

Central Asia Regional Flash Flood Guidance System: FFGS Products and Data Needs



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CARFFG Steering Committee Meeting
14-16 SEP 2015
Astana, KAZAKHSTAN

Motivation

CARFFG - Central Asia Regional Flash Flood Guidance




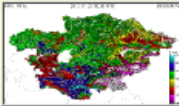

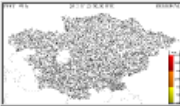



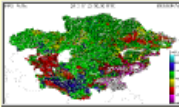

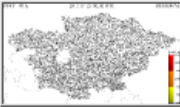
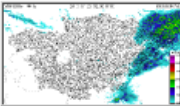
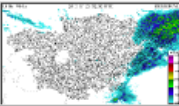


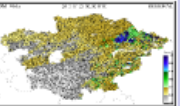
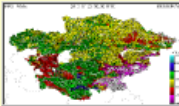


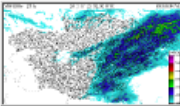
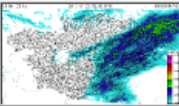

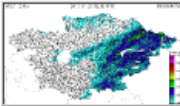
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Nav Date: 2015-04-27 02:00 UTC

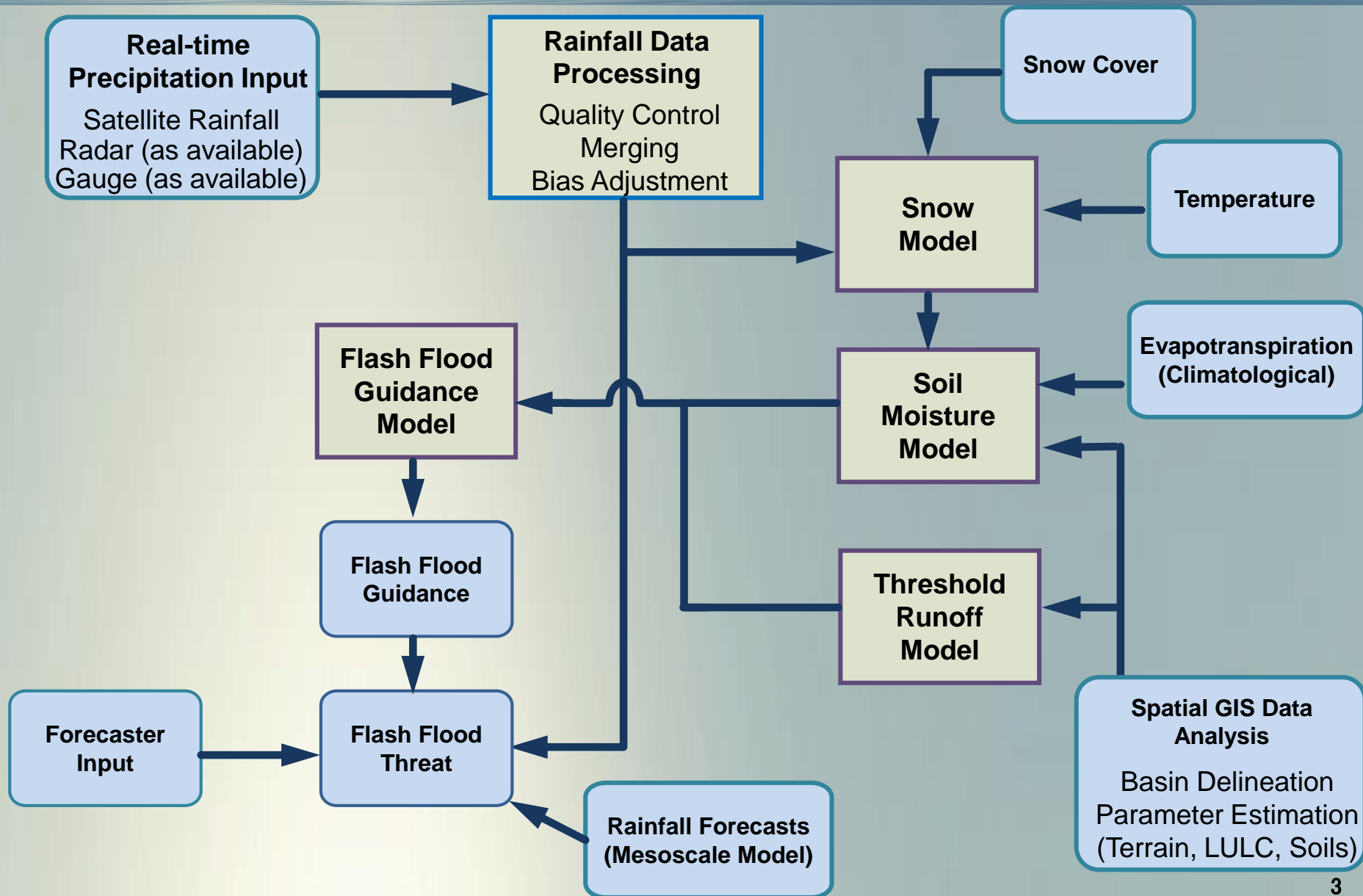
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-1 Month -1 Day -6 Hours -1 Hour +1 Hour +6 Hours +1 Day +1 Month

