Flash Flood Guidance System On-going Enhancements

Theresa M. Modrick, PhD
TModrick@hrcwater.org
Hydrologic Research Center

CARFFG SCM2 04-06 OCT 2016 Astana, KAZAKHSTAN

FFG System Enhancements

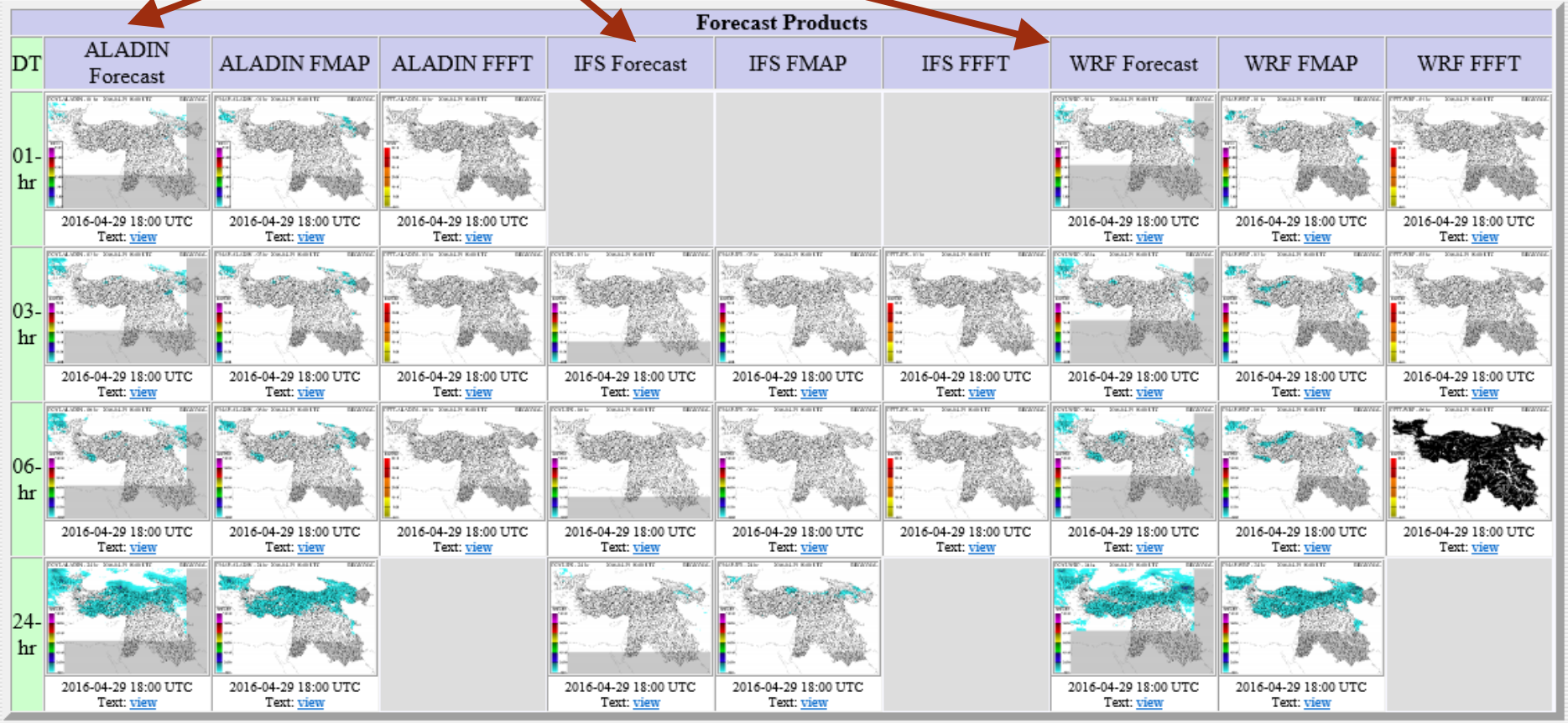
The following enhancements are in various stages of development and implementation based on specific country needs, expressed interest, funding priorities and cooperation.

- *Multi-model quantitative precipitation forecast (QPF) use within FFG systems*
- *Use of satellite inundation mapping and associated surface soil moisture observations to adjust FFGS soil water estimation.*
- *Landslide susceptibility and landslide occurrence prediction*
- *Urban Flash Flood Warning*
- *Riverine routing and discharge ensemble prediction*

Multi-model QPF Use

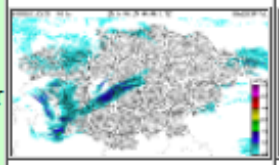
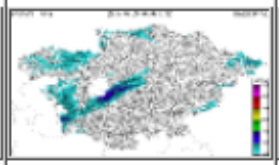
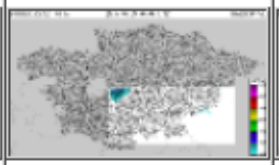
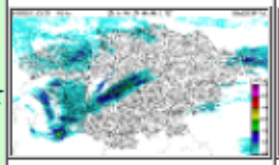
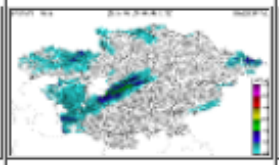
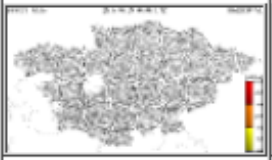
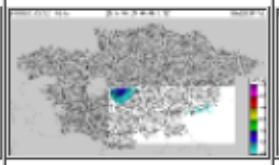
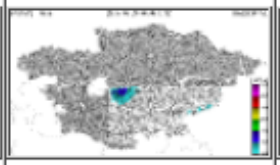
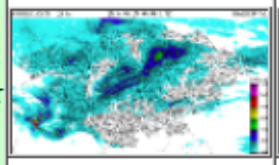
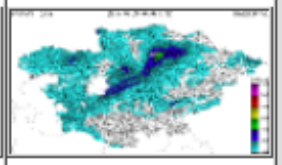
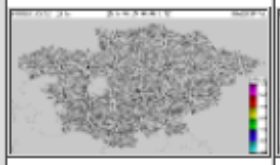
Example from the Black Sea Middle East (BSMEFFGS)

