Asimilación de datos del FFGS y control de calidad

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HYDROLOGIC RESEARCH CENTER

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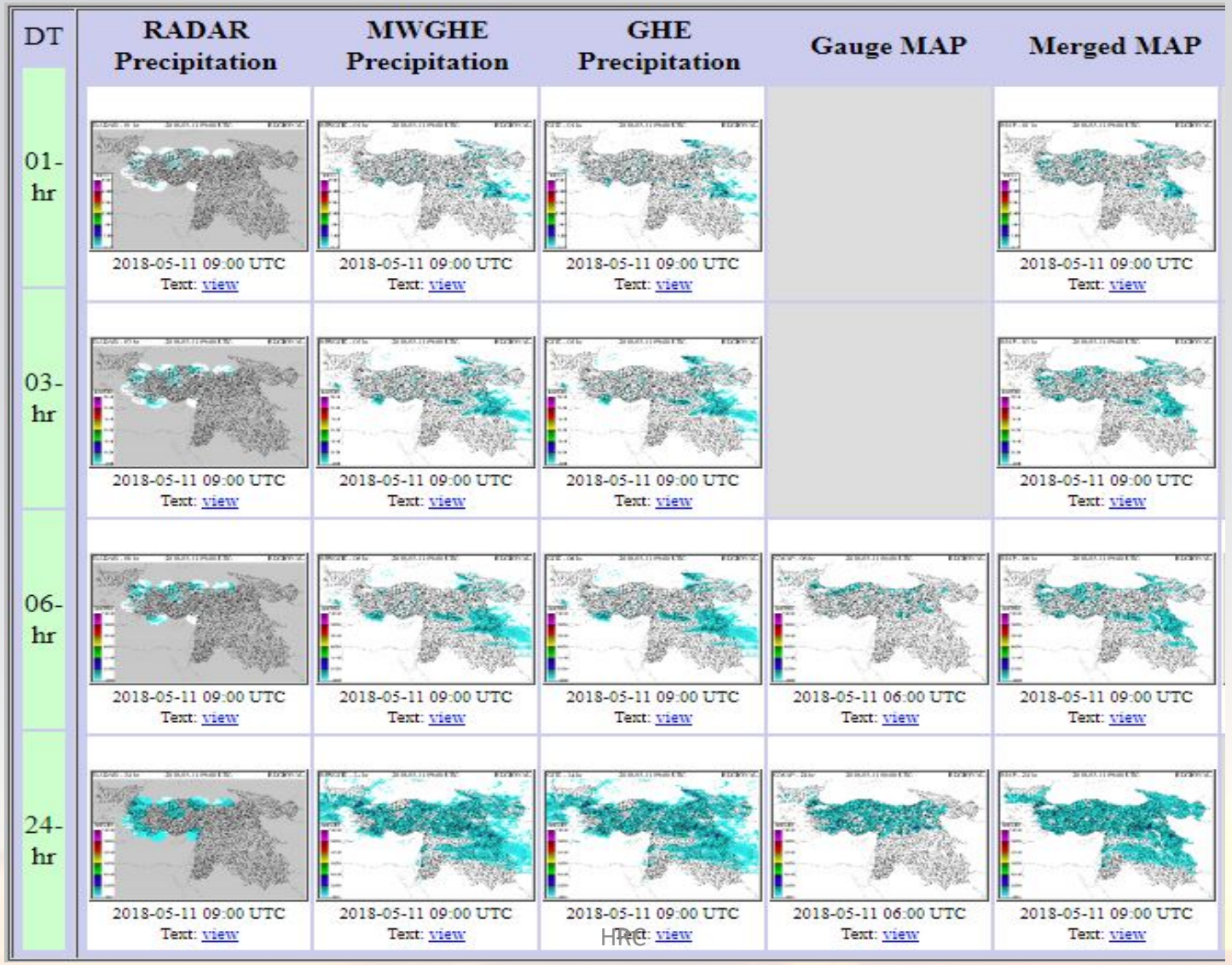
Ejemplo de interfaz de datos

Productos derivados de los datos observados y de datos cuya calidad ha sido controlada



Ejemplo de interfaz de usuario para datos

Datos observados in-situ

Composite Product: text, CSV, CSVT	SFTP data transfer (requires SFTP Client): EXPORTS/REGIONAL/2018/05/11

Surfmet Gauge Observations at 2018-05-11 06:00 UTC

Station Identifier	Station Name	Accumulated Precipitation (mm/06hr)	Average Temperature (C)	Snow Depth (cm)	Snow Cover (Index)	Region	Latitude	Longitude	Elevation	Enable Precipitation Flag	Enable Temperature Flag
15502	Vidin	0.00	16.20	No Report	No Report	BULGARIA	43.9942	22.8525	31	Enabled	Enabled
15525	Lovech	0.10	14.50	No Report	No Report	BULGARIA	43.1631	24.7006	220	Enabled	Enabled
15549	Razgrad	1.40	13.40	No Report	No Report	BULGARIA	43.5661	26.5078	346	Enabled	Enabled
15552	Varna	0.00	16.25	No Report	No Report	BULGARIA	43.2125	27.9522	39	Enabled	Enabled
15600	Murgash	9.00	5.25	No Report	No Report	BULGARIA	42.8333	23.6683	1687	Enabled	Enabled
15614	Sofia	0.30	13.40	No Report	No Report	BULGARIA	42.6553	23.3847	586	Enabled	Enabled

Station Identifier	17204
Station Name	Mus
Region	TURKEY
Latitude	38.7509
Longitude	41.5023
Elevation (m)	1322
Agency	TURKEY
Type	SYNOP
Precipitation Enabled Flag	Enabled
Temperature Enabled Flag	Enabled

Reported Surfmet Gauge Observations from Station '17204' within the past 30 days

Station Identifier	Observation Date & Time	Precipitation (mm/06hr)	Temperature (C)	Snow Depth (cm)	Snow Cover (Index)
17204	2018-05-11 06:00:00+00	2.40	10.30	No Data	No Data
17204	2018-05-11 00:00:00+00	0.60	10.85	No Data	No Data
17204	2018-05-10 18:00:00+00	0.10	14.15	No Data	No Data
17204	2018-05-10 12:00:00+00	0.00	16.03	No Data	No Data
17204	2018-05-10 06:00:00+00	0.00	10.15	No Data	No Data
17204	2018-05-10 00:00:00+00	0.00	9.27	No Data	No Data
17204	2018-05-09 18:00:00+00	1.00	10.77	No Data	No Data
17204	2018-05-09 12:00:00+00	2.00	10.55	No Data	No Data
17204	2018-05-09 06:00:00+00	19.00	8.07	No Data	No Data
17204	2018-05-09 00:00:00+00	3.00	8.05	No Data	No Data
17204	2018-05-08 18:00:00+00	1.00	9.28	No Data	No Data
17204	2018-05-08 12:00:00+00	16.00	9.30	No Data	No Data
17204	2018-05-08 06:00:00+00	0.80	12.33	No Data	No Data
17204	2018-05-08 00:00:00+00	0.00	12.68	No Data	No Data
17204	2018-05-07 18:00:00+00	12.00	11.17	No Data	No Data
17204	2018-05-07 12:00:00+00	12.00	11.53	No Data	No Data
17204	2018-05-07 06:00:00+00	1.00	11.35	No Data	No Data
17204	2018-05-07 00:00:00+00	0.00	12.48	No Data	No Data
17204	2018-05-06 18:00:00+00	0.00	16.37	No Data	No Data

Ejemplo de interfaz de usuario para datos

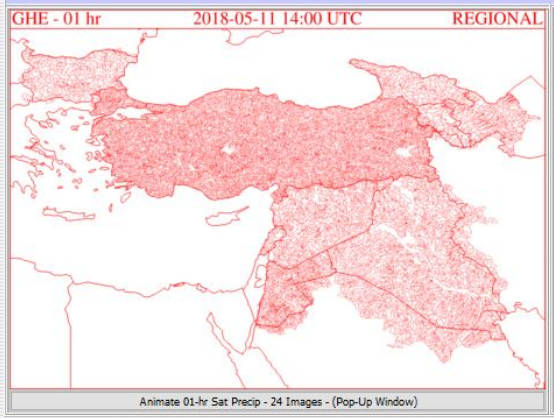
Panel – para datos , estatus del servidor y salud

2018-05-11 17:22:14 EET

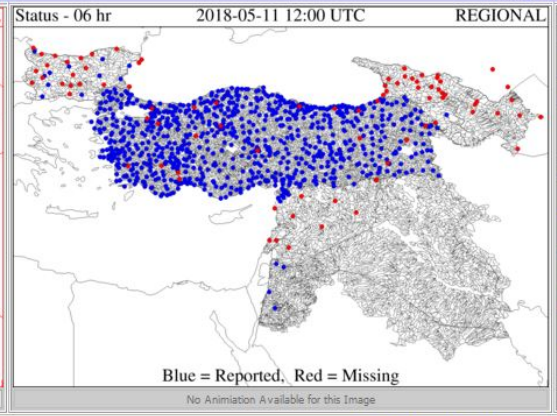
BSMEFFG - Real-Time Status Dashboard

2018-05-11 15:23:14 UTC

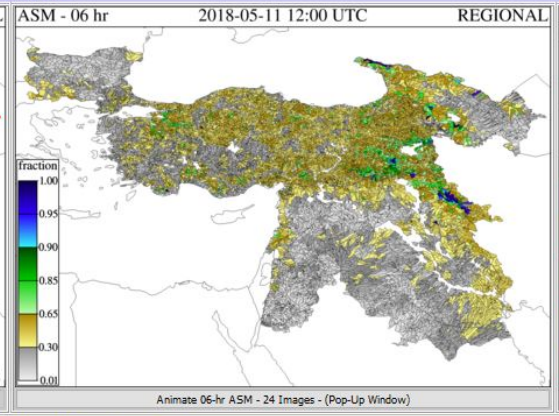
Image Products



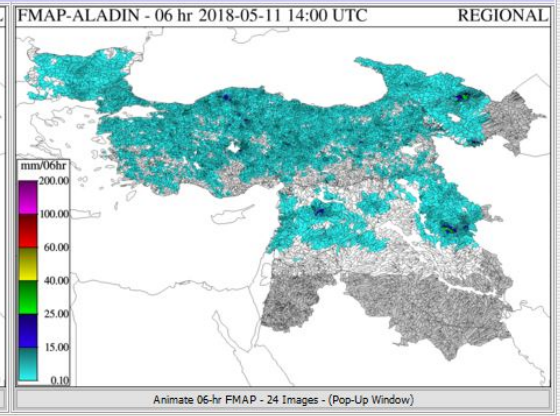
Animate 01-hr Sat Precip - 24 Images - (Pop-Up Window)