Prev 6-hr Interval (00 UTC) Reset to Current Next 6-hr Interval (06 UTC)

DT	MWGHE Precipitation	GHE Precipitation	Gauge MAP	Merged MAP	ASM	FFG	IFFT	PFFT
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24-hr	 2015-04-27 02:00 UTC Text view	 2015-04-27 02:00 UTC Text view	 2015-04-27 00:00 UTC Text view	 2015-04-27 02:00 UTC Text view	<p>OBJECTIVE FOR THIS PRESENTATION: Review FFGs products, and discuss data requirements.</p>			

KEY TECHNICAL COMPONENTS OF CARFFG SYSTEM

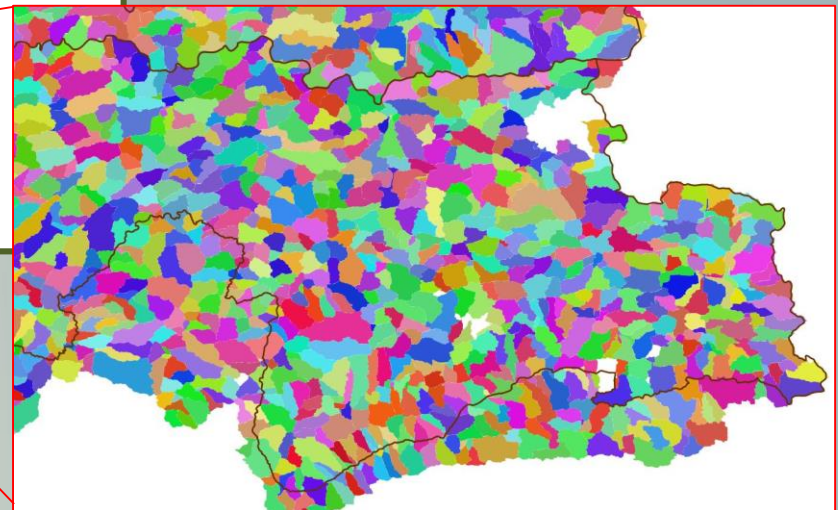
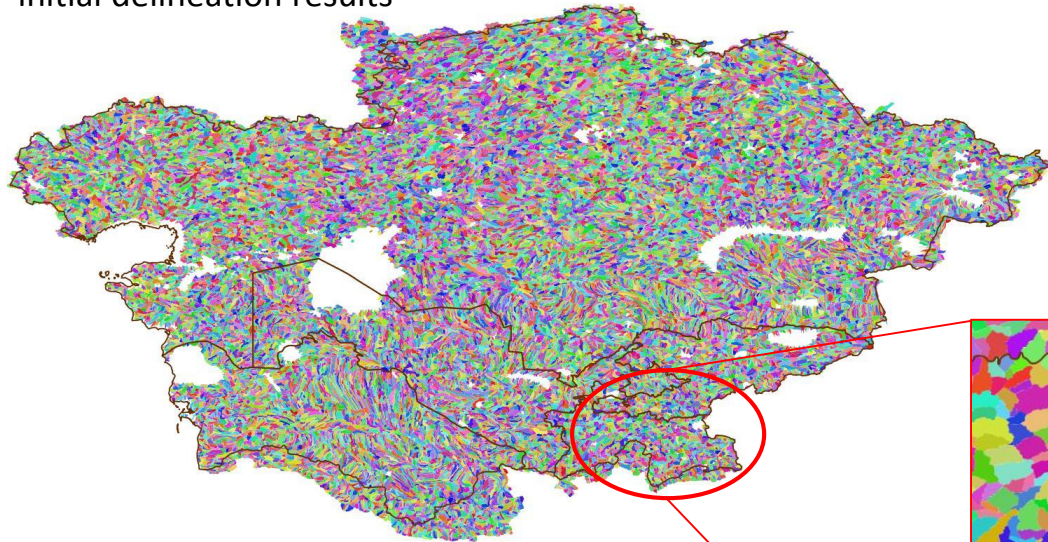