QPF from 3 operational NWP models available to forecasters

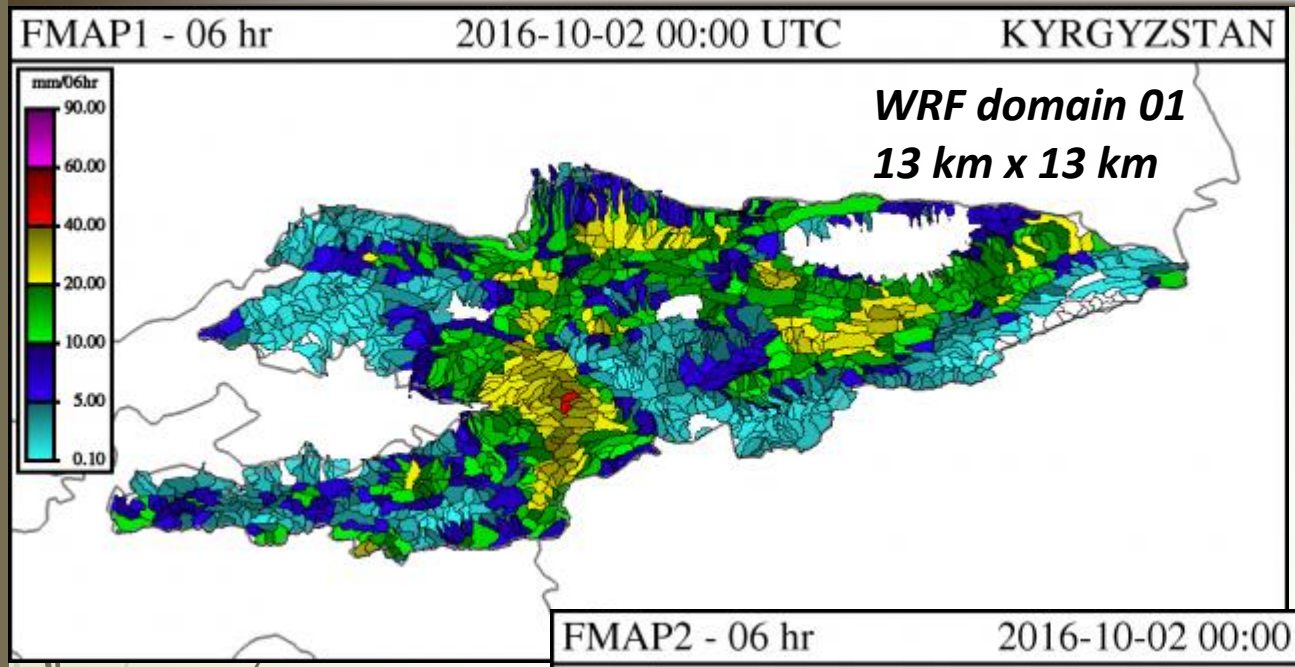


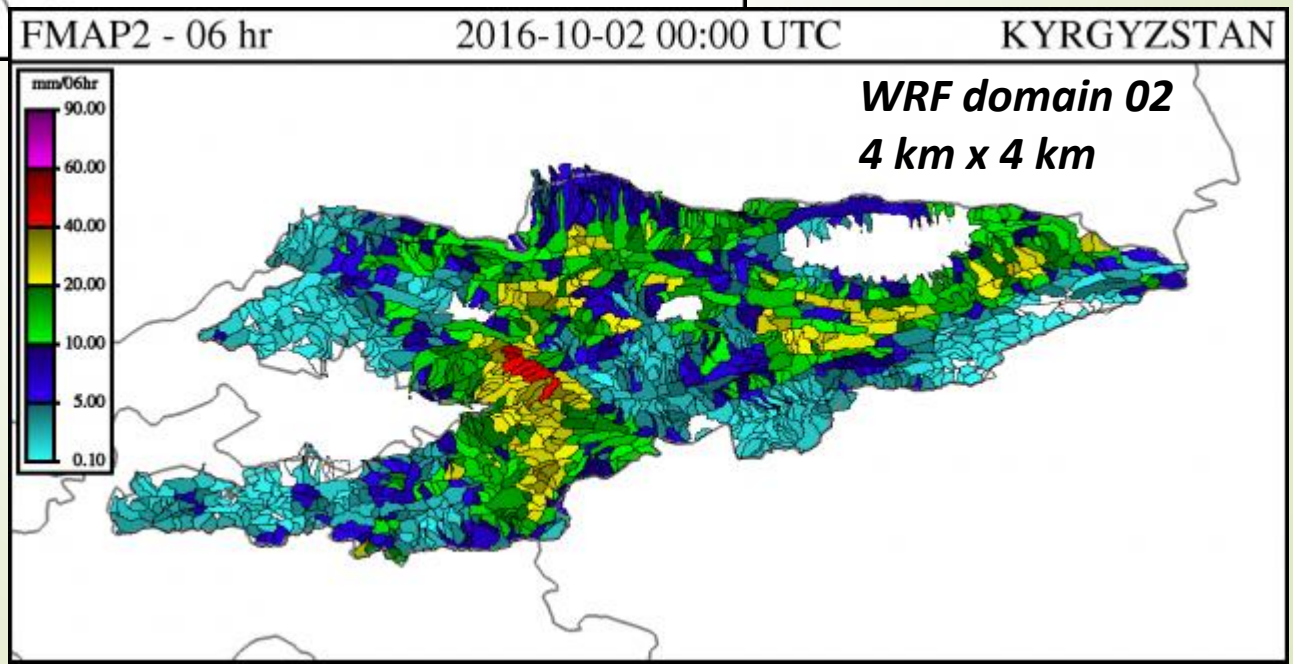
Multi-model QPF Use in CARFFG System

Forecast Products

DT	WRF D01 Forecast	WRF D01 FMAP	WRF D01 FFFT	WRF D02 Forecast	WRF D02 FMAP	WRF D02 FFFT
01-hr						
03-hr	 2016-09-29 06:00 UTC Text: view	 2016-09-29 06:00 UTC Text: view	 2016-09-29 06:00 UTC Text: view	 2016-09-29 06:00 UTC Text: view	 2016-09-29 06:00 UTC Text: view	 2016-09-29 06:00 UTC Text: view
06-hr	 2016-09-29 06:00 UTC Text: view	 2016-09-29 06:00 UTC Text: view	 2016-09-29 06:00 UTC Text: view	 2016-09-29 06:00 UTC Text: view	 2016-09-29 06:00 UTC Text: view	 2016-09-29 06:00 UTC Text: view
24-hr	 2016-09-29 06:00 UTC Text: view	 2016-09-29 06:00 UTC Text: view		 2016-09-29 06:00 UTC Text: view	 2016-09-29 06:00 UTC Text: view	

