OVERVIEW OF THE FLASH FLOOD GUIDANCE SYSTEM FOR SOUTHEAST ASIA

HYDROLOGIC RESEARCH CENTER

FLASH FLOODS

- World Meteorological Organization A flood of short duration with a relatively high peak discharge
- American Meteorological Society A flood that rises and falls quite rapidly with little or no advance warning, usually as the result of <u>intense rainfall</u> over a relatively small area
- Response time is 6 hours or less
- A local hydrometeorological phenomenon that requires:
 - BOTH Hydrological and Meteorological expertise for real time forecasting/warning
 - Knowledge of local up to the hour information for effective warning (24 -7 operation)

FLASH FLOOD GUIDANCE SYSTEMS

- The implementation of Flash Flood Guidance (FFG) systems is a program to provide a <u>tool for National</u> <u>Meteorological and Hydrologic Services</u> to develop flash flood warnings.
- Addresses the need to provide early warnings for flash floods in the development of regional or country-wide approaches to flash flood issues.

FFG SYSTEM BENEFITS

- Addresses all flash flood prone basins over the area of interest
- Provides information on rainfall and hydrologic response of the basin
- Early awareness of impending local flash flood threats for all potentially vulnerable areas
 - Provide rapid assessments of the **occurrence** (not the magnitude) of a flash flood
 - Only analyzing the occurrence allows for more rapid mobilization, reduces uncertainty and complexity

• System designed to provide a balance between quality (accuracy) and value (timely)

FFG OPERATIONS SCHEMATIC



DEFINITION OF KEY FFG PRODUCTS

Flash Flood Guidance – volume of rainfall of a given duration (1-6 hours) over a given small catchment that is just enough to cause minor flooding at the outlet (bank full flow)

FFG = INDEX



Flash Flood Threat – rainfall of a given duration in excess of the corresponding Flash Flood Guidance value (existing/past or "forecast" rainfall)

FFT = INDEX



BANK FULL FLOW

Bank full flow is a conservative measure of flooding as it may not be associated with significant flood damage.



FLASH FLOOD POTENTIAL

- Potential based on <u>static indicators</u> basin characteristics
 - Soil type
 - Land cover/land use
 - Slope
 - Stream characteristics hydraulic depth, bankfull width
- Potential based on <u>dynamic indicators</u> e.g. soil moisture, rainfall

• FFG system provides access to all these data

KEY TECHNICAL COMPONENTS FOR THE STANDARD FFG SYSTEM



STANDARDIZED FFG SYSTEM

Real-time Satellite Precipitation Inputs

- Global HydroEstimator (NOAA/NESDIS) short latency (<30 minutes), IR-based
- CMORPH (NOAA/CPC) for Adjustments to the Global HydroEstimator, microwave-based
- Snow Model and Snow Cover
 - SNOW-17 (NOAA/NWS)
- Soil Moisture Model
 - Sacramento Soil Moisture Accounting Model
- Rainfall Forecast Model
 - Mesoscale Models examples WRF, ALADIN, UNIFIED, HRM

DATA FLOW SCHEMATIC



STANDARDIZED FFG SYSTEM DASHBOARD

Can do animations/loops



Intended for IT staff and forecasters, to get a quick look at the system status – specifically the real-time data downloads, data processing and server(s) status.

STANDARDIZED FFG SYSTEM FORECASTER USER INTERFACE

| | | | Current Date: 2017- | 11-13 19:51 UTC | Product Date: 2017 | -10-09 22:00 UTC | | | | | |
|------|--|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|--|--|--|
| | | Year: 2017 | Month: 10 Day: | -6 Hours -1 Hour + | GION: REGIONAL ▼ | OPHON: MEDIAN V Subr | nit | | | | |
| | | | Prev 6-hr Inte | erval (18 UTC) Reset to C | urrent Next 6-hr Interval | (00 UTC) | | | | | |
| | Product Console - Main Table | | | | | | | | | | |
| DI | MWGHE Precipitation | GHE Precipitation | Gauge MAP | Merged MAP | ASM | FFG | IFFT | PFFT | | | |
| 01-1 | 1r 2017-10-09 22:00 UTC Text: view | 2017-10-09 22:00 UTC Text: view | | 2017-10-09 22:00 UTC Text: view | | 2017-10-09 18:00 UTC Text: view | 2017-10-09 19:00 UTC Text: view | 2017-10-09 18:00 UTC Text: view | | | |
| 03-ł | 1r 2017-10-09 22:00 UTC Text: view | 2017-10-09 22:00 UTC Text: view | | 2017-10-09 22:00 UTC Text: view | | 2017-10-09 18:00 UTC Text: view | 2017-10-09 21:00 UTC Text: view | 2017-10-09 18:00 UTC Text: view | | | |
| 06-ł | 1r 2017-10-09 22:00 UTC Text: view | 2017-10-09 22:00 UTC Text: view | 2017-10-09 18:00 UTC Text: view | 2017-10-09 22:00 UTC Text: view | 2017-10-09 18:00 UTC Text: view | | | |
| 24-1 | 1r 2017-10-09 22:00 UTC Text: view | 2017-10-09 22:00 UTC Text: view | 2017-10-09 18:00 UTC Text: view | 2017-10-09 22:00 UTC Text: view | | | | | | | |
| | | Composite Product: text , (| CSV, CSVT | | SFTP data tran | sfer (requires SFTP Client): | EXPORTS/REGIONAL/201 | 17/10/09 | | | |
| | 1 | | Surf | met Gauge Observations | at 2017-10-09 22:00 UT | с | | | | | |
| | Station Identifier | Station Name Accumulated | Precipitation Average Tem 01hr) | perature (C) Regio | n Latitud | e Longitude | Elevation | Enable Precipitation Flag | | | |
| | No reports for region No re | eports for region No reports | for region No reports | for region No reports for | or region No reports for | r region No reports for regio | n No reports for region | No reports for region | | | |

Thumbnails to access a Map Server Interface

STANDARDIZED FFG SYSTEM FORECASTER USER INTERFACE





BASIN DELINEATIONS



6372 sub-basins

Mean area ~180 km²

For Radars ~ 30-70 km²



Precipitation estimates from the Global HydroEstimator, NOAA



Precipitation estimates from the CMORPH (micro-wave) adjusted Global HydroEstimator, NOAA



Mean areal precipitation for each flash flood basin based on gauges



Mean areal precipitation for each flash flood basin based on biascorrected satellite, radar, or gauge estimates

Model-based soil moisture for each basin presented as fraction of saturation (top 20 cm)

2017-10-09 18:00 UTC

REGIONAL

FFG - 03 hr

ASM - 06 hr

Flash Flood Guidance values for each basin The lower the FFG, the more likely flooding will occur during a rainfall event

2017-10-09 18:00 UTC

REGIONAL

mm/03hr

150.00

00.00

<u>Radars</u>









Mean areal precipitation for each basin based on QPF

Forecast flash flood threat based on QPF

2017-10-09 18:00 UTC

REGIONAL

mm/06hr

100.00

\$0.00

40.00

25.00

10.00

5.00

<u>Model</u> <u>Information</u>

FFFT1 - 06 hr



12, 24, and 36-hour Flash Flood Risk

TEXT FILES AVAILABLE

| BASIN 01MAP2 | 2014101412 | 03MAP20 | 14101412 | 06MAP20 | 014101412 | 24MAP2 | 014101412 | 06GMAP | 201410141 | 2 24GMAP2 | 01410141 | 2 06ASMU2 | 01410141 | 2 OGASML2 | 01410141 | 2 06A3MT2 | 01410141 | 01FFG20 | 14101412 | 03FFG20 | 14101412 | 06FFG20 | 4101412 | 01FFG201 | 4101412 | 03FFG201410 | 1412 06 | FFG2014101412 | 01FMAP | 2014101 |
|--------------|------------|---------|----------|---------|-----------|--------|-----------|--------|-----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|---------|----------|-----------|----------|---------|---------|----------|---------|-------------|---------|----------------------|--------|---------|
| 2022901039 | 0.00 | 0.00 | 0.00 | 1.23 | 0.00 | 0.00 | 0.16 | 0.71 | 0.53 | 168.00 | 206.35 | 241.46 | 167.74 | 206.09 | 241.20 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 85 25.52 | 0.00 | 0.00 |
| 2022901042 | 0.00 | 0.00 | 0.00 | 4.92 | 0.00 | 0.00 | 0.28 | 0.68 | 0.54 | 137.50 | 172.59 | 204.41 | 137.10 | 172.19 | 204.02 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 26.09 | 0.00 | 0.00 |
| 2022901043 | 0.00 | 0.00 | 0.00 | 0.94 | 0.00 | 0.00 | 0.20 | 0.68 | 0.82 | 127.39 | 156.75 | 184.44 | 127.05 | 130.95 | 184.17 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 85 25.71 | 0.00 | 0.00 |
| 2022901045 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.18 | 0.68 | 0.51 | 142.06 | 176.27 | 207.52 | 141.81 | 176.03 | 207.28 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 84 24.88 | 0.00 | 0.00 |
| 2022901046 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.14 | 0.69 | 0.51 | 142.14 | 170.68 | 198.58 | 141.94 | 170.49 | 198.39 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 71 22.01 | 0.00 | 0.00 |
| 2022901047 | 0.00 | 0.07 | 0.15 | 0.45 | 0.00 | 0.00 | 0.21 | 0.76 | 0.58 | 79.83 | 85.58 | 91.63 | 79.74 | 85.49 | 91.53 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 60 18.72 | 0.00 | 0.00 |
| 2022901048 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.73 | 0.55 | 127.75 | 153.20 | 179.58 | 127.49 | 152.95 | 179.33 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 70 20.47 | 0.00 | 0.00 |
| 2022901049 | 0.00 | 0.27 | 0.35 | 0.40 | 0.00 | 0.00 | 0.42 | 0.79 | 0.67 | 60.61 | 66.11 | 71.92 | 60.50 | 65.99 | 71.81 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 55 16.47 | 0.00 | 0.00 |
| 2022901050 | 0.00 | 0.16 | 0.19 | 0.19 | 0.00 | 0.00 | 0.40 | 0.78 | 0.66 | 105.14 | 130.12 | 157.82 | 104.85 | 129.83 | 157.53 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 58 17.92 | 0.00 | 0.00 |
| 2022901081 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 0.65 | 0.49 | 132.89 | 100.00 | 164.37 | 132.73 | 137.83 | 164.21 | -999.00 | -999.00 | -999 00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 71 20.14 | 0.00 | 0.00 |
| 2022901053 | 0.00 | 0.00 | 0.00 | 0.20 | 0.00 | 0.00 | 0.14 | 0.72 | 0.53 | 85.92 | 91.82 | 98.06 | 85.75 | 91.65 | 97.89 | -999 00 | -999.00 | -999 00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999 00 | -999 00 -99 | 9 00 0 | 64 18.48 | 0.00 | 0.00 |