Spatial Analysis for Basin Delineation

OBJECTIVE:

- ❑ Define flash flood-scale watershed boundaries
- ❑ Provide spatial representation for model parameterization
- ❑ Determine geometric properties of flash flood basins used in model calculations.

*initial delineation results



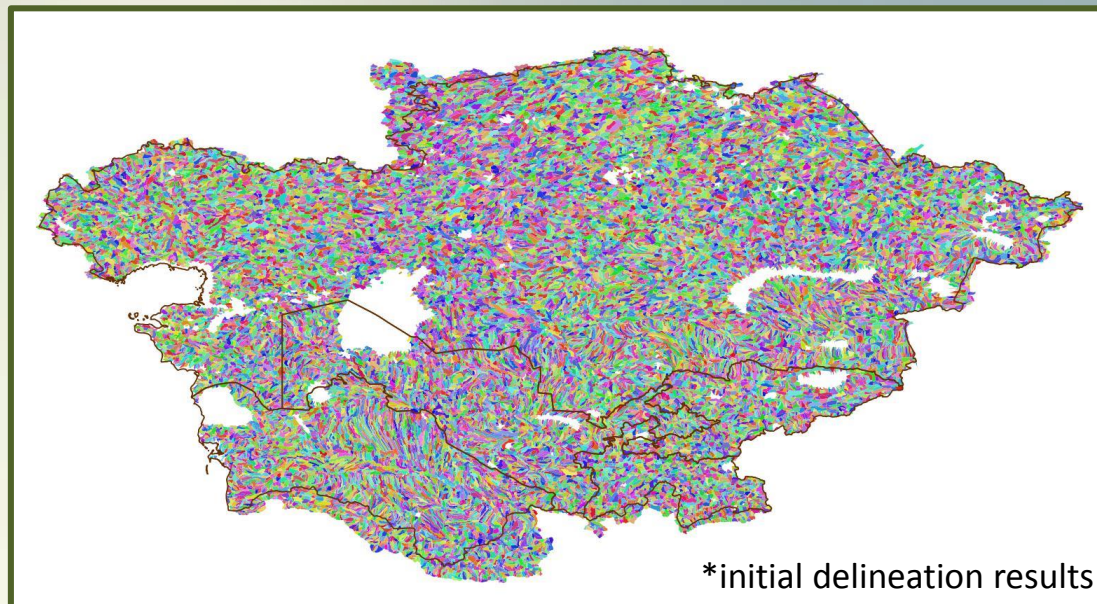
Spatial Analysis for Basin Delineation

DEVELOPMENT INPUT DATA:

- ❑ Digital Elevation Model (DEM) data
 - The preliminary delineation shown was based on SRTM-90m data

VALIDATION DATA:

- ❑ Digital stream network data (Digital Chart of the World database)
- ❑ Comparison with satellite visible imagery (e.g., GoogleEarth)
- ❑ Country-provided *digital* stream and/or basin GIS files
- ❑ *Country-representative review and comments*



Real-Time Rainfall Processing and Merged MAP

CARFFG - Central Asia Regional Flash Flood Guidance

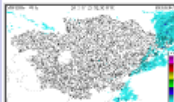


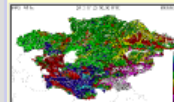

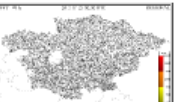
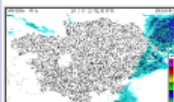
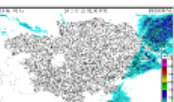
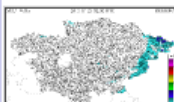
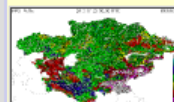


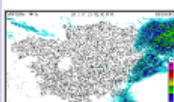
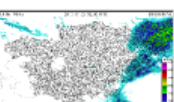

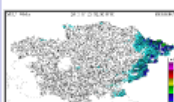
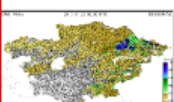
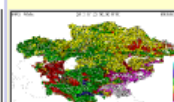
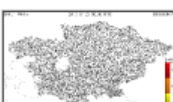