No Animation Available for this Image



Animate 06-hr ASM - 24 Images - (Pop-Up Window)



Animate 06-hr FMAP - 24 Images - (Pop-Up Window)

Real-Time Data Download and Inventory Status

NESDIS GHE Download					GAUGE Download					IMS Download					RADAR Download					ALADIN Download					NESDIS MWGHE Download					IFS Download					WRF Download				
ENABLED					ENABLED					ENABLED					ENABLED					ENABLED					ENABLED					ENABLED					ENABLED				
SUCCESS					SUCCESS					SUCCESS					SUCCESS					SUCCESS					SUCCESS					SUCCESS					SUCCESS				
May-07	May-08	May-09	May-10	May-11	May-07	May-08	May-09	May-10	May-11	May-07	May-08	May-09	May-10	May-11	May-07	May-08	May-09	May-10	May-11	May-07	May-08	May-09	May-10	May-11	May-07	May-08	May-09	May-10	May-11	May-07	May-08	May-09	May-10	May-11	May-07	May-08	May-09	May-10	May-11
24	24	24	24	14	91%	91%	91%	91%	90%	1	1	1	1	1	239	240	240	240	154	0	0	0	0	0	24	24	24	24	14	0	0	0	0	0	0	0	0	0	0

Real-Time Data Processing Status

NESDIS GHE Data Processing	GAUGE Data Processing	IMS Data Processing	RADAR Data Processing	ALADIN Data Processing	NESDIS MWGHE Data Processing	IFS Data Processing	WRF Data Processing
ENABLED	ENABLED	ENABLED	ENABLED	ENABLED	ENABLED	ENABLED	ENABLED
SUCCESS	SUCCESS	SUCCESS	PENDING	PENDING	SUCCESS	SUCCESS	PENDING

Model Processing Status

SNOW Model Processing	SACSMA & FFG Model Processing
ENABLED	ENABLED
SUCCESS	SUCCESS

Export Processing Status

Text/CSV Exports	Image Exports
ENABLED	ENABLED
SUCCESS	PENDING

Computational Server Status

General Info				Processing Load				CPU Activity				Disk Activity			Storage			
IP Address	Hostname	Uptime	Active Logins	1-Min	5-Min	15-Min	Swap Used	User	System	IOwait	Idle	Transfers	Read	Write	Free	Used	% Used	Days to Filled
192.168.2.78	BSMEFFG-CS	465.09 days	0	22.62 %	20.16 %	18.66 %	144612 KB	16.11 %	0.88 %	0.00 %	83.01 %	494.80 t/s	2.00 KB/s	8,723.20 KB/s	10,374,189 MB	5,301,008 MB	34 %	2026 days

Dissemination Server Status

General Info				Processing Load				CPU Activity				Disk Activity			Storage			
IP Address	Hostname	Uptime	Active Logins	1-Min	5-Min	15-Min	Swap Used	System	User	IOwait	Idle	Transfers	Read	Write	Free	Used	% Used	Days to Filled
192.168.2.79	BSMEFFG-DS	472.11 days	3	29.16 %	29.00 %	26.00 %	1401636 KB	4.22 %	0.75 %	6.51 %	88.52 %	409.00 t/s	1,631.20 KB/s	43.60 KB/s	5,232,071 MB	10,443,129 MB	67 %	1022 days

Regional Armenia Azerbaijan Bulgaria Georgia Iraq Lebanon Syria Turkey Jordan

Go to Regional Product Console

BSMEFFG Real-Time Status Dashboard v.1.0, © 2013 Hydrologic Research Center

Ejemplo de interfaz de usuario para datos

Registro de procesos – Alertas, errores y resumenes de procesos

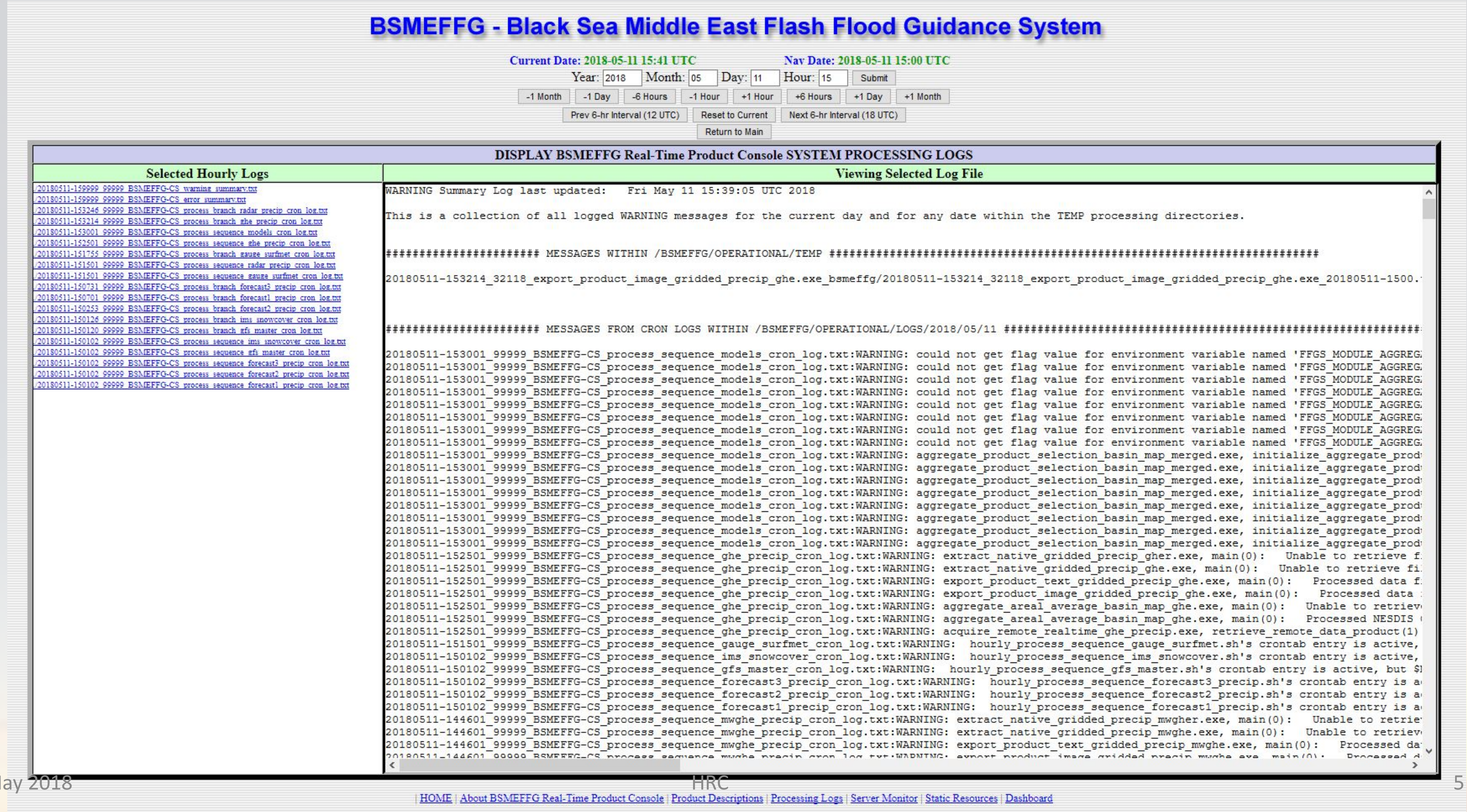
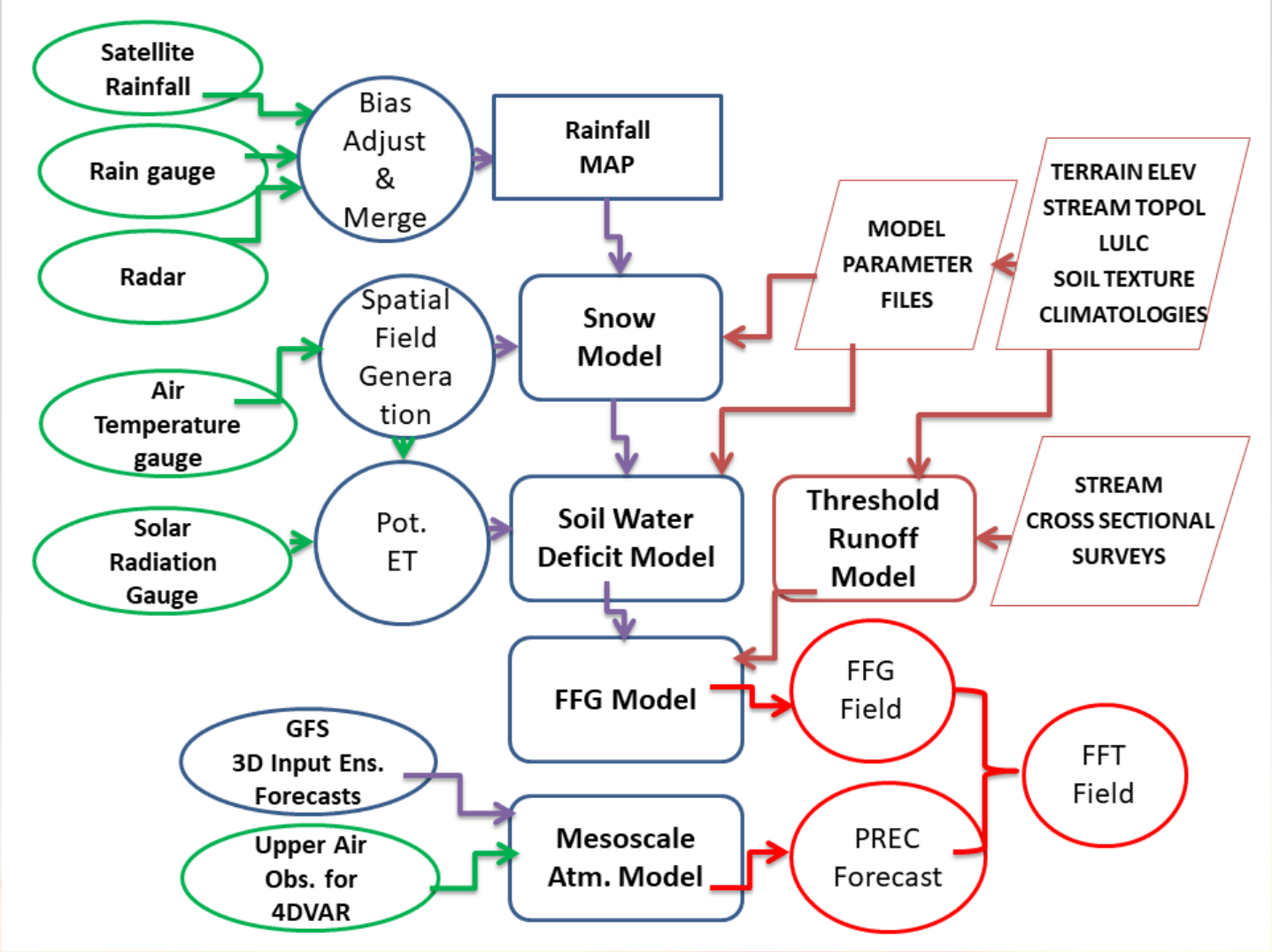
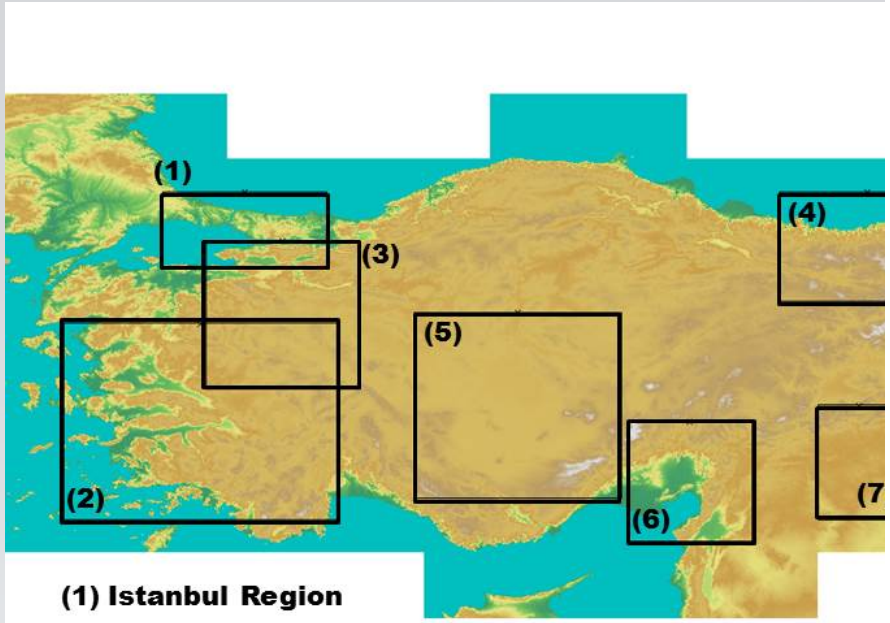


