

## FLASH FLOOD GUIDANCE (FFG)

The term “flash flood guidance” (FFG) refers to the volume of rainfall of a given duration distributed uniformly over a small catchment that is just enough to cause minor flooding at the outlet of the draining stream.

Flash flood guidance values determined statistically or based on geomorphological principles have been used in an operational environment for quickly assessing localized flash flood threats within a large area by comparing to same-duration observed or forecast rainfall accumulations (e.g., Mogil et al. 1978; Sweeney et al. 1992). The details of the formulation of the elements of geomorphologically-based flash flood guidance systems are given in Carpenter et al. (1999) and Georgakakos (2006). Ntelekos et al. (2005) examine in detail the uncertainty in models and input data (Georgakakos, 2005).

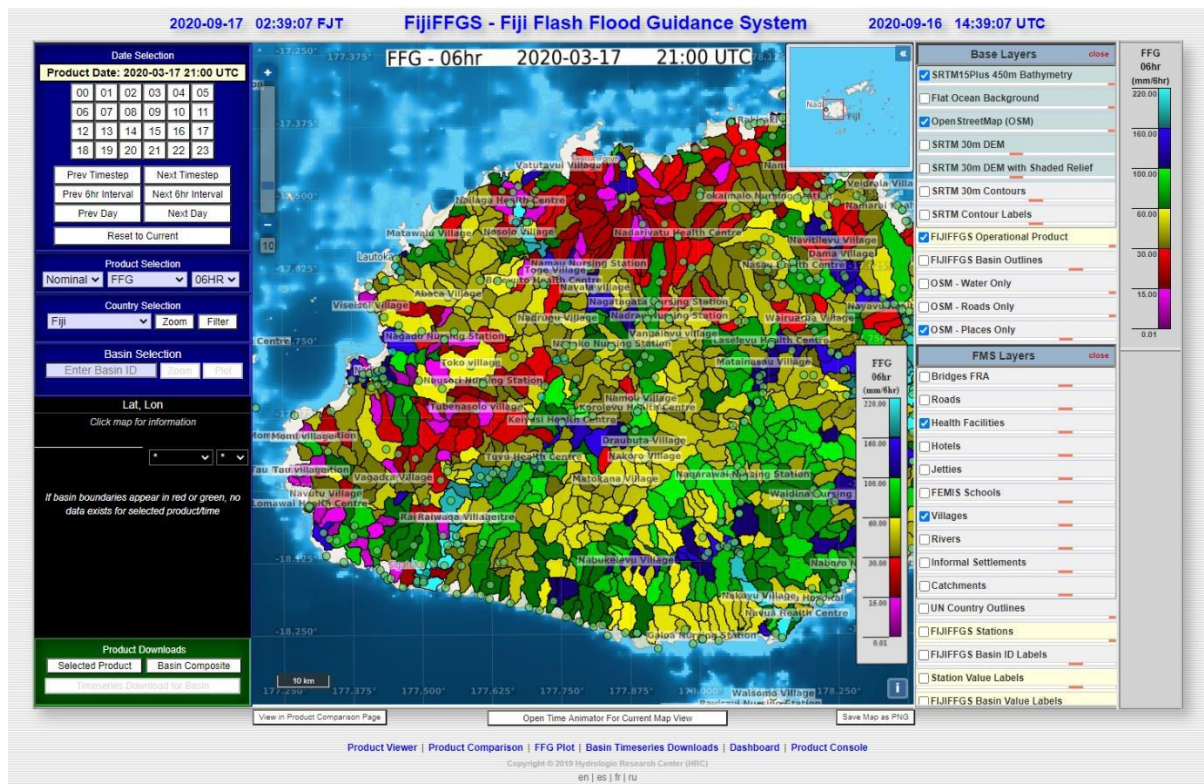
The FFG is the key product in the determination of flash flood potential when using FFGS. The FFG is defined as the amount of actual rainfall (the total volume of rainfall) of a given duration (e.g. 1, 3 or 6 hours) that is just enough to cause bankfull flow at the outlet of the catchment.

Flash Flood Guidance then is an index that indicates how much rainfall is needed to overcome soil and channel storage capacities and to cause minimal flooding at the outlet of a given small basin. The FFG is calculated and updated at every six hours at the model processing hour of 00, 06, 12 and 18 UTC and is valid for the next 1, 3 and 6 hours. If this FFG amount is known, one may compare it to the forecast or nowcast rainfall of the same duration and for the same period (and other local information) to determine whether there is a risk of flash flooding in the sub-basins. If the observed or forecast rainfall volume exceeds the FFG value of the same duration (MAP – FFG), this excess is termed the Flash Flood Threat (FFT) and indicates that flooding at or near the catchment outlet can be possible.

Values of FFG (1, 3, and 6-hour) are greyed not displayed in the graphical products (they are greyed) or provided in the data text files for basins with areas of 40% or greater snow cover or basins with an accumulated drainage area greater than 2,000 km<sup>2</sup>.

**Forecasters are advised to pay attention to the inverse relationship between the possibility of flash flood occurrence and FFG values. The lower the FFG, the higher possibility of flash flood occurrence.**

The image below present example 6-hour FFG product for the part of Viti Levu island, Fiji – i.e., the required rainfall over the next 6 hours to cause bankfull flow following the most recent (current) model processing hour (mm/6hr).



6-hr FFG on 17 March 2020 at 21 UTC, Viti Levu, Fiji

**For more information, please read:**

Carpenter, T.M., J.A. Sperflage, K.P. Georgakakos, T. Sweeney, D.L. Fread, 1999: National hreshold runoff estimation utilizing GIS in support of operational flash flood warning systems, *Journal of Hydrology* 224: 21-44.

Georgakakos, K.P., 2005: Modern Operational Flash Flood Warning Systems Based on Flash Flood Guidance Theory: Performance Evaluation. *Proceedings, International Conference on Innovation, Advances and Implementation of Flood Forecasting Technology*, 9-13 October 2005, Bergen - Tromsø, Norway, pp. 1-10.

Georgakakos, K.P., 2006: Analytical results for operational flash flood guidance. *Journal of Hydrology* 317: 81-103.

Mogil, H.M., J.C. Monro, H.S. Groper, 1978: NWS's flash flood warning and disaster preparedness programs. *Bulletin of the American Meteorological Society* 59, 690–699.

Ntelekos, A.A., K.P. Georgakakos and W.F. Krajewski 2006: On the uncertainties of flash flood guidance: Towards probabilistic forecasting of flash floods, *Journal of Hydrometeorology*, 7(5), 896–915.

Sweeney, T.L., 1992: Modernized areal flash flood guidance. NOAA Technical Report NWS HYDRO 44, Hydrology Laboratory, National Weather Service, NOAA, Silver Spring, MD, 21 pp. and an appendix.

This document was prepared by WMO-FFGS team using South East Europe Flash Flood Guidance System Forecaster Guide<sup>1</sup>, FFGS Operational Output Product Descriptions available in the FFGS Real-Time Product Console developed by the Hydrologic Research Center and above-mentioned documents.

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<sup>1</sup> [https://www.wmo.int/pages/prog/hwrf/flood/ffgs/documents/SEFFGS\\_Forecaster\\_Guide-Final\\_ES\\_TM-AS-PM.pdf](https://www.wmo.int/pages/prog/hwrf/flood/ffgs/documents/SEFFGS_Forecaster_Guide-Final_ES_TM-AS-PM.pdf)