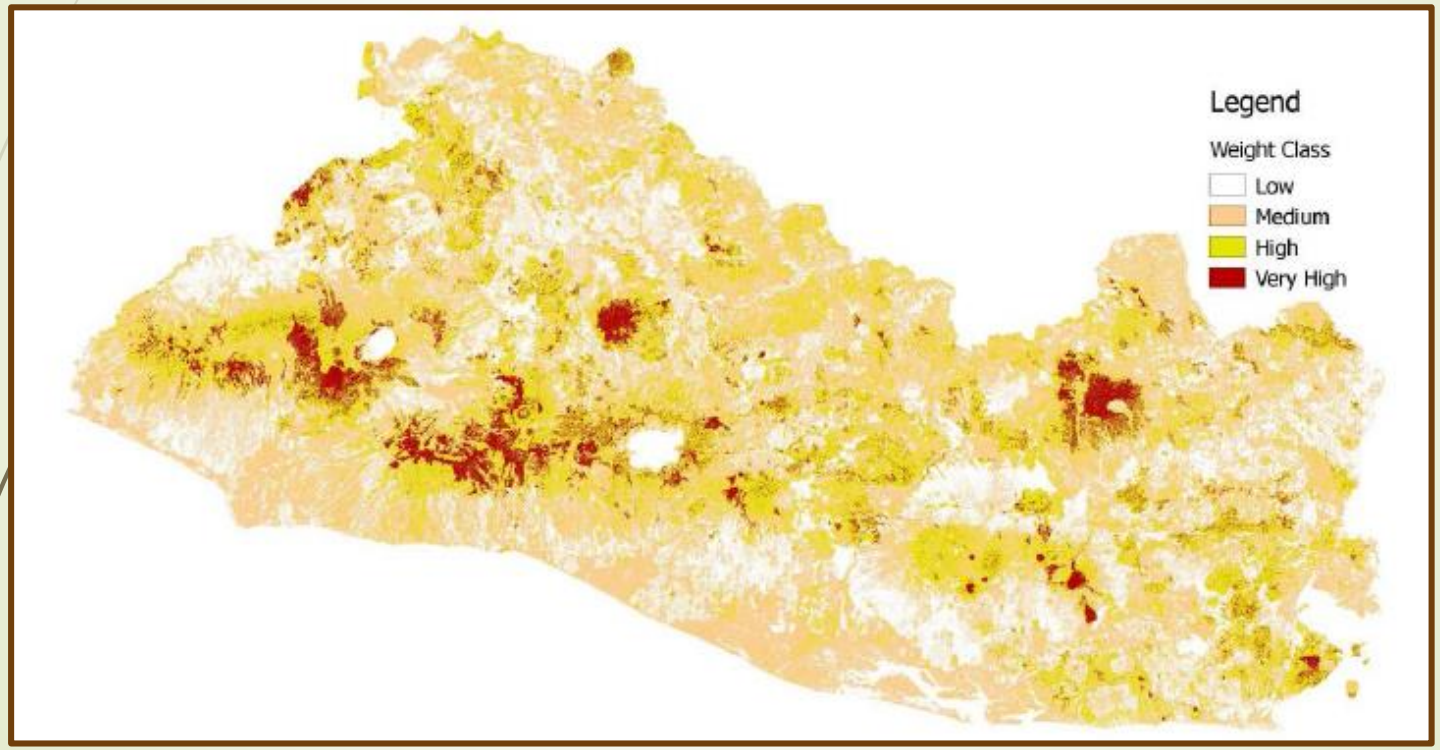
Multi-model QPF Use in CARFFG System





Landslide Susceptibility

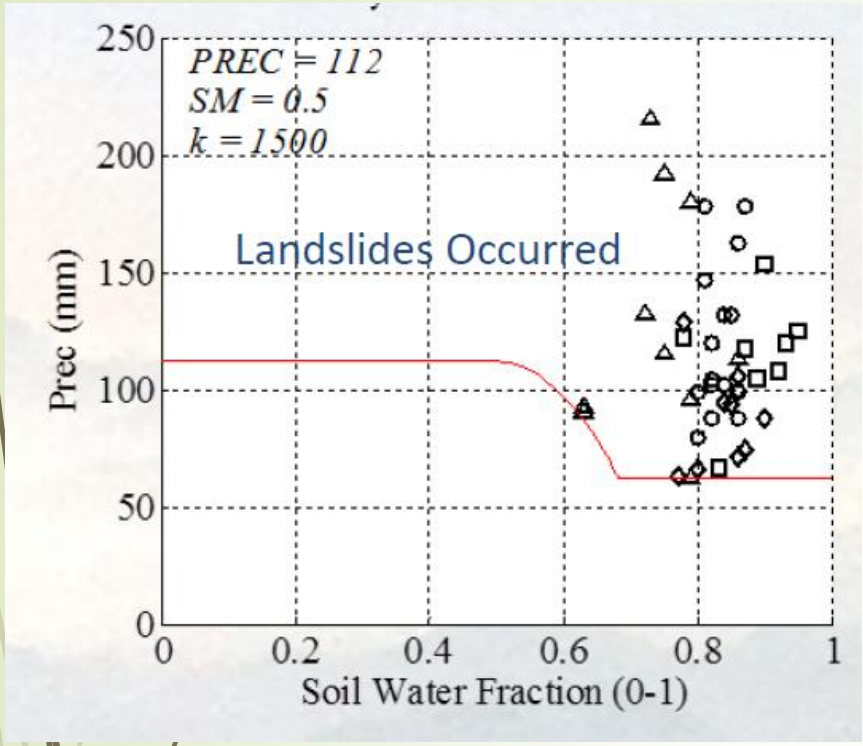
Relates susceptibility to landslides based on physical characteristics of land surface for historical landslide events, then extends to entire country.



Example Susceptibility map for country of El Salvador within Central America FFG System (30m resolution). Categories of low, medium, high and very high.

Results from El Salvador then used throughout Central America.

Landslide Susceptibility



From database of historical landslide events, develop threshold line of antecedent soil moisture condition and precipitation for those known events.

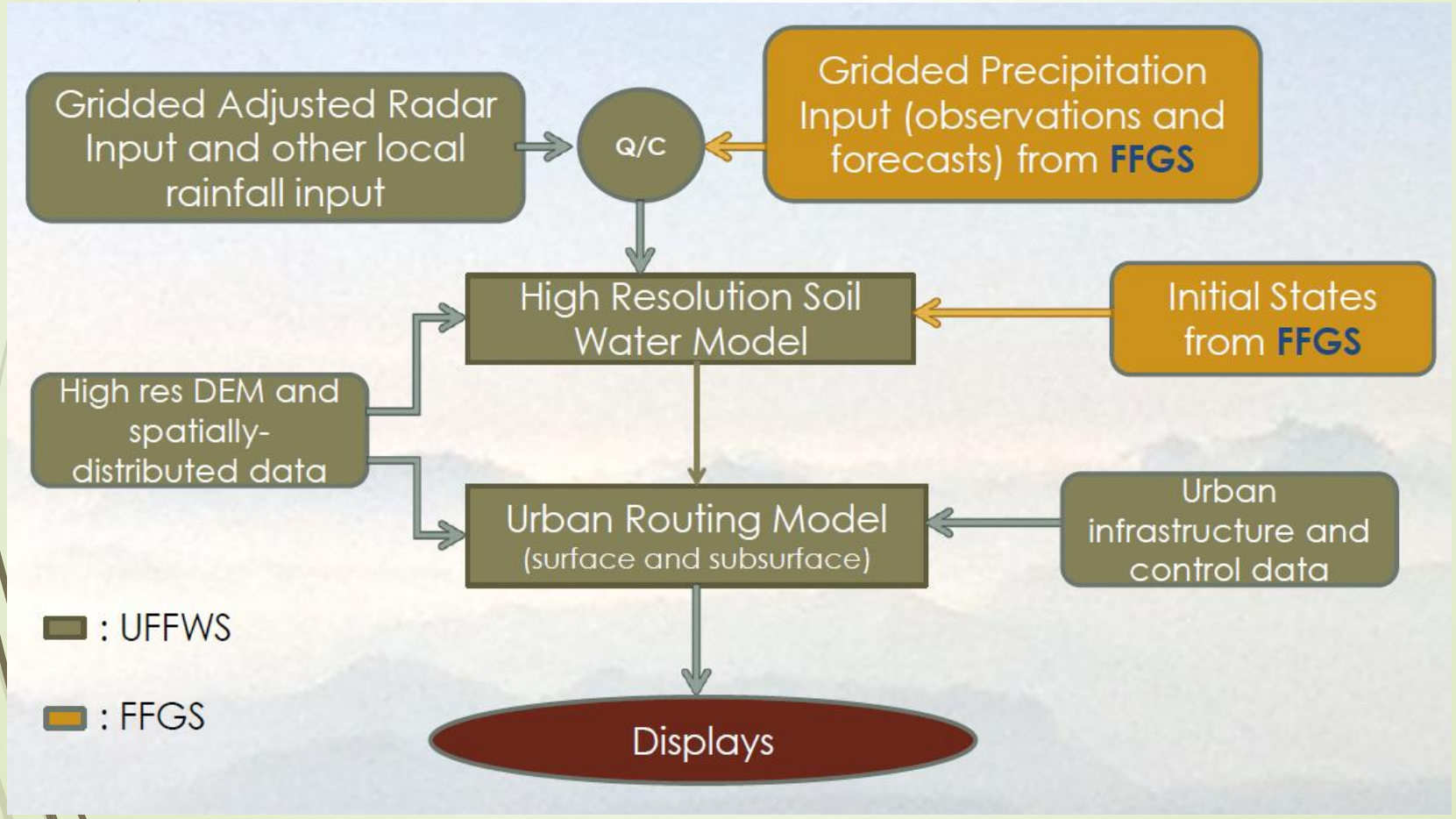
Use of real-time FFG system estimates of lower soil moisture and precipitation together with landslide susceptibility to identify critical regions.

Currently being deployed for Central America FFG System

Historical analysis is data-intensive, requiring quality records of landslide occurrence, location and other attributes.

Urban Flash Flood Warning

Builds upon data available from FFGS (precipitation, model conditions) and includes high resolution modeling in urban area to include both surface and subsurface flow routing.