Diagrama de flujo de datos y modelos

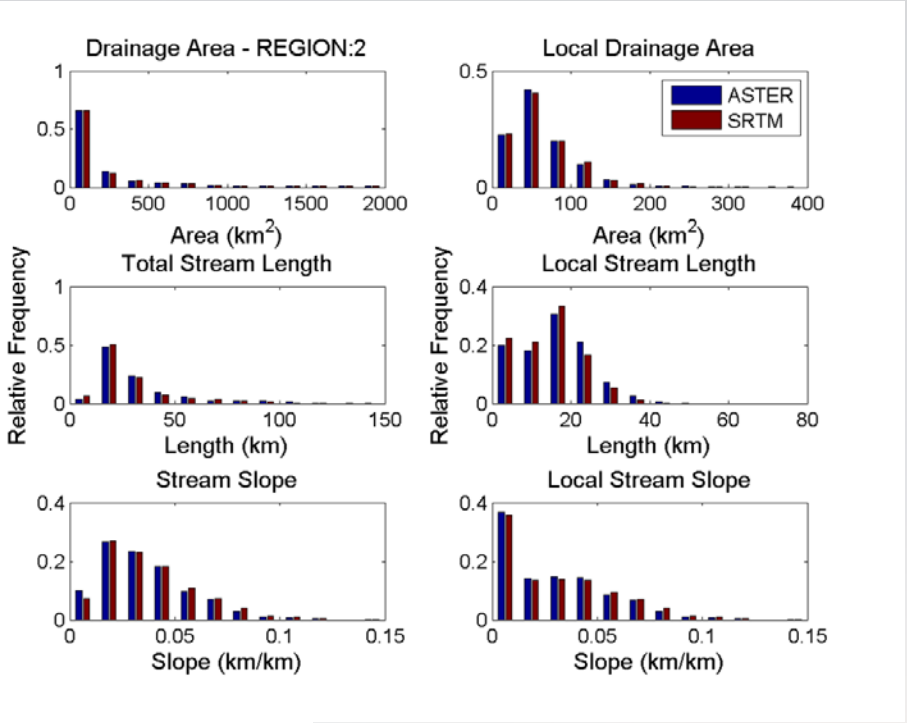


Delineaciones alrededor del mundo

SRTM 90m versus ASTER 30m

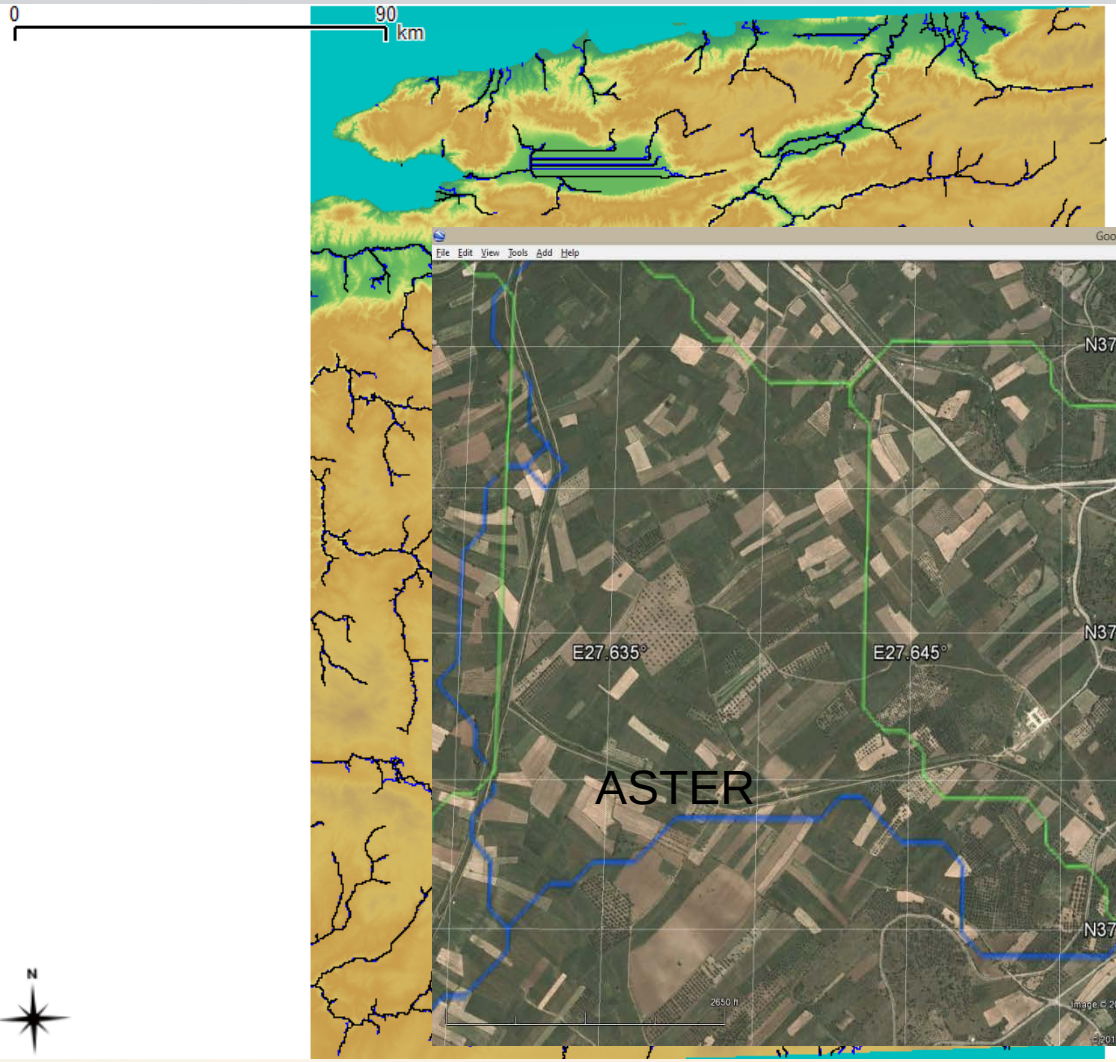


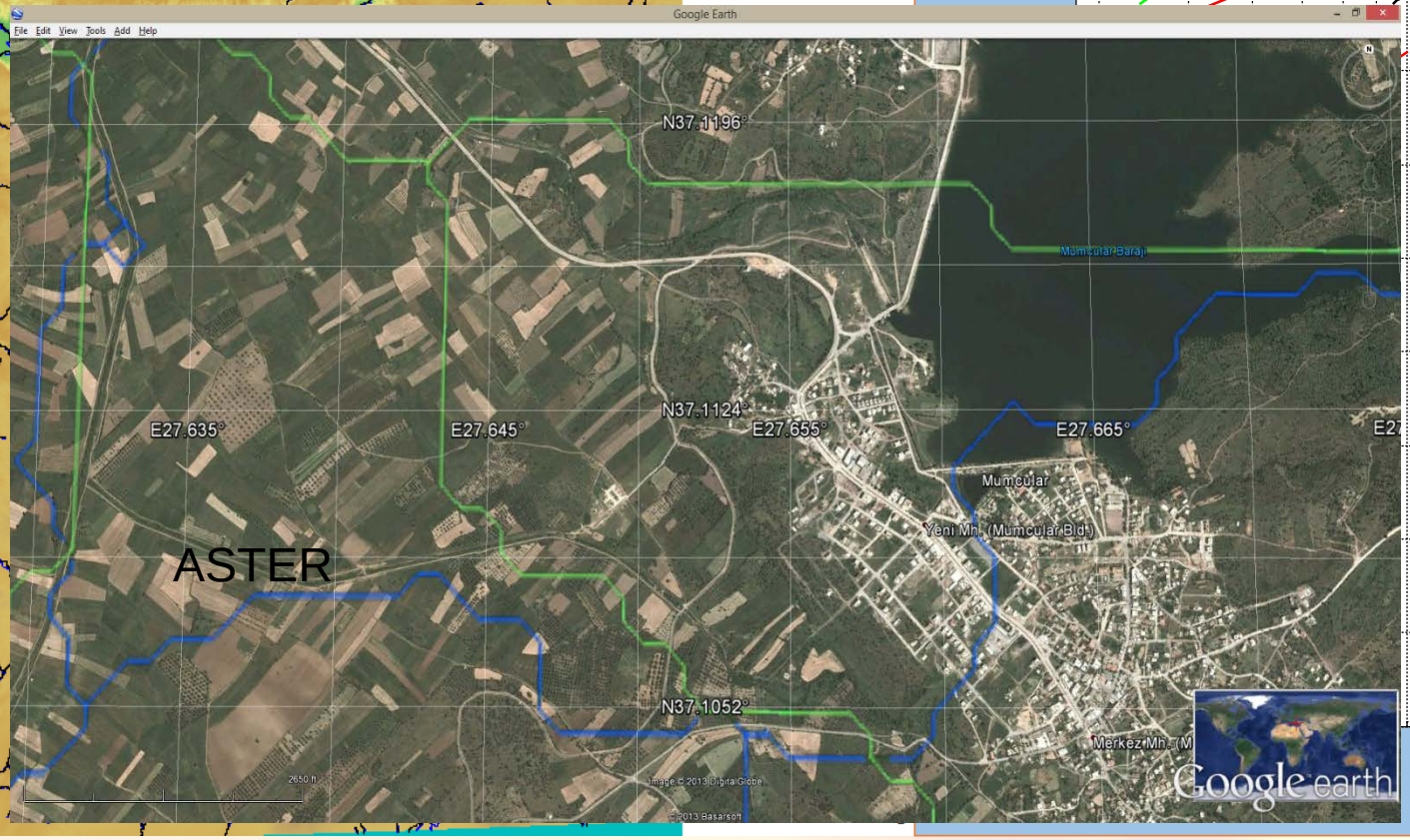
(1) Istanbul Region
(2) Mediterranean Coast
(3) Mediterranean Inland
(4) Black Sea Coast
(5) Region South of Ankara
(6) South Mediterranean Coast
(7) Southern Arid Region

