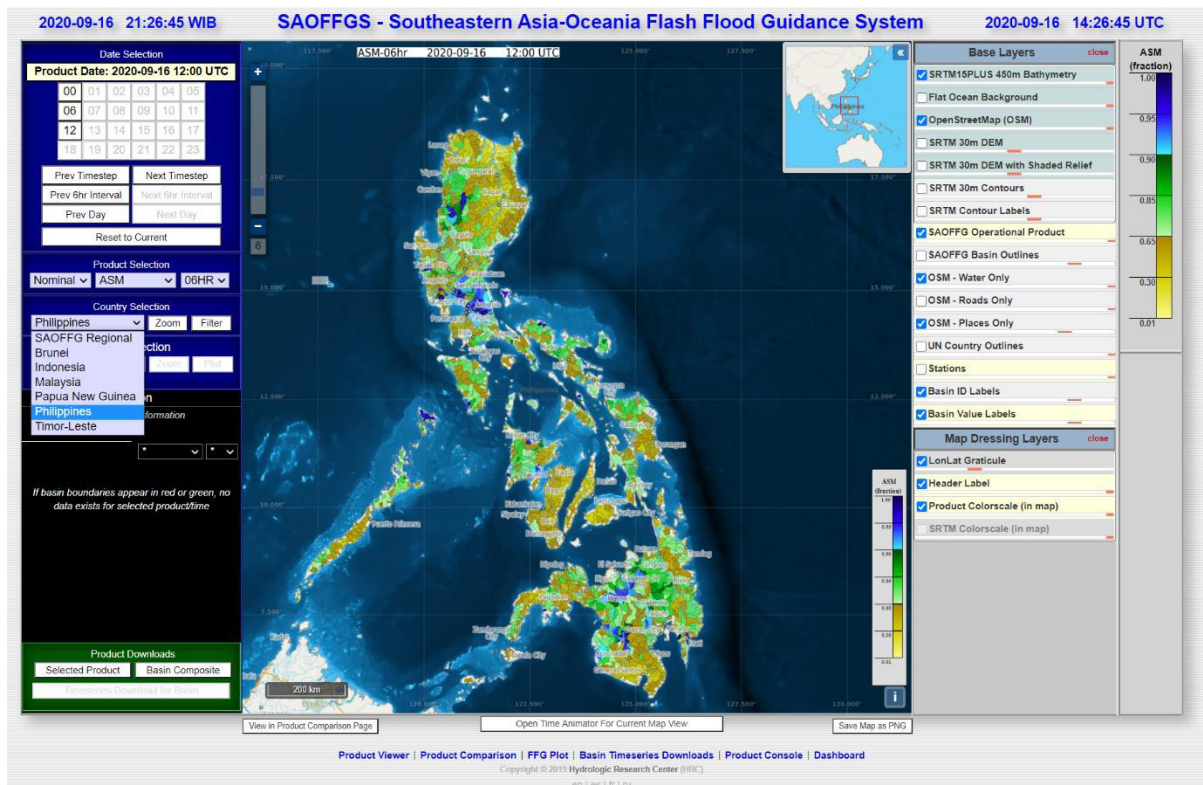


AVERAGE SOIL MOISTURE (ASM)

Soil moisture content indicates the volume of water present in the soil pores and is typically measured in m³/m³ (volume of water per total volume). For hydrologic applications, depth-integrated soil moisture is also used, expressed in mm of water over the depth of soil. Soil moisture varies temporally and spatially and is an important component of the FFG model. It provides the available storage for buffering part of rainfall, reducing the runoff and potential to flash flooding.

The Average Soil Moisture (ASM) product shows soil water saturation fraction (dimensionless ratio of contents over capacity) for the upper zone water contents (20-30 cm depth) of the [Sacramento Soil Moisture Accounting Model \(SAC-SMA\)](#) for each of the sub-basins. Saturation of the upper zone is important for flash floods because if rainfall continues, most of the rainfall will become surface runoff. The forecaster must pay attention to spatial and temporal distribution of ASM. Temporal variation is quite rapid, depending on precipitation intensity and duration and soil type. If the upper soil moisture saturation fraction is high and meteorological models show continuation of rainfall in those regions, flash flood occurrence can be a concern depending on rainfall amounts/duration and the FFG values, i.e., these sub-basins should be monitored by the forecasters to assess if the rainfall will likely trigger flash flooding.

Within the FFGs, the ASM products are updated every 6 hours (in a case of the FFG Systems which include radar QPE – product is updated hourly) at the model-processing hour at 00, 06, 12 and 18 UTC.



6-hour Average Soil Moisture (ASM) product for the Philippines

The image above shows ASM product for the Philippines for 16 September 2020 at 12 UTC. The scale indicates the fraction of soil moisture for a given sub-basin, with 1.00 meaning fully saturated. In this example, some sub-basins have approached complete saturation (dark blue) which makes this area vulnerable to the occurrence of flash floods if rainfall occurs at a level that may bring the stream channel to bankfull.

ASM provides information on the hydrologic state of the land surface and the land surface's capability to accept more rainfall input prior to generating fast runoff. The soil saturation in the upper zone is most relevant for flash flooding as this provides indication of the fast-response runoff generation. This is a key product for assessment of flash flood potential. Forecasters should be attentive to rapid changes in soil saturation.

Also, during the summer and when soil is dry, soil crusts can be formed.



Soil crust

These can significantly reduce soil infiltration rate and subsequently the utilization of water resources, and increase surface runoff, especially during intense summer convective rainfall.

This document was prepared by WMO-FFGS team using South East Europe Flash Flood Guidance System Forecaster Guide¹, FFGS Operational Output Product Descriptions available in the FFGS Real-Time Product Console developed by the Hydrologic Research Center and National Oceanic and Atmospheric Administration (NOAA) materials and documents.

¹ https://www.wmo.int/pages/prog/hwrf/flood/ffgs/documents/SEFFFGS_Forecaster_Guide-Final_ES_TM-AS-PM.pdf