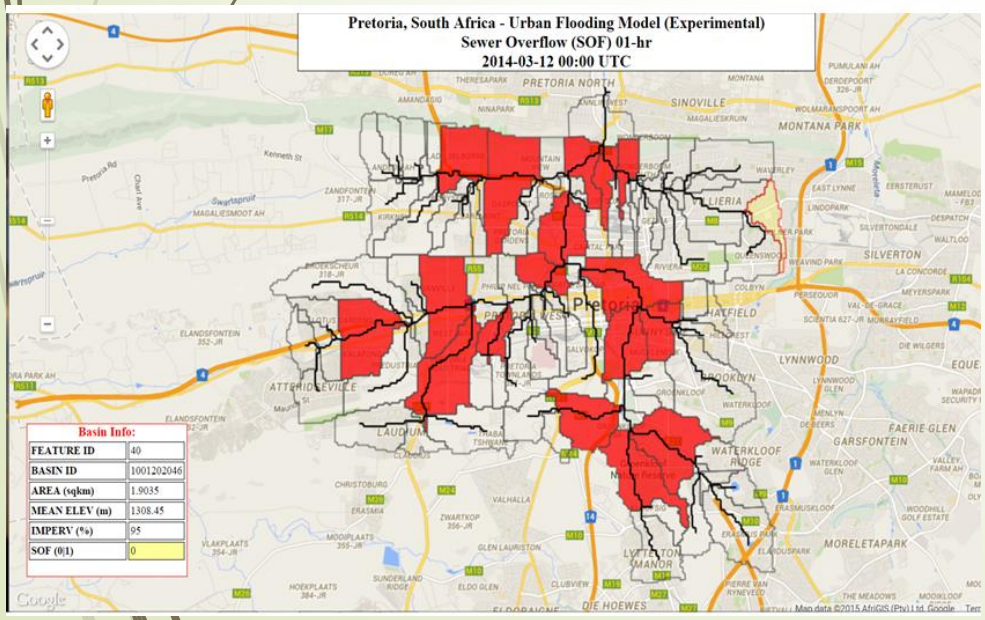
Urban Flash Flood Warning

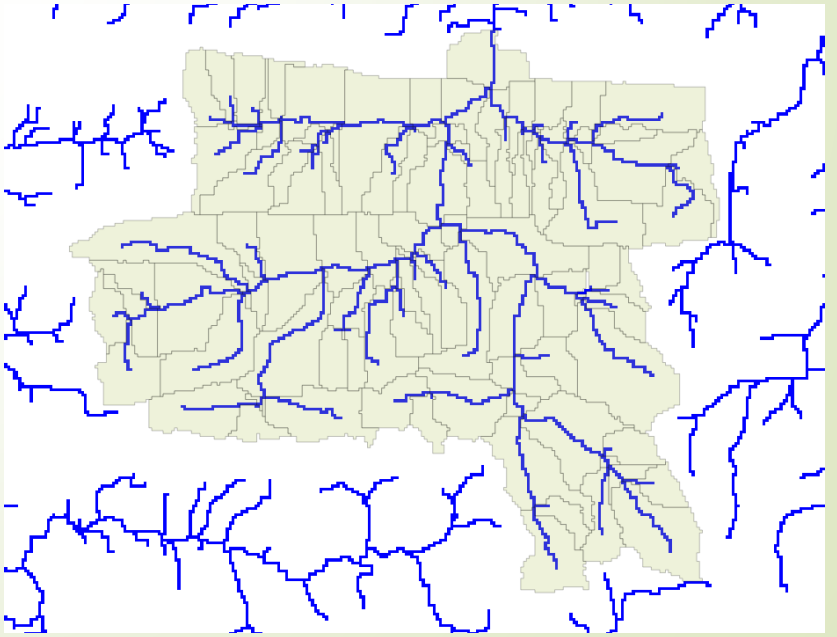
Demonstration for the municipality of Pretoria, Rep. of South Africa.