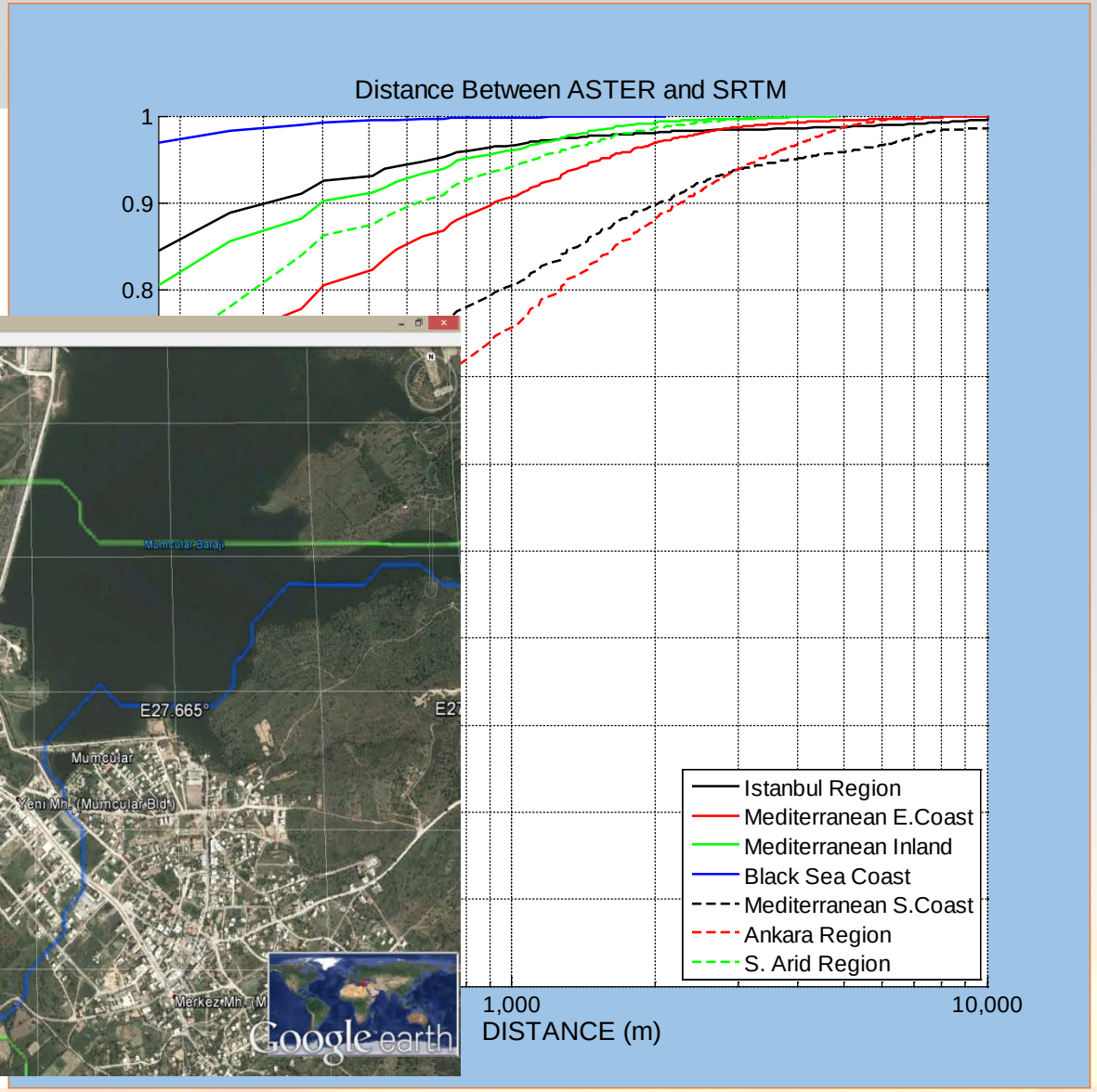


Delineaciones alrededor del mundo

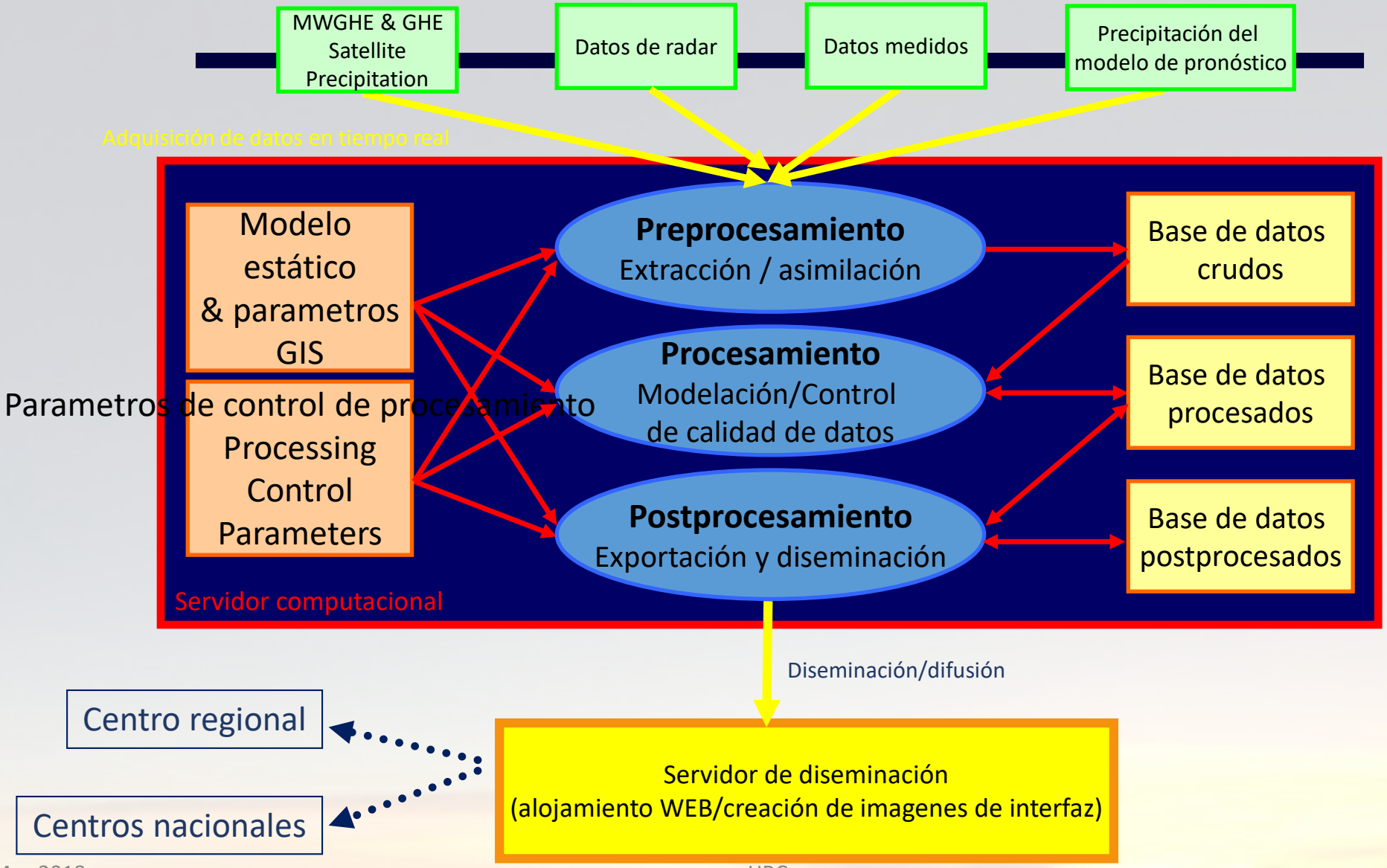
Antes de finalizar los “shapefiles” revisados por los países y los ajustes apropiados se hacen en HRC



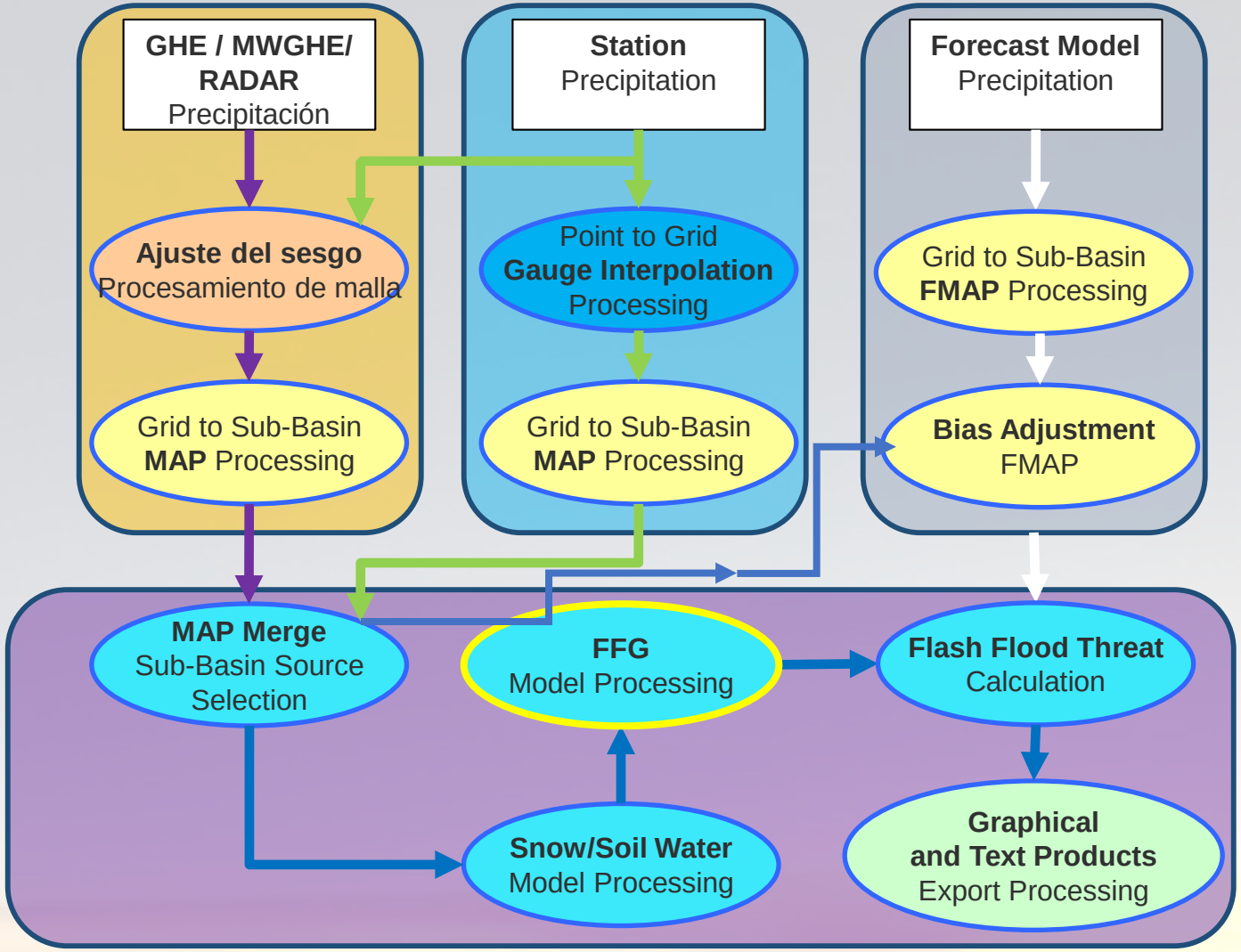




Diseño del flujo general de procesamiento de datos del FFGS



Procesamiento de la precipitación del FFGS



Current Multi-Sensor Strategy

Global Data
NESDIS GLOBAL HYDROESTIMATOR (IR, MODEL, OROGRAPHY) – Short Latency
CMORPH (MW-BASED) – Longer latency

Regional and Local Data
OPERATIONAL RADAR CAPPI (IF IN DIGITAL FORM) – Short latency
OPERATIONAL PRECIPITATION GAUGES – Short Latency