| 2022901054 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 | 0.68 | 0.54 | 118.35 | 146.51 | 173.96 | 117.99 | 146.16 | 173.61 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 85 25.76 | 0.00 | 0.00 |
| 2022901055 | 0.00 | 0.00 | 0.00 | 2.74 | 0.00 | 0.00 | 0.20 | 0.68 | 0.52 | 120.99 | 147.85 | 173.06 | 120.70 | 147.57 | 172.78 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 87 25.83 | 0.00 | 0.00 |
| 2022901064 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.21 | 0.70 | 0.54 | 100.13 | 120.29 | 141.21 | 99.82 | 119.99 | 140.91 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 87 25.96 | 0.00 | 0.00 |
| 2022901065 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.20 | 0.70 | 0.54 | 135.44 | 167.95 | 197.97 | 135.15 | 167.66 | 197.68 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 87 25.99 | 0.00 | 0.00 |
| 2022901066 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.20 | 0.65 | 0.52 | 128.99 | 155.59 | 187.01 | 128.17 | 158.27 | 105.79 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 87 25.72 | 0.00 | 0.00 |
| 2022901068 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.68 | 0.51 | 126.95 | 156.41 | 184.71 | 126.69 | 156.15 | 184.45 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 87 25.66 | 0.00 | 0.00 |
| 2022901069 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15 | 0.71 | 0.52 | 135.76 | 163.01 | 190.86 | 135.54 | 162.79 | 190.64 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 76 24.05 | 0.00 | 0.00 |
| 2022901070 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.16 | 0.72 | 0.53 | 147.91 | 179.27 | 209.52 | 147.68 | 179.04 | 209.29 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 76 23.22 | 0.00 | 0.00 |
| 2022901071 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.69 | 0.54 | 114.27 | 139.55 | 163.83 | 113.96 | 139.24 | 163.52 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 85 25.55 | 0.00 | 0.00 |
| 2022901074 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.18 | 0.71 | 0.53 | 130.38 | 156.74 | 184.45 | 130.13 | 156.49 | 184.19 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 77 23.81 | 0.00 | 0.00 |
| 2022901075 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.24 | 0.73 | 0.57 | 131.79 | 160.71 | 190.16 | 131.45 | 160.37 | 189.82 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 75 22.85 | 0.00 | 0.00 |
| 2022901108 | 0.00 | 0.00 | 0.00 | 0.44 | 0.00 | 0.00 | 0.15 | 0.70 | 0.52 | 137.95 | 165.60 | 193.50 | 137.72 | 165.37 | 193.27 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 82 24.36 | 0.00 | 0.00 |
| 2022901109 | 0.00 | 0.00 | 0.00 | 1.35 | 0.00 | 0.00 | 0.14 | 0.70 | 0.82 | 155.05 | 100.00 | 220.88 | 104.00 | 100.40 | 220.65 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 77 23.64 | 0.00 | 0.00 |
| 2022901113 | 0.00 | 0.00 | 0.00 | 0.12 | 0.00 | 0.00 | 0.24 | 0.67 | 0.52 | 109.00 | 125.00 | 146 44 | 104.28 | 125 66 | 146 11 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 25.99 | 0.00 | 0.00 |
| 2022901116 | 0.00 | 0.00 | 0.00 | 3.38 | 0.00 | 0.00 | 0.30 | 0.67 | 0.55 | 131.47 | 165.10 | 195.89 | 131.03 | 164.66 | 195.45 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 26.11 | 0.00 | 0.00 |
| 2022901117 | 0.00 | 0.00 | 0.00 | 1.87 | 0.00 | 0.00 | 0.17 | 0.64 | 0.48 | 126.89 | 155.10 | 181.45 | 126.66 | 154.86 | 181.21 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 87 25.95 | 0.00 | 0.00 |
| 2022901118 | 0.00 | 0.00 | 0.00 | 1.25 | 0.00 | 0.00 | 0.15 | 0.63 | 0.47 | 137.68 | 169.80 | 199.80 | 137.47 | 169.59 | 199.59 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 87 26.00 | 0.00 | 0.00 |
| 2022901119 | 0.00 | 0.00 | 0.00 | 4.47 | 0.00 | 0.00 | 0.16 | 0.70 | 0.52 | 137.32 | 165.35 | 193.83 | 137.07 | 165.10 | 193.58 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 82 25.08 | 0.00 | 0.00 |
| 2022901120 | 0.00 | 0.00 | 0.03 | 2.52 | 0.00 | 0.00 | 0.14 | 0.69 | 0.51 | 123.54 | 145.54 | 168.86 | 123.34 | 145.34 | 168.66 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 84 25.37 | 0.00 | 0.00 |
| 2022901121 | 0.00 | 0.00 | 0.00 | 2 76 | 0.00 | 0.00 | 0.30 | 0.00 | 0.54 | 145 84 | 182 74 | 217 10 | 145 62 | 182 52 | 216 88 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 86 25 71 | 0.00 | 0.00 |