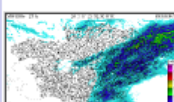
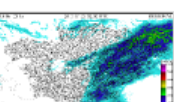

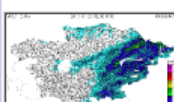
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24-hr	 2015-04-27 02:00 UTC Text: view	 2015-04-27 02:00 UTC Text: view	 2015-04-27 00:00 UTC Text: view	 2015-04-27 02:00 UTC Text: view				

Real-Time Rainfall Processing and Merged MAP

OBJECTIVE:

- ❑ Provide “best estimate” of mean areal precipitation over each watersheds input to soil water and FFG models.

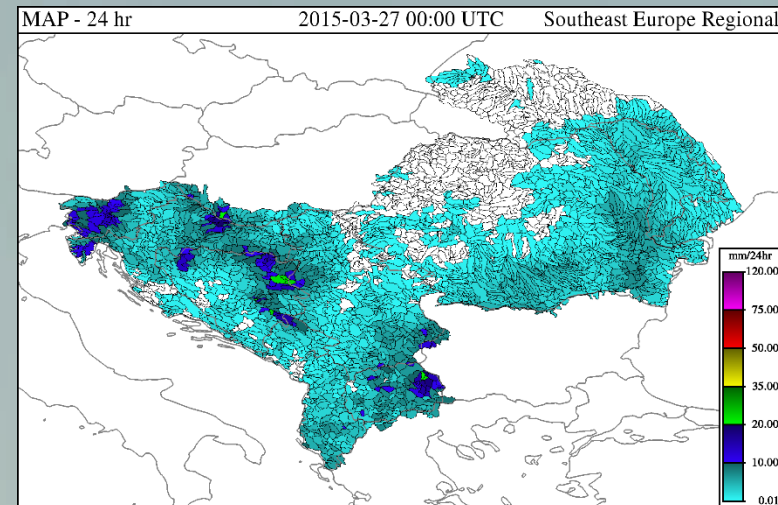
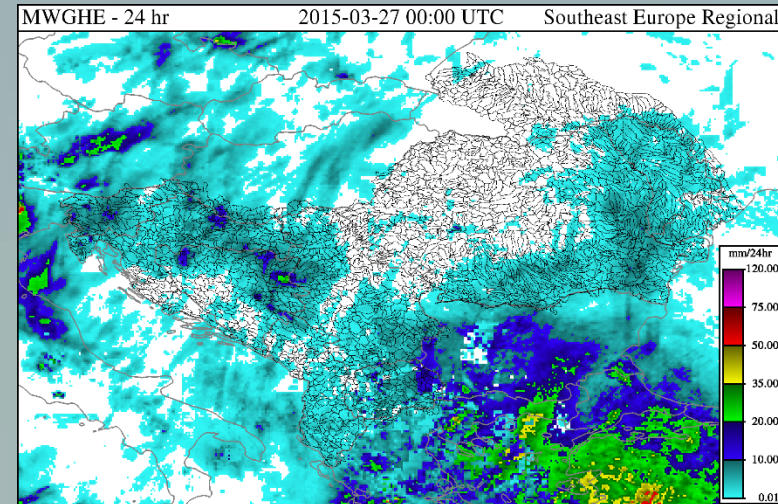
DEVELOPMENT INPUT DATA:

- ❑ Historical satellite precipitation data (HRC)
- ❑ Historical rain gauge precipitation data (6-hourly or daily)
- ❑ Analysis of climatological bias of satellite precipitation

REAL-TIME INPUT DATA:

- ❑ Satellite precipitation (GHE, MWGHE)
- ❑ Climatological adjustment factors
- ❑ Real-time rain gauge precipitation for dynamic (real-time) precipitation bias adjustment

Examples from SEFFGS



Flash Flood Guidance



FFG product is computed through several hydrologic modeling components:

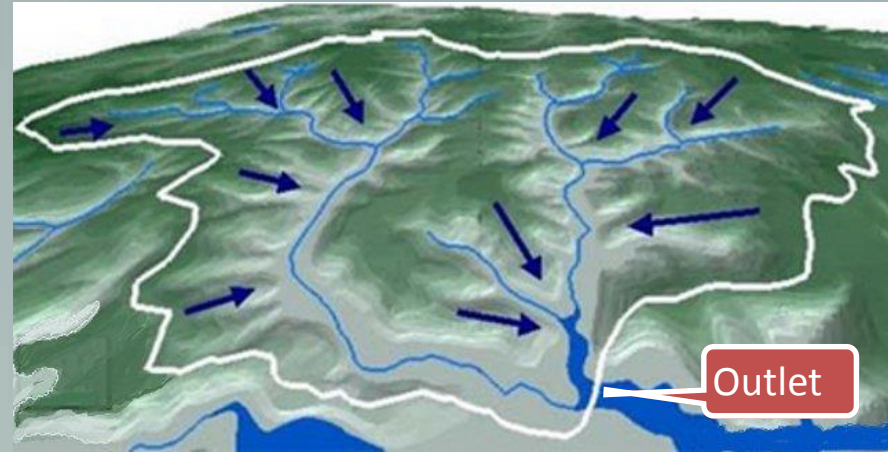
- Threshold Runoff Modeling
- Snow Modeling
- Soil Water Modeling

Threshold Runoff Model Component

Threshold Runoff is a foundational parameter of FFG, defined as the amount of *effective* rainfall of a given duration over a watershed that produces bankfull flow at the watershed outlet.

OBJECTIVE:

- ❑ Estimate *Threshold Runoff* for all flash flood-scale watersheds in region.



DEVELOPMENT INPUT DATA:

- ❑ Geometric properties of watersheds as determined via spatial analysis;
- ❑ Stream surveys or estimates of cross-sectional properties at channel bankfull for developing regional relationships;
- ❑ Return period discharge information for flash flood prone streams to develop regional relationships.

Snow Model Component (1)

OBJECTIVE:

- ❑ Estimate area covered by snow

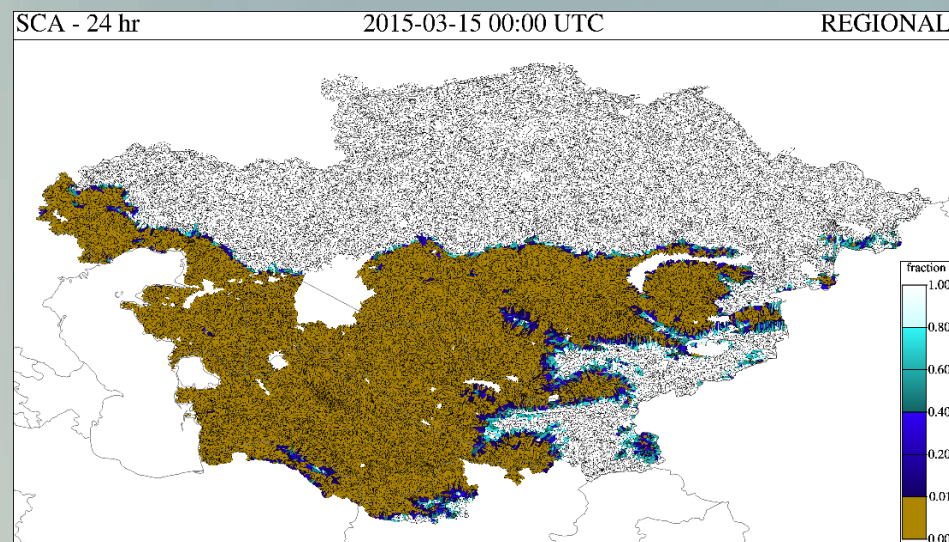
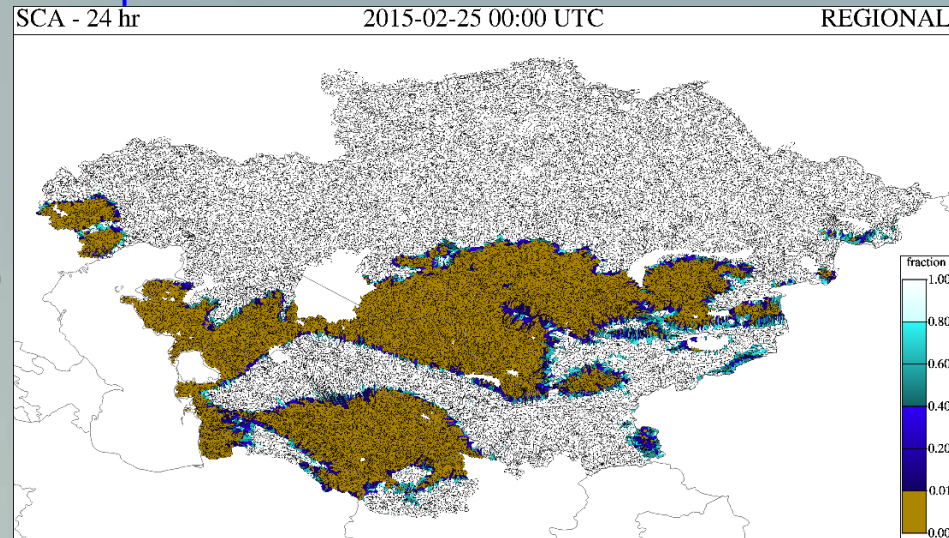
REAL-TIME INPUT DATA:

- ❑ NOAA Integrated Multi-Sensor (IMS) Snow and Ice satellite product

DEVELOPMENT INPUT DATA:

- ❑ Spatial Land Cover Data
- ❑ Historical archive of IMS products (for climatology analysis)
- ❑ Historical snow cover data (observations)

Examples of Snow Cover Area over Central Asia



Snow Model Component (2)

OBJECTIVE:

- ❑ Account for snow melt contribution to soil water modeling

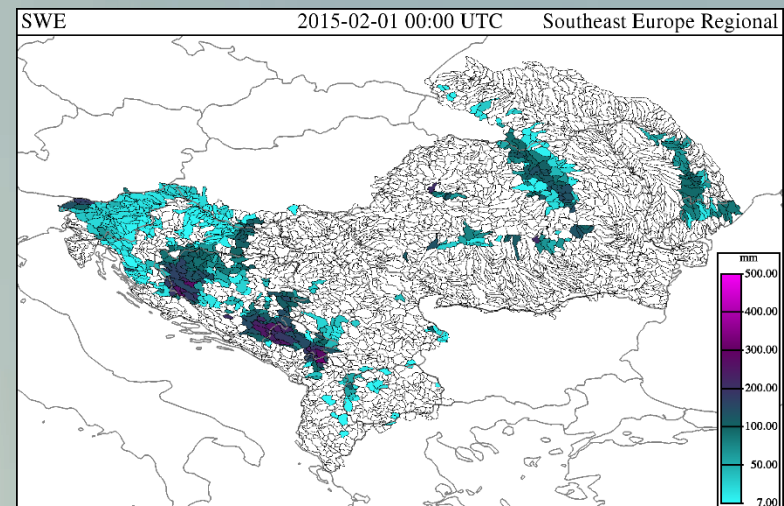
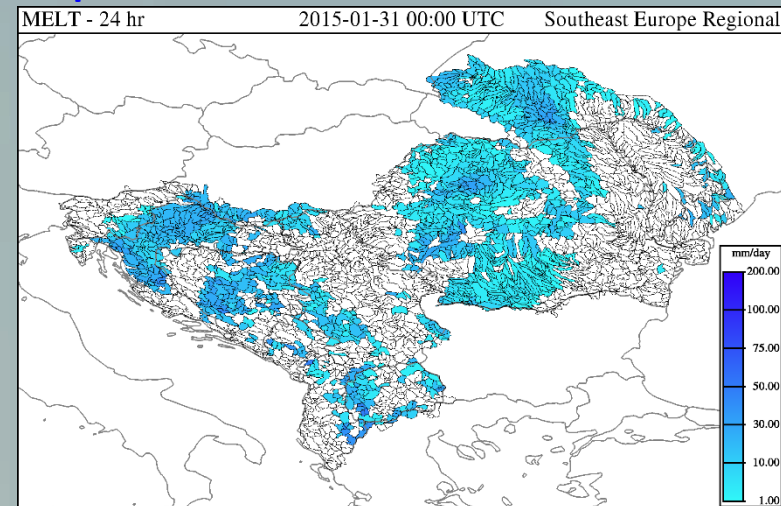
Examples of Snow Melt & SWE from SEFFGS

REAL-TIME INPUT DATA:

- ❑ Mean Areal Precipitation (from Rainfall Processing)
- ❑ Mean Areal Temperature
- ❑ Snow Covered Area (IMS Product)

DEVELOPMENT INPUT DATA:

- ❑ Spatial Land Cover Data
- ❑ Historical temperature data (for climatology)
- ❑ Historical snow cover/snow depth data
- ❑ Historical snow water equivalent



Soil Water Model Component

OBJECTIVE:

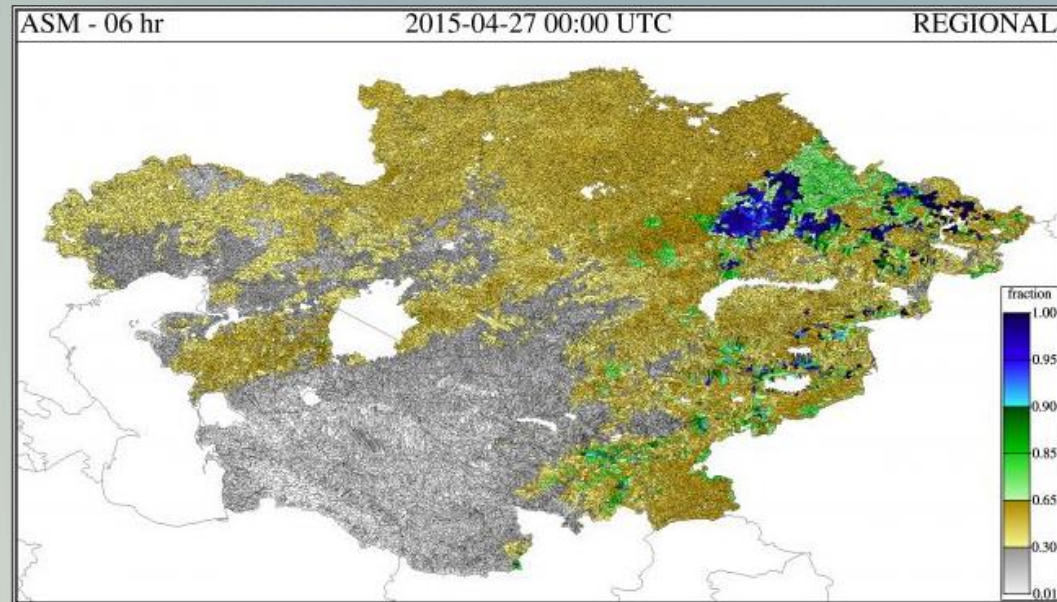
- Estimate soil water conditions within basins in real-time
- Account for land surface processing in transformation of rainfall to runoff

REAL-TIME INPUT DATA:

- Small watershed mean areal precipitation
- Snow melt

DEVELOPMENT INPUT DATA:

- Soils Properties
- Spatial Land Cover Data
- Historical temperature and evaporation data
- Stream discharge data



Central Asia Regional FFG System Products and Data Needs

CARFFG - Central Asia Regional Flash Flood Guidance

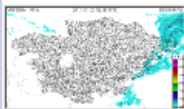


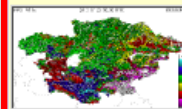





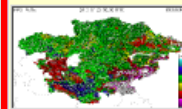


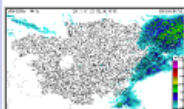
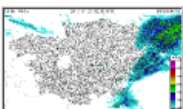

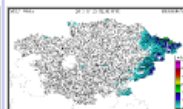
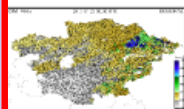
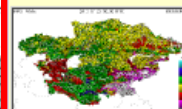

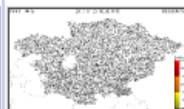
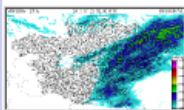
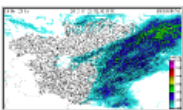

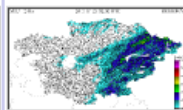
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Summary of Development Data

Note: These are global datasets.

- ❖ Shuttle Radar Topography Mission (SRTM) Digital Elevation Data (CGIAR)
- ❖ Hydro-Estimator Satellite Precipitation (NOAA/NESDIS)
- ❖ CMORPH Satellite Precipitation (NOAA/CPC)
- ❖ Soils Taxonomy (FAO Soils Database)
- ❖ Digital Land Cover (AVHRR)

Summary of Data Received and Data Needs



We have received:

- ❖ Limited historical precipitation, temperature, and soils data (Kazakhstan)
- ❖ Real-time station precipitation and temperature data (GTS)

Development needs:

- ❖ Historical precipitation, temperature, and soils data
- ❖ Real-time station precipitation and temperature data (GTS)
- ❖ Local/Country specific soils and land use data, if available

Central Asia Regional FFG System Products and Data Needs