Initial Quality Control – Requires historical data – Requires NMHS Agency Collaboration
Snow Mask for CMORPH (IMS)
Radar CAPPI Analysis to develop Radar Mask of Invalid Data for Application
Raingauge data analysis for persistent errors and unrealistic values

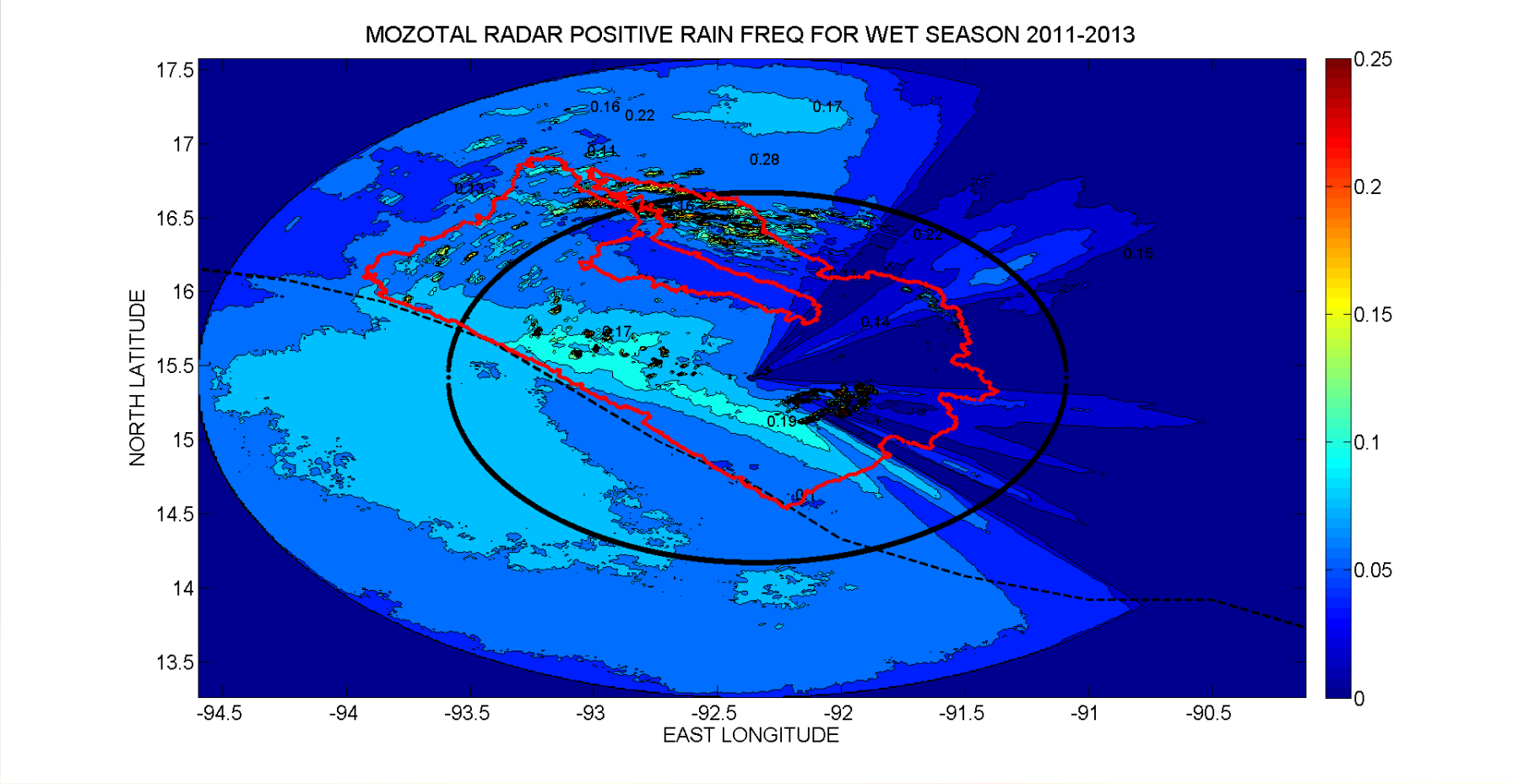
Bias Adjustments – Requires historical data - Requires NMHS Agency Collaboration
CMORPH + GHE → MWGHE (gridded)
MWGHE, Radar Data, Raingauge Data → MWGHE, Radar, Raingauge MAP
MWGHE MAP + Raingauge MAP → Bias Adj MWGHE MAP
RADAR MAP + Raingauge MAP → Bias Adj RADAR MAP

Merging: Bias Adj RADAR MAP – Bias Adj MWGHE MAP - ….

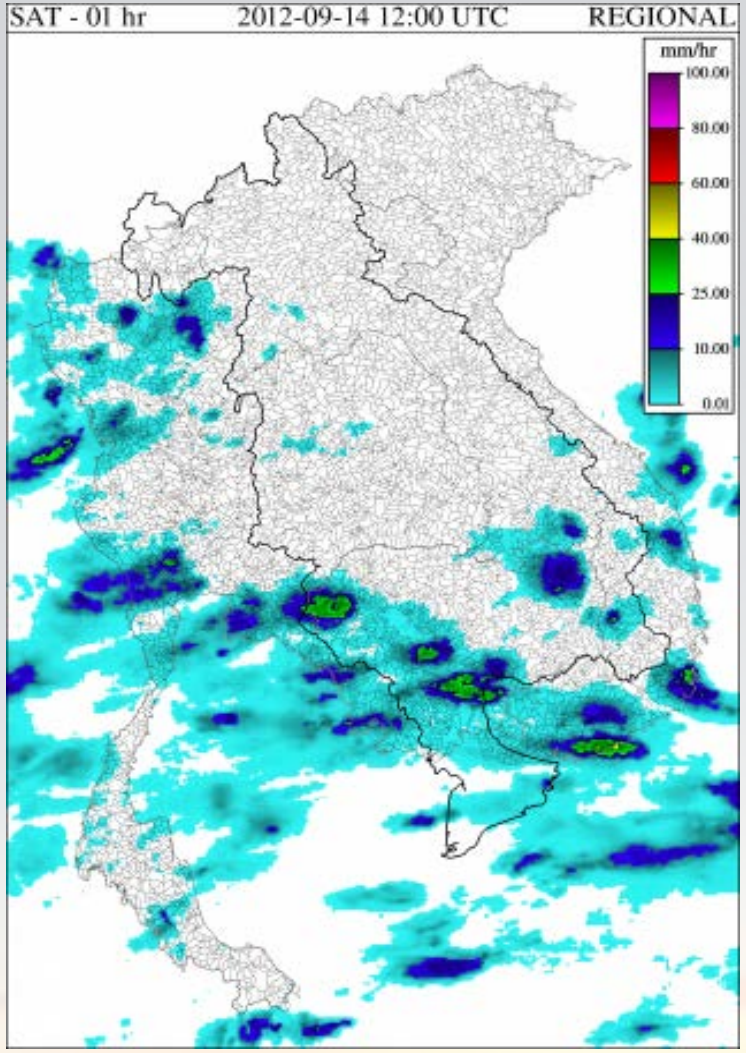
Example Positive Rainfall Frequency

C-band (1 degree beam width) Radar at ~3 km altitude ; 4km CAPPI

Gauges with < 20% of time missing data used for reference



Satellite Precipitation – NESDIS Global Hydroestimator (GHE)



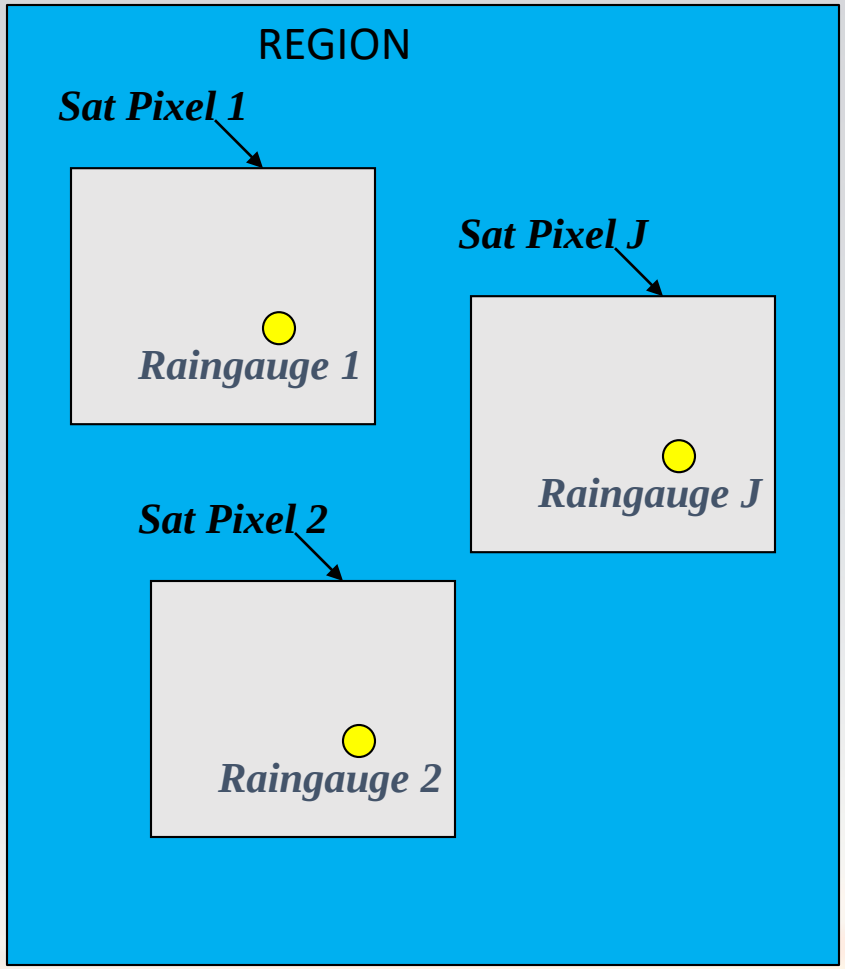
- **IR based (10.7 μm)**
- **Short latency**

Rain Rate =
Function of brightness temperature

Enhanced for:

1. Atmospheric moisture effects
2. Orography (upslope/downslope)
3. Convective Equilibrium Level (warm-top convection)
4. Local pixel T difference with surroundings
5. Convective core/no-core region

Bias and Log-Bias Factors



Log-Bias

$$\beta_t = \ln\left[\frac{\sum_{j=1}^{N_g} R_g(t,j)}{\sum_{j=1}^{N_g} R_s(t,j)}\right]$$

Bias (B)

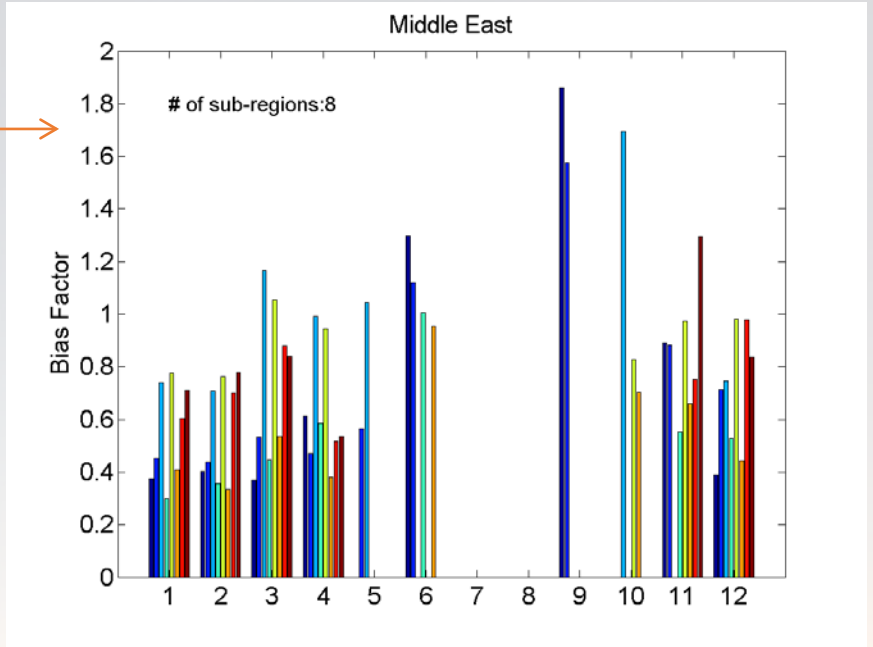
Climatological Adjustment Using Gauges and Corresponding Satellite Pixel Data

