

Haiti Dominican Republic Flash Flood Guidance System HDRFFG

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HDRFFG Steering Committee #2
12 – 14 February 2018
Santo Domingo, Dominican Republic



Hydrologic Research Center

- HRC is a prototype Non-profit, public-benefit research and training corporation in the USA, 501(c)(3), established in 1993 in San Diego, California.
- Staff of professional scientists and engineers, university professors, post-doctoral associates, graduates, and visiting scholars.
- Currently 10 employees
 - Hydrologists
 - Meteorologists
 - Climate Scientists
 - Wave modeler
 - Computer specialists
 - Disaster Risk Reduction Specialist



Objective: to Advance the science and engineering in Hydrology, Hydrometeorology, and Hydroclimatology through Research, Science Cooperation, Technology Transfer and Training.

FFGS Terminology

- **Flood** - occurrence of a flow event that overtops the natural or artificial banks in a reach of river channel.
- **Flash Flood** – a flood that follows shortly after rainfall event.
- **Bankfull Flow** - a flow in which the water level is at the top of its banks and further rise would result in inundation of the flood plain.
- **Flash Flood Guidance (FFG)** – the volume of spatially uniform precipitation of a given duration (1-6 hours) over a certain small catchment that is required to cause minor flooding in the draining outlet of the catchment.
- **Threshold Runoff** – rainfall depth in a given duration that is needed for the flow at the basin outlet to exceed bankfull flow when the basin is in near saturation conditions.
- **Flash Flood Threat** – rainfall of a given duration in excess of the corresponding Flash Flood Guidance value

Haiti Flash Flood Guidance System

DATA

- Precipitation: NESDIS Geostationary Satellite Hydroestimator
(Hourly totals; 4x4 km²)
Haiti and DR hourly raingauge data
NCEP High Res Mesoscale Model Forecast (0-48hrs)
- Reference ET: Climatological estimates using historical temperature
- Digital elevation data (90m)
- Digital soils and land-use/land-cover data (FAO and DR)

