 0.07 |
| Threat Score: $a / (a+b+c)$ | 0.50 |