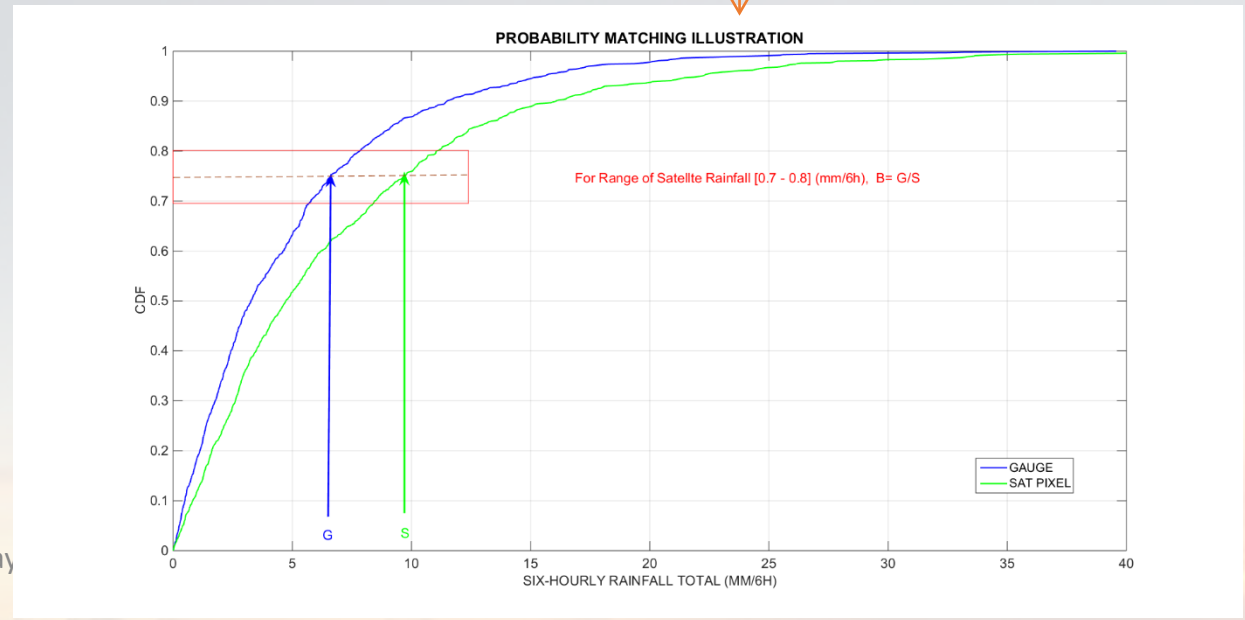
- Historical Data for regions of uniform hydroclimatology, terrain and gauge density
- Usually done for an given month or season
- Result is bias factor for each region and month/season

Bias Factor computed from:

(1) Mean values

(2) Probability matching considerations





Dynamic Bias Adjustment Basics

$$\beta_t = \ln\left[\frac{\sum_{j=1}^{N_g} R_g(t,j)}{\sum_{j=1}^{N_g} R_s(t,j)}\right]$$

$$\beta_{t+1} = \beta_t + w_{t+1}$$

$$z_{t+1} = \beta_{t+1} + v_{t+1}$$

Kalman Filter
Stochastic Approximations

- N pairs of consecutive values
- At least 20% raingauges with rain
- Conditional Mean > Threshold (mm/h) (satellite/radar and gauge)

Bias (B)

Important issue:
Gauge data quality control

Multi-Spectral Satellite Rainfall

HE

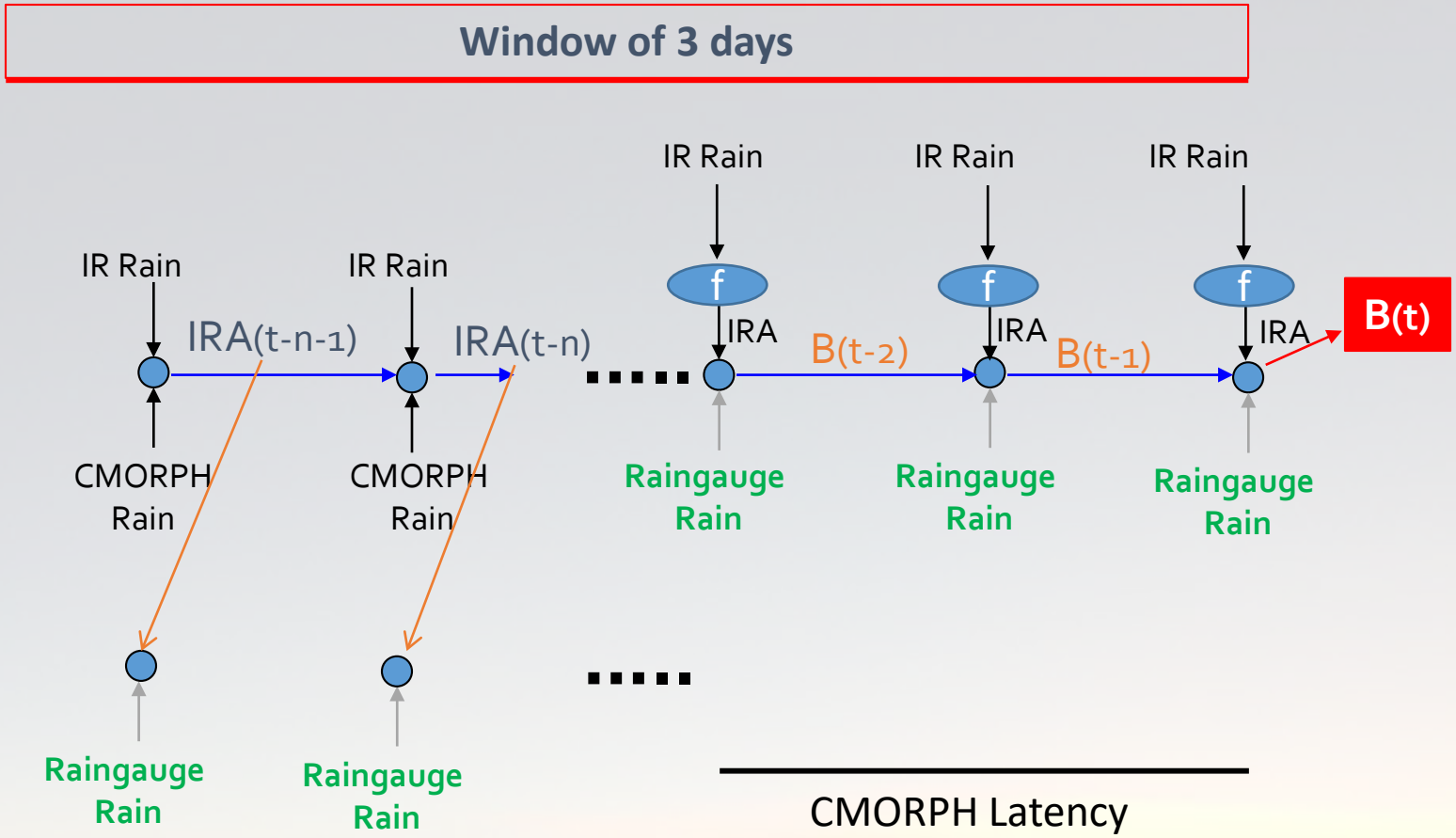
IR – Based
30-min latency in operations
Based on measurements of top cloud brightness temperature

CMORPH

MW – Based
18-26 hour latency in operations
Based on measurements of microwave scattering from raindrops

New global FFGS product combines IR-based HE rainfall with MW-based CMORPH rainfall

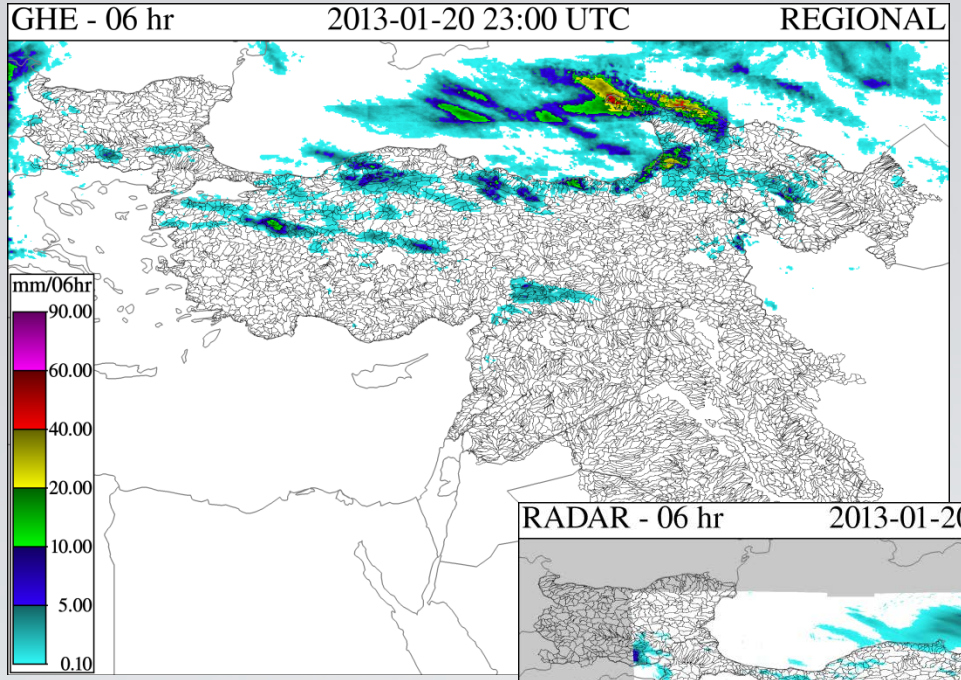
Multi-Spectral Satellite Rainfall for FFG Systems