| 2022901123 | 0.00 | 0.00 | 0.00 | 1.17 | 0.00 | 0.00 | 0.22 | 0.64 | 0.50 | 133.23 | 165.94 | 196.68 | 132.91 | 165.62 | 196.36 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 25.98 | 0.00 | 0.00 |
| 2022901124 | 0.00 | 0.00 | 0.09 | 1.15 | 0.00 | 0.00 | 0.15 | 0.72 | 0.53 | 143.27 | 173.01 | 202.65 | 143.14 | 172.89 | 202.53 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 78 23.81 | 0.00 | 0.00 |
| 2022901125 | 0.00 | 0.00 | 0.00 | 1.52 | 0.00 | 0.00 | 0.14 | 0.69 | 0.51 | 135.41 | 162.58 | 191.41 | 135.20 | 162.37 | 191.20 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 84 24.81 | 0.00 | 0.00 |
| 2022901132 | 0.00 | 0.00 | 0.00 | 2.60 | 0.00 | 0.00 | 0.29 | 0.68 | 0.55 | 117.31 | 145.74 | 172.89 | 116.89 | 145.32 | 172.48 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 26.02 | 0.00 | 0.00 |
| 2022901133 | 0.00 | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.19 | 0.67 | 0.51 | 125.02 | 153.74 | 181.20 | 124.76 | 153.48 | 180.94 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 85 25.53 | 0.00 | 0.00 |
| 2022901134 | 0.00 | 0.00 | 0.00 | 0.97 | 0.00 | 0.00 | 0.19 | 0.68 | 0.52 | 125.59 | 159.59 | 182.93 | 125.28 | 159.28 | 182.17 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -95 | 9.00 0. | 85 25.50 | 0.00 | 0.00 |
| 2022901135 | 0.00 | 0.00 | 0.00 | 2.00 | 0.00 | 0.00 | 0.25 | 0.67 | 0.53 | 110.80 | 124 61 | 156.71 | 110.45 | 124.26 | 156.26 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 26.06 | 0.00 | 0.00 |
| 2022001107 | 0.00 | 0.00 | 0.00 | 0.98 | 0.00 | 0.00 | 0.17 | 0.68 | 0.51 | 149.48 | 186.41 | 210.06 | 140.24 | 186.17 | 210.72 | -000.00 | -999.00 | -000.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 84 25.71 | 0.00 | 0.00 |
| 2022901199 | 0.00 | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.17 | 0.64 | 0.48 | 117.01 | 140.08 | 160.67 | 116.77 | 139.84 | 160.43 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 26.11 | 0.00 | 0.00 |
| 2022901200 | 0.00 | 0.00 | 0.00 | 1.69 | 0.00 | 0.00 | 0.16 | 0.64 | 0.48 | 125.43 | 151.73 | 175.19 | 125.20 | 151.50 | 174.96 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 26.10 | 0.00 | 0.00 |
| 2022901238 | 0.28 | 0.28 | 0.28 | 7.83 | 0.00 | 0.00 | 0.29 | 0.51 | 0.44 | 104.19 | 131.93 | 157.83 | 104.09 | 131.83 | 157.73 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 26.07 | 0.00 | 0.00 |
| 2022901240 | 0.30 | 0.30 | 0.30 | 8.43 | 0.00 | 0.00 | 0.29 | 0.54 | 0.45 | 122.83 | 157.15 | 188.14 | 122.75 | 157.07 | 188.06 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 26.02 | 0.00 | 0.00 |
| 2022901241 | 0.26 | 0.26 | 0.26 | 15.36 | 0.00 | 0.00 | 0.32 | 0.64 | 0.54 | 101.40 | 125.35 | 149.87 | 101.22 | 125.17 | 149.68 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 83 24.61 | 0.00 | 0.00 |
| 2022901242 | 4 81 | 7 55 | 7.55 | 9.00 | 0.00 | 0.00 | 0.20 | 0.69 | 0.55 | 111 54 | 126 98 | 162 71 | 118 62 | 144 08 | 170 82 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 02 20.02 79 22.48 | 0.00 | 0.00 |
| 2022901244 | 1.49 | 2.94 | 2.94 | 4.87 | 0.00 | 0.00 | 0.25 | 0.65 | 0.52 | 111.40 | 133.39 | 158.57 | 113.99 | 135.99 | 161.17 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 79 23.35 | 0.00 | 0.00 |
| 2022901245 | 0.06 | 0.06 | 0.06 | 6.06 | 0.00 | 0.00 | 0.21 | 0.65 | 0.50 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 -99 | 9.00 0. | 83 25.84 | 0.00 | 0.00 |
| 2022901780 | 7.14 | 34.41 | 36.87 | 48.23 | 0.00 | 0.00 | 0.56 | 0.62 | 0.60 | 122.54 | 159.63 | 193.03 | 131.56 | 168.62 | 201.97 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 26.31 | 0.00 | 0.00 |
| 2022901782 | 6.31 | 32.76 | 34.47 | 47.80 | 0.00 | 0.00 | 0.54 | 0.65 | 0.62 | 119.29 | 155.07 | 188.11 | 127.74 | 163.51 | 196.52 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 86 25.88 | 0.00 | 0.00 |
| 2022901783 | 7.80 | 43.64 | 45.70 | 58.20 | 0.00 | 0.00 | 0.98 | 0.63 | 0.74 | 67.35 | 95.9Z | 123.43 | 107.33 | 135.28 | 161.82 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 89 26.31 | 0.00 | 0.00 |
| 2022901786 | 12.03 | 54 25 | 57.02 | 64 22 | 0.00 | 0.00 | 0.97 | 0.51 | 0.67 | 29.01 | 112 50 | 144 10 | 120 48 | 161 61 | 101 25 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -91 | 9.00 0. | 80 26 41 | 0.00 | 0.00 |
| 2022901788 | 13.87 | 43.09 | 43.64 | 52.51 | 0.00 | 0.00 | 0.99 | 0.51 | 0.67 | 77.53 | 110.77 | 142.46 | 108.29 | 140.48 | 170.56 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 84 24.81 | 0.00 | 0.00 |
| 2022901789 | 18.24 | 55.23 | 55.89 | 65.82 | 0.00 | 0.00 | 0.99 | 0.56 | 0.71 | 57.56 | 83.80 | 110.59 | 99.91 | 125.21 | 150.53 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 86 26.08 | 0.00 | 0.00 |
| 2022901792 | 13.73 | 47.47 | 51.47 | 62.87 | 0.00 | 0.00 | 0.56 | 0.53 | 0.54 | 119.93 | 156.05 | 188.68 | 126.25 | 162.31 | 194.86 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 89 26.42 | 0.00 | 0.00 |
| 2022901793 | 0.76 | 2.54 | 4.74 | 4.81 | 0.00 | 0.00 | 0.60 | 0.57 | 0.58 | 99.74 | 128.99 | 155.79 | 103.35 | 132.55 | 159.28 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 90 26.70 | 0.00 | 0.00 |
| 2022901794 | 7.44 | 23.98 | 32.93 | 33.53 | 0.00 | 0.00 | 0.94 | 0.59 | 0.71 | 76.90 | 107.64 | 136.32 | 106.01 | 136.04 | 163.63 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 90 26.67 | 0.00 | 0.00 |
| 2022901795 | 9.29 | 20.99 | 30.59 | 30.00 | 0.00 | 0.00 | 0.61 | 0.55 | 0.37 | 09.74 | 115.70 | 100.07 | 97.10 | 123.03 | 147.20 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 09 20.00 | 0.00 | 0.00 |
| 2022901790 | 21.98 | 47.85 | 51.44 | 62.26 | 0.00 | 0.00 | 0.55 | 0.56 | 0.55 | 105.58 | 126.27 | 164.98 | 111.01 | 142.57 | 171.22 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 26.14 | 0.00 | 0.00 |
| 2022901798 | 14.17 | 26.29 | 31.90 | 33.52 | 0.00 | 0.00 | 0.98 | 0.45 | 0.63 | 48.54 | 70.63 | 93.12 | 72.23 | 92.78 | 112.91 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 26.45 | 0.00 | 0.00 |
| 2022901799 | 15.82 | 28.82 | 32.01 | 34.28 | 0.00 | 0.00 | 0.98 | 0.46 | 0.63 | 75.20 | 106.61 | 135.98 | 100.94 | 130.90 | 158.07 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 26.49 | 0.00 | 0.00 |
| 2022901828 | 5.30 | 23.63 | 26.36 | 37.48 | 0.00 | 0.00 | 0.53 | 0.67 | 0.62 | 88.05 | 111.86 | 135.22 | 94.47 | 118.27 | 141.63 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 26.26 | 0.00 | 0.00 |
| 2022901829 | 7.60 | 35.37 | 37.24 | 50.16 | 0.00 | 0.00 | 0.58 | 0.65 | 0.63 | 90.63 | 116.87 | 142.30 | 99.75 | 125.96 | 151.33 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 87 26.11 | 0.00 | 0.00 |
| 2022901830 | 3.91 | 14.52 | 15.96 | 28.12 | 0.00 | 0.00 | 0.85 | 0.58 | 0.67 | 87.20 | 120.19 | 150.72 | 101.41 | 134.06 | 164.08 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 25.82 | 0.00 | 0.00 |
| 2022901031 | 2.08 | 0.00 | 0.00 | 27.00 | 0.00 | 0.00 | 0.70 | 0.65 | 0.69 | -999 00 | -000 00 | -999 00 | -999 00 | 101.95 | -999 00 | -999.00 | -999.00 | -999.00 | -999 00 | -999 00 | -999 00 | -999 00 | -999 00 | -999 00 | -999.00 | -999.00 -99 | 9.00 0. | 00 20.37 90 26.67 | 0.00 | 0.00 |
| 2022901847 | 1.22 | 6.65 | 9.47 | 20.65 | 0.00 | 0.00 | 0.72 | 0.66 | 0.68 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 -99 | 9.00 0. | 89 26,62 | 0.00 | 0.00 |
| 2022901848 | 0.96 | 5.62 | 6.93 | 15.90 | 0.00 | 0.00 | 0.53 | 0.69 | 0.63 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 -99 | 9.00 0. | 88 26.22 | 0.00 | 0.00 |
| 2022901849 | 1.69 | 5.02 | 5.12 | 12.85 | 0.00 | 0.00 | 0.51 | 0.58 | 0.56 | 75.51 | 97.61 | 119.89 | 80.02 | 102.12 | 124.39 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 83 25.01 | 0.00 | 0.00 |
| 2022901850 | 0.62 | 3.96 | 4.85 | 15.34 | 0.00 | 0.00 | 0.59 | 0.56 | 0.57 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 | -999.00 -99 | 9.00 0. | 85 25.33 | 0.00 | 0.00 |
| 2022901851 | 2.51 | 4.89 | 4.93 | 10.81 | 0.00 | 0.00 | 0.40 | 0.59 | 0.52 | 99.17 | 127.37 | 153.97 | 103.70 | 131.90 | 158.50 | -999.00 | -999.00 | -999.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -999.00 | -999.00 -99 | 9.00 0. | 77 23.79 | 0.00 | 0.00 |
| 2022901882 | 0.88 | a.70 | 1.52 | 10.95 | 0.00 | 0.00 | 0.44 | 0.70 | 0.01 | -, 333.00 | -333.00 | -яяя.00 | -333.00 | -333.00 | -333.00 | -яяя.00 | -333.00 | -aaa.00 | -333.00 | , ~aaa.00 | -333.00 | -333.00 | -333.00 | -333.00 | -333.00 | -333.00 -35 | w.uu 0. | 0% 25.18 | 0.00 | 0.00 |

PRODUCT DESCRIPTIONS AVAILABLE

MRCFFG Real-Time Product Console Operational Output Product Descriptions

The MRCFFG Real-Time Product Console system provides a collection of real-time data products in text, image and CSV file formats. The text products are available for direct review as well as download using the web interface. Each hour, the system provides images and text tables related to estimated and forecast for direct review as well as download using the web interface. Each hour, the system provides images and text tables related to estimated and forecast for direct review as well as download using the web interface. Each hour, the system provides images and text tables related to estimated and forecast for direct review as well as download using the web interface. Each hour, the system provides images and text tables related to estimated and the FFG data, the other products are made available so that the forecaster can leverage that information in their efforts for quality control and in their assessments when further applying the FFG data, the other products are used available so that the forecaster can leverage that information in their efforts for quality control and in their assessments when further applying the FFG data.

The following identifies and describes each of the MRCFFG Real-Time Product Console system operational output products (from left to right on the above figure). In interpreting the following products, the term "navigation hour" refers to every hour at the top of the hour (e.g., 00Z, 01Z, 02Z etc.) while the term "model processing hour" refers to the six-hour updates of the soil moisture model matching the rainfall gauge accumulation reports (e.g., 00Z, 02Z, 12Z, 18Z).

| Label | Definition | Format | Updated | Description |
|--------------|---|------------------|---------------------------|--|
| MWGHE | Microwave-adjusted Global HydroEstimator Satellitte-based Precipitation Estimates | Text & Images | Hourly | The images and text provide gridded 1-hour, 3-hour, 6-hour and 24-hour accumulations of satellite-based rainfall estimates (mm) ending on the current hour from the NOAA-NESDIS Global HydroEstimator (infrared-based) and adjusted by the NOAA-CPC CMORPH microwave- based satellite rainfall product. The satellite-based rainfall estimates are provided on a grid which is displayed over a background of the system sub-basin boundaries. The MWGHE data products are updated every hour with a latency of approximately 45 minutes and are <u>not</u> bias- corrected (see Merged MAP product). This product is provided for visual quality control assessment of the adjusted satellite input. MWGHE 01-hr: Accumulations of rainfall estimates from the microwave-adjusted Global HydroEstimator over the last bours ending on the current navigation hour. (mm/lh) MWGHE 01-hr: Accumulations of rainfall estimates from the microwave-adjusted Global HydroEstimator over the last 5 hours ending on the current navigation hour. (mm/lh) MWGHE 01-hr: Accumulations of rainfall estimates from the microwave-adjusted Global HydroEstimator over the last 5 hours ending on the current navigation hour. (mm/lh) MWGHE 01-hr: Accumulations of rainfall estimates from the microwave-adjusted Global HydroEstimator over the last 5 hours ending on the current navigation hour. (mm/lh) MWGHE 24-hr: Accumulations of rainfall estimates from the microwave-adjusted Global HydroEstimator over the last 24 hours ending on the current navigation hour. (mm/lhr) MWGHE 24-hr: Accumulations of rainfall estimates from the microwave-adjusted Global HydroEstimator over the last 24 hours ending on the current navigation hour. (mm/lhr) MWGHE 24-hr: Accumulations of rainfall estimates from the microwave-adjusted Global HydroEstimator over the last 24 hours ending on the current navigation hour. (mm/lhr) MWGHE 24-hr: Accumulations of rainfall estimates from the microwave-adjusted Global HydroEstimator over the last 24 hours ending on the current navigation hour. (mm/lhr) MWGHE 24-hr: Accumulati |
| | | | | |
| GHE | Global HydroEstimator Satellite- based Precipitation Estimates | Text & Images | Hourly | The images and text provide gridded 1-hour, 3-hour, 6-hour and 24-hour accumulations of satellite-based rainfall estimates (mm) ending on the current hour from the NOAA-NESDIS HydroEstimator. The satellite-based rainfall estimates are provided on a grid which is displayed over a background of system sub-basin boundaries. The data products are updated every hour with a latency of approximately 25 minutes and are not based many based MAP product). This product is provided for visual quality control assessment of the satellite input. GHE 01-hr: Accumulations of rainfall estimates from the Global HydroEstimator over the last hour ending on the current navigation hour. (mm/ltr) GHE 03-hr: Accumulations of rainfall estimates from the Global HydroEstimator over the last 3 hours ending on the current navigation hour. (mm/ltr) GHE 03-hr: Accumulations of rainfall estimates from the Global HydroEstimator over the last 3 hours ending on the current navigation hour. (mm/ltr) GHE 03-hr: Accumulations of rainfall estimates from the Global HydroEstimator over the last 6 hours ending on the current navigation hour. (mm/ltr) GHE 03-hr: Accumulations of rainfall estimates from the Global HydroEstimator over the last 6 hours ending on the current navigation hour. (mm/ltr) GHE 24-hr: Accumulations of rainfall estimates from the Global HydroEstimator over the last 24 hours ending on the current navigation hour. (mm/24hr) Missing 01-hr: GHE input product is unavailable or missing, the sub-basin boundaries are displayed in red. GHE data availability can be monitored using the system Dashboard. Accumulated GHE Products: Each of the 3, 6- and 24-hour GHE accumulations are produced from the 01-hr: GHE observations over the corresponding interval, a gray image is shown to indicate insufficient 01-hr satellite input data were available. |
| | | | | |
| Gauge MAP | Gauge Mean Areal Precipitation | Text & Images | 00, 06, 12, and 18 UTC | The images and text provide 6-hour and 24-hour accumulations of mean areal precipitation (mm) estimates for each sub-basin produced from interpolation of precipitation gauge data. The Gauge MAP data products are updated every six hours and reflect accumulations of basin- average precipitation of a given duration ending on the current navigation hour. CMAP 06-hr : Accumulations of gauge-interpolated mean areal precipitation estimates over the last 6 hours ending on the current navigation hour. (mm/6hr) CMAP 24-hr : Accumulations of gauge-interpolated mean areal precipitation estimates over the last 24 hours ending on the current navigation hour. (mm/6hr) CMAP 24-hr : Accumulations of gauge-interpolated mean areal precipitation estimates over the last 24 hours ending on the current navigation hour. (mm/2hr) Cauge laterpolation and CMAP : The interpolation of the gauge precipitation is performed on the observations made by a predefined list of "Active" stations. And observations are incorporated into the gauge precipitation interpolation. Zero precipitation is saginged to accide the observation. The Gauge MAP product is then derived for all sub-basins from the interpolated 6-hourly station observations. Gauge data availability can be monitored using the system Dathboard . |