Urban watersheds define at a resolution of 2km².

Surface and subsurface flow modeled.

Red watersheds below indicate where system indicates storm sewer overflow.

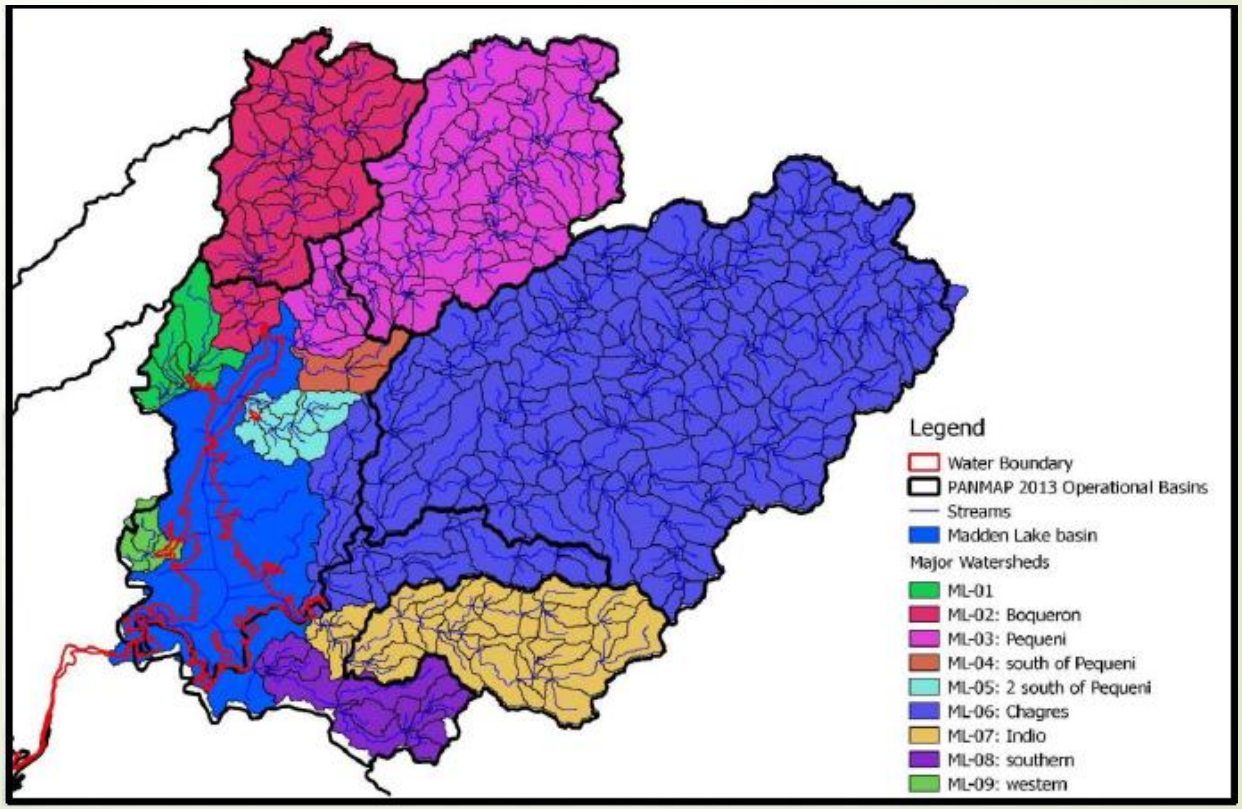




Riverine Routing and Ensemble Discharge Prediction

Extracts subcatchment runoff from FFG System and routes river flow through channel network.

Considers large reservoirs and their Operation.



Riverine Routing and Ensemble Discharge Prediction

Ensemble discharge prediction if multiple NWP predictions or ensemble NWP results from single model are available.

Longer lead time of NWP predictions is required (> 48hours).

Bias adjustment on forecast precipitation will also be required.