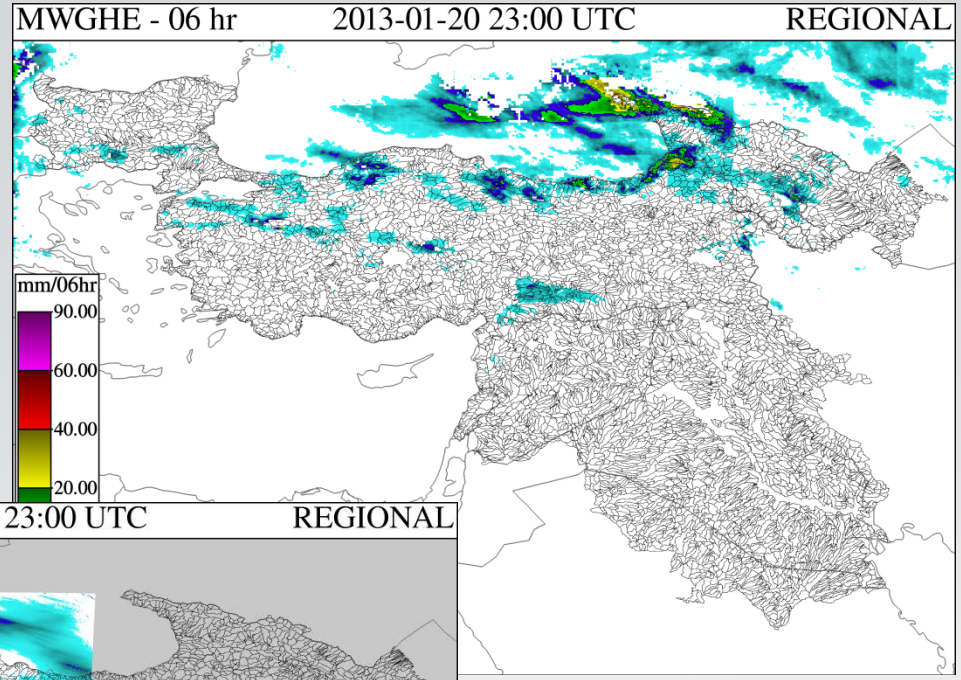


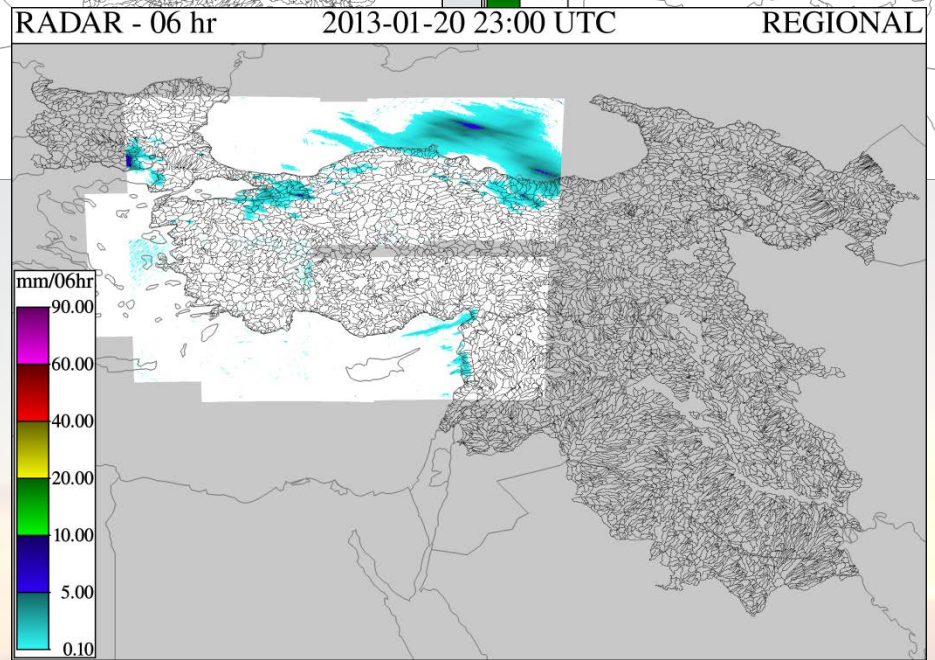
Examples from BSMEFFG

Original GHE

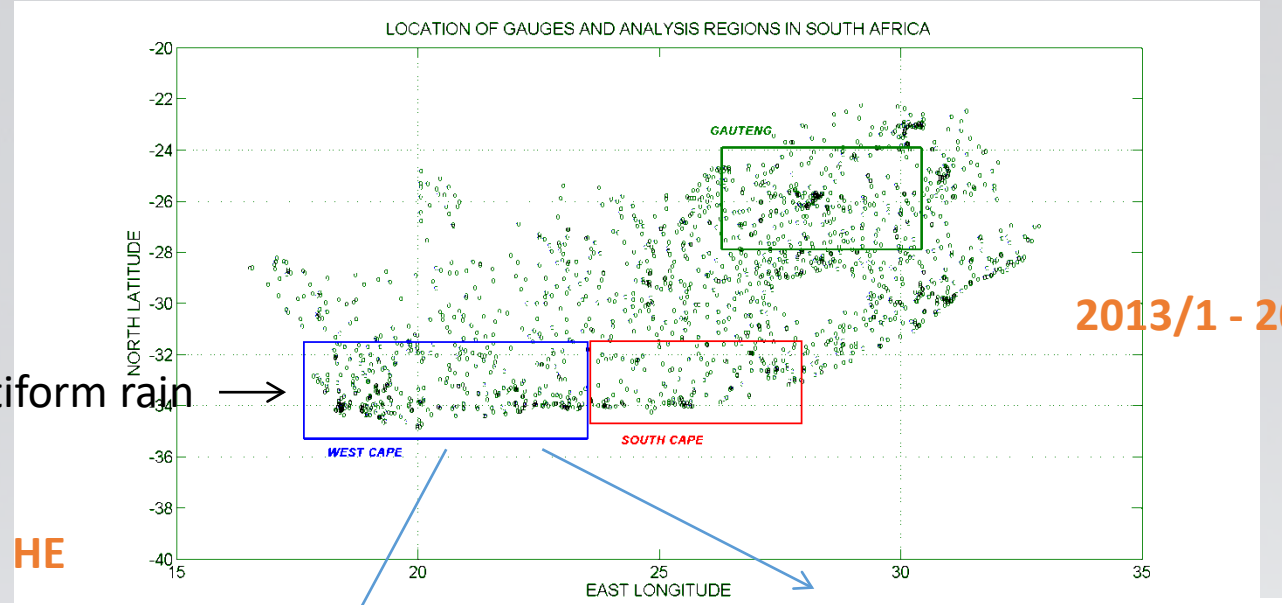
Adjusted GHE







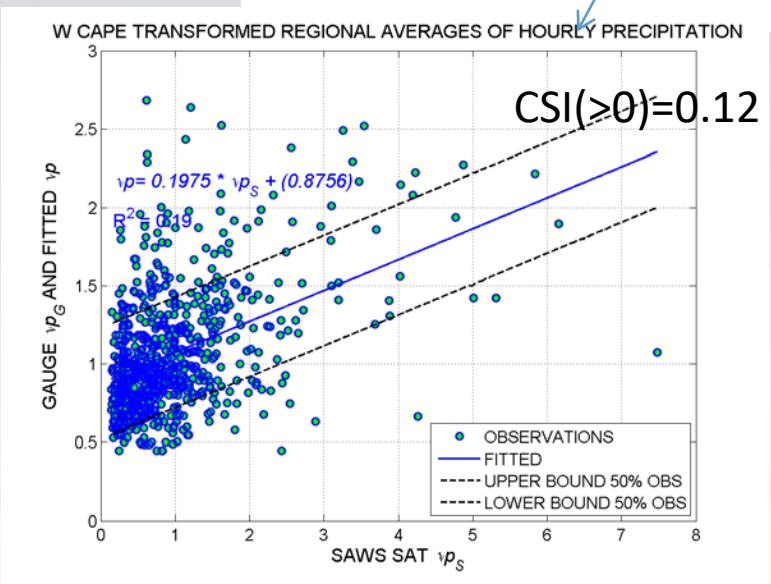
Evaluation from SARFFG



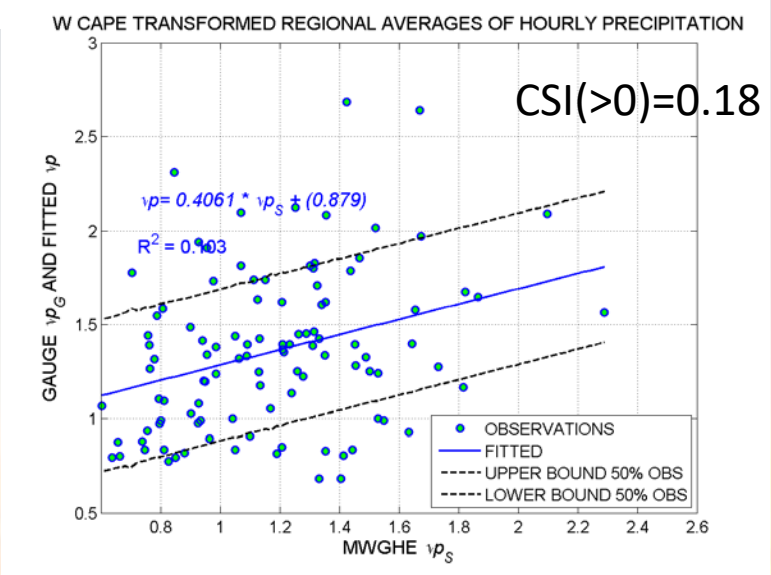
2013/1 - 2014/3

Low Level stratiform rain →

UM Adjusted HE



MWGHE



Challenges FFGS Had to Overcome

Data and Information Focus

1. **Data Ingest** (format type variety, public versus private, asynchronous, variable space-time resolution)
2. **Measurement /Forecast Uncertainty** (climatological vs time varying, short records for reliability fine-tuning)
3. **Timely Product/Warning Generation** (computer and comm. requirements and constraints, timely forecaster adjustment and response)
4. **Products Easily Accessible and Searchable by NMHSs** (interface and database requirements, local versus regional data storage, requirement to use free and open source software for developing countries)
5. **Education and Training in Product Interpretation and Communication with DMAs** (diverse backgrounds, inter- and multi-disciplinary focus, cultural diversity in the perceived value of and the response to warnings)

Gracias

The strong support of the country National Meteorological, Hydrological and Disaster Management Services has been essential for the useful operational utilization of the regional FFG systems.