STATIC RESOURCES AVAILABLE

Static Resources and Reference Materials

| Category | Item | Resource Link | Description |
|----------------------|--|------------------------------|--|
| GIS Data Layers | MRCFFG Sub-Basin Shapefiles All Layers (21M) | MRCFFG All Shapefiles | A zipped archive (* zip) of the component files for all shapefile layers from boundaries for all MRCFFG export regions. This is a single download file that includes *all* of the individual archives offered below. |
| GIS Data Layers | REGIONAL Sub-Basin Shapefiles (11M) | MRCFFG REGIONAL Shapefile | A zipped archive (*.zip) of the shapefile component files that provide basins boundaries for the REGIONAL export region. |
| GIS Data Layers | CAMBODIA Sub-Basin Shapefiles (1.3M) | MRCFFG CAMBODIA Shapefile | A zipped archive (*.zip) of the shapefile component files that provide basins boundaries for the CAMBODIA export region. |
| GIS Data Layers | LAO Sub-Basin Shapefiles (1.6M) | MRCFFG LAO Shapefile | A zipped archive (* zip) of the shapefile component files that provide basins boundaries for the LAO export region. |
| GIS Data Layers | MYANMAR Sub-Basin Shapefiles (3.3M) | MRCFFG MYANMAR Shapefile | A zipped archive (*.zip) of the shapefile component files that provide basins boundaries for the MYANMAR export region. |
| GIS Data Layers | THAILAND Sub-Basin Shapefiles (2.2M) | MRCFFG THAILAND Shapefile | A zipped archive (* zip) of the shapefile component files that provide basins boundaries for the THAILAND export region. |
| GIS Data Layers | VIETNAM Sub-Basin Shapefiles (2.2M) | MRCFFG VIETNAM Shapefile | A zipped archive (* zip) of the shapefile component files that provide basins boundaries for the VIETNAM export region. |
| | | | |
| Software Download | Quantum GIS (129MB) | QGIS v.1.8.0-2 | A free, GUI-based GIS software package available for Windows (available for Linux platforms too). This GIS package may be used to visualize FFGS reference shapefiles and to merge FFGS CSV composite product files to those shapefiles for interactive forecaster review and modification. QGIS may also be used for visual overlay of additional GIS resources, if available, such as stations, roads, cities, populations, provincial boundaries, etc. For more information shout this software, visit the QGIS web alle |
| Software Download | 7-Zip v9.22 Archive Utility (1MB) | 7-Zip Installer for Windows | A free, popular and light-weight GUI-based data archive creation extraction utility for Windows. (This software is provided as a solution to unpack the FFGS GIS shapefile archives provided above.) For more information about this software, visit the 7-Zip <u>web site</u> . |
| Software Download | WinSCP v5.1.4 SCP Client (5MB) | WinSCP Installer for Windows | A free, popular and light-weight SCP Client for Windows allowing GUI navigation as well as drag-and-drop tranfers. (This software might be required for web-browser-activated access to SFTP downloads from the FFGS export archives linked within the FFGS Product Console interface.) For more information about this software, visit the WinSCP <u>web site</u> . |
| | | | |

| Software Download | PuTTY SSH v0.62 SSH Client (1.7MB) | PuTTY Installer for Windows | A free, popular and light-weight SSH client for Windows providing secure, remote logins. (Optional. Not required for use of the FFGS or its data products, but may be used for direct thehl login to the FFGS Dissemination Server in order to setup SSH keys for automated authentication during advanced FFGS text/image product download procedures.) For more information about this software, visit the PuTTY <u>web site</u> . | | | | | | |
|------------------------------|---|----------------------------------|--|--|--|--|--|--|--|
| Software Information | Cygwin | Cygwin (Home Page) | A free, Linux-like software layer that runs on top of Windows providing a full-featured Linux environment including terminal shells, GNU compilers, SSH, SCP, cron and X-Windows. (Optional. Not required for use of the FFGS or its data products, but might be useful to establish, manage and post- process automated downloads of FFGS text image products to a Windows PC using Linux tools and methodologies. Recommended only for advanced users already familiar with basic Linux administration and shell scripting.) | | | | | | |
| | | | | | | | | | |
| Demonstration (Download) | Shockwave Flash Video (4MB) | FFGS ArcView Demonstration Video | A training video (standalone executable Shockwave file) that demonstrates the use of ArcView as a GIS to manipulate FFGS data products obtained from the FFGS Disseminitation Server. To watch, just double-click the executable file after download. | | | | | | |
| Demonstration (Streaming) | Shockwave Flash Video | FFGS ArcView Demonstration Video | A training video (streaming flash video in browser) that demonstrates the use of ArcView as a GIS to manipulate FFGS data products obtained from the FFGS bissemination Server. The video will open in a new window after clicking on the link. | | | | | | |
| | | | | | | | | | |
| Documentation | MRCFFG User's Guide (coming) | MRCFFG User's Guide | Forecaster- and SysAdmin-Centric discussion related to the MRCFFG system installation, design, usage, mainenance and sustainability. | | | | | | |

SUSTAINABILITY

- Proven concept in many regional and country applications
- Robust operation and stability of the FFG system software
- Adaptable to various regional and local conditions (environment, institutional, technical)

Dedicated capacity-building component

POTENTIAL FUTURE ENHANCEMENTS

- Multi-NWP QPF Ingestion
- Implement a rainfallinduced landslide hazard threat product
 - Using soil moisture and rainfall thresholds from FFG systems
- Evaluate urban flooding issues
- Riverine Routing
- Seasonal and sub-seasonal discharge prediction



Landslide Susceptibility Map



THANK YOU

Planning Meeting Dev and Impl of Flash Flood Guidance System for SE Asia

MESOSCALE MODEL INGESTION

- Up to five (5) different models can be run through the FFG
- Allows forecaster decision on the most appropriate model for the situation
- Ingest hourly forecasts out to 48 hours
 - Output of 1, 3,6 and 24 hour precipitation accumulations (for FFG)
 - Produce Forecast Mean Areal Precipitation (FMAP) products
- Can ingest nowcasting products from SWFDP if available – just another model product

RETURN

RADAR INGESTION

In addition to satellite- and gauge- based precipitation can also ingest radar-based estimates

- Evaluate viable radars in the region calibration status, data availability
- Develop clutter masking for areas blocked or show clutter
- Develop a bias adjustment procedure climatological or dynamic (need good quality gauge data under radar umbrella)
- Develop a merged product as required
- Backup (blocked/clutter areas) is satellite

<u>Return</u>