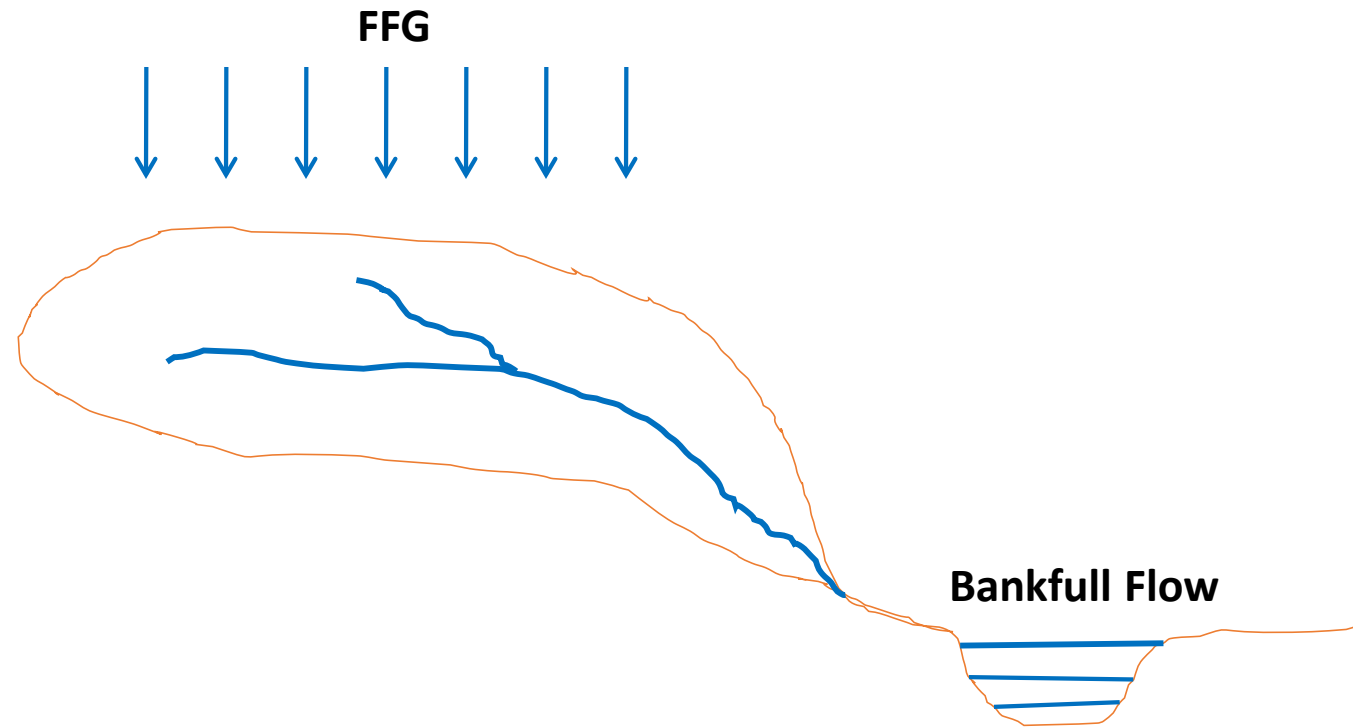
MODELS

- Satellite Rainfall Bias Adjustment
- Adaptation of NWS Soil Water Accounting Model
- Geomorphologic Unit Hydrograph Model
- Modern Flash Flood Guidance Estimation Theory

PRODUCTS *(catchment based – median area=72 km² [25-2000]; hourly updates)*

- Mean Areal Precipitation Totals (1, 3, 6 hr duration)
- Soil Water Estimates over Two Soil Zones
- Flash Flood Guidance/Flash Flood Threat Volumes (1, 3, 6 hr duration)

Flash Flood Guidance Concept



Volume of rainfall of a given duration over a small catchment that is just enough to cause bankfull flow at the outlet of the draining stream

System is Operational- Running at HRC

Forecasters should be able to access the system

HDRFFG - Haiti and Dominican Republic Flash Flood Guidance System




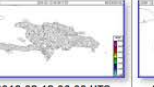

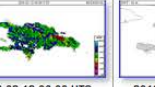
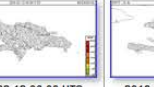
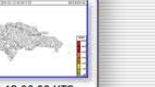



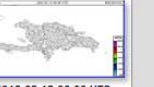
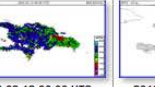
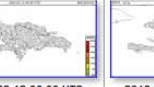
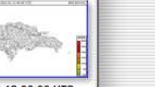



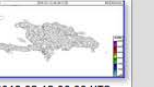
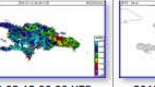
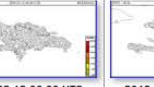
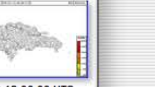



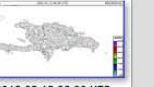
Current Date: 2018-02-12 12:03 UTC Product Date: 2018-02-12 06:00 UTC

Year: 2018 Month: 02 Day: 12 Hour: 06 REGION: REGIONAL OPTION: MEDIAN Submit

-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 (12 UTC)

Product Console - Main Table



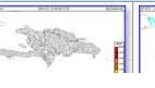
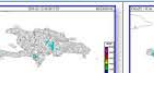
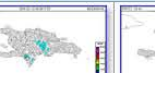
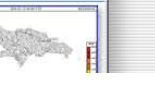
| DT | MWGHE Precipitation | GHE Precipitation | Gauge MAP | Merged MAP | ASM | FFG | IFFT | PFPT |
|-------|--|--|--|--|--|--|--|--|
| 01-hr |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |
| 03-hr |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view | |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |
| 06-hr |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view | |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |
| 24-hr |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view |  2018-02-12 06:00 UTC Text view | | | | |

Composite Product: text , CSV , CSVT SFTP data transfer (requires SFTP Client): EXPORTS/REGIONAL/2018/02/12

Surfmet Gauge Observations at 2018-02-12 06:00 UTC

| Station Identifier | Station Name | Accumulated Precipitation (mm/01hr) | Average Temperature (C) | Region | Latitude | Longitude | Elevation | Enable Precipitation Flag |
|-----------------------|-----------------------|-------------------------------------|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------------|
| No reports for region | No reports for region | No reports for region | No reports for region | No reports for region | No reports for region | No reports for region | No reports for region | No reports for region |

Product Console - Model Forecast Products

| DT | HIRESW ARW Forecast | HIRESW ARW FMAP | HIRESW ARW FFFT | HIRESW NMMB Forecast | HIRESW NMMB FMAP | HIRESW NMMB FFFT |
|-------|---|---|---|---|---|---|
| 01-hr |  |  |  |  |  |  |

HDRFFG Project Implementation Status

- BASINS DELINEATION
 - FEEDBACK ON DELINEATION BY COUNTRIES
 - HISTORICAL DATA BY COUNTRIES
 - PARAMETRIC DEVELOPMENT AND PRECIPITATION BIAS ADJUSTMENT USING HISTORICAL DATA
 - INGEST REAL TIME LOCAL DATA BY COUNTRIES
 - SYSTEM IMPLEMENTED AT HRC
 - HANDS-ON TRAINING
-
- LOCAL INSTALLATION AND OPERATIONAL TRAINING

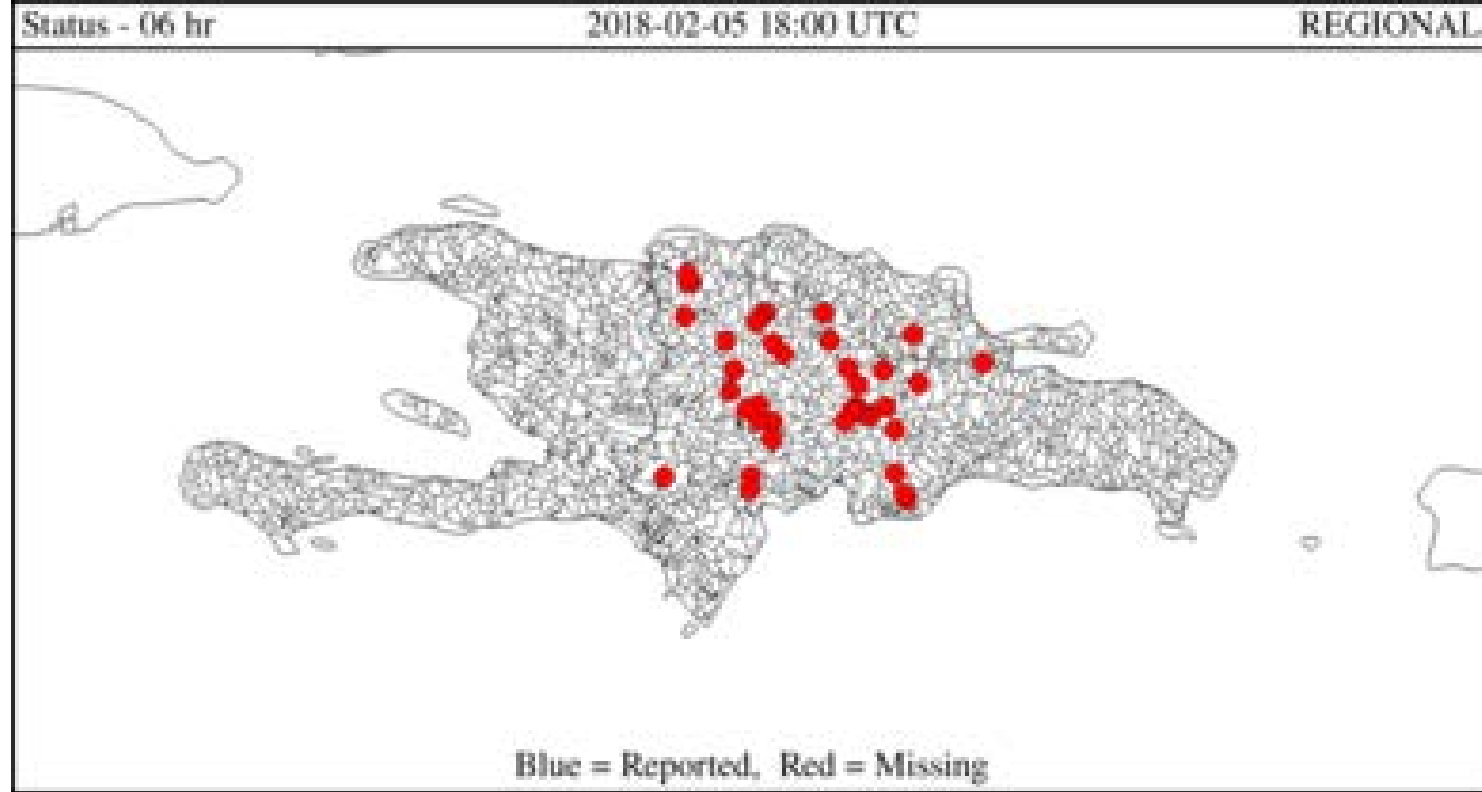
Data Requirements

Real Time Data:

- Real time rainfall data
- Gauge data from Haiti
- Potential ET maps

GIS Layers to be added to the map server

Numerical Weather Prediction



DASHBOARD

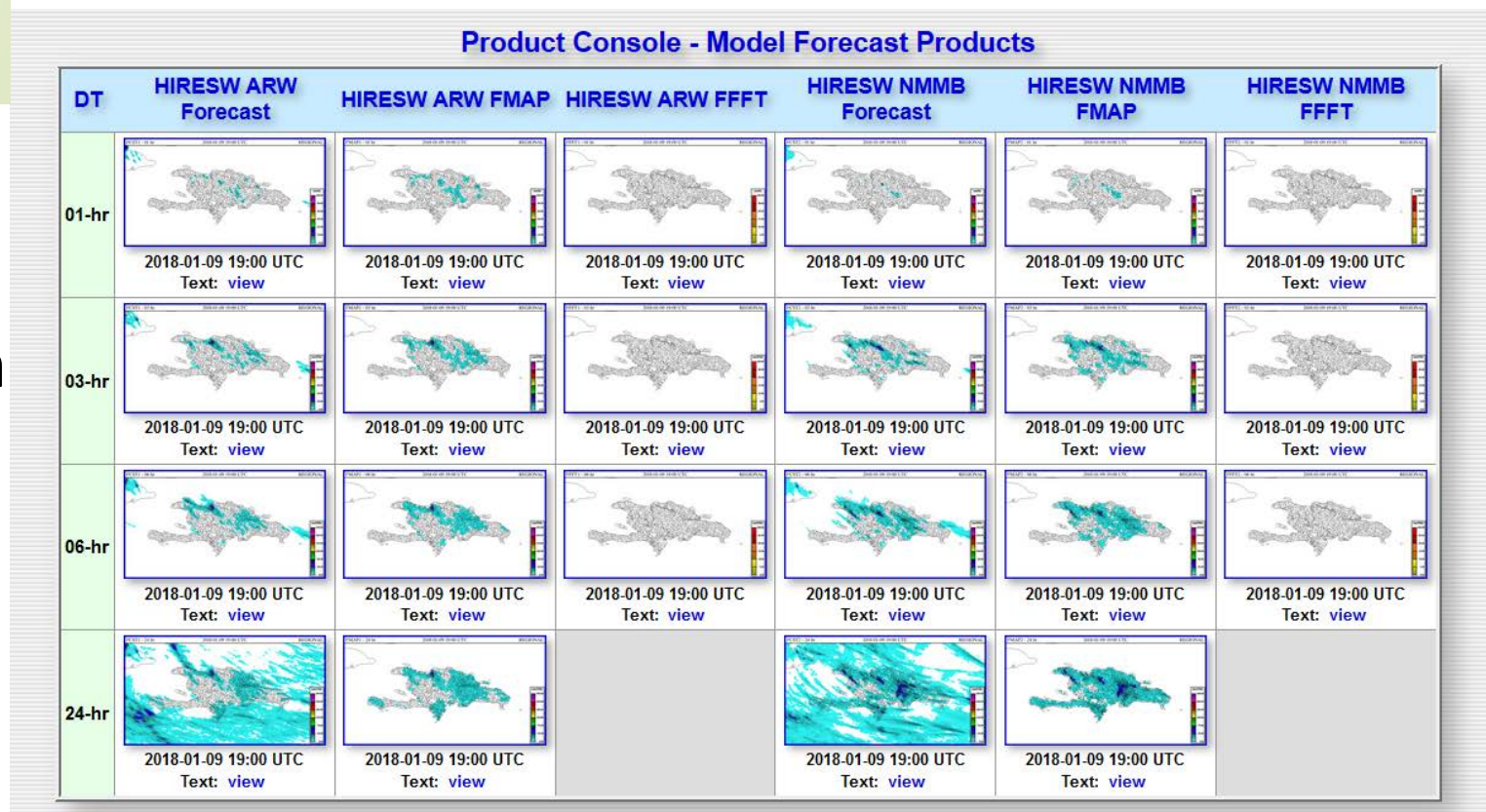
| GAUGE Download | | | | |
|----------------|--------|--------|--------|--------|
| ENABLED | | | | |
| SUCCESS | | | | |
| Feb-02 | Feb-03 | Feb-04 | Feb-05 | Feb-06 |
| 19% | 18% | 0% | 0% | 0% |

| | WRF-NMM | WRF-ARW |
|------------------------------|--------------------------|--------------------|
| Horizontal grid spacing (km) | 4.0 | 5.15 |
| Vertical levels | 35 sigma-pressure hybrid | 35 sigma |
| PBL/turbulence | MYJ | YSU |
| Microphysics | Ferrier | WSM3 |
| Land-Surface | NOAH | NOAH |
| Radiation (SW/LW) | GFDL/GFDL | Dudhia/RRTM |
| Convection | None parameterized | None parameterized |

- WRF models from NCEP
- Model output interpolated to a common 0.045 degrees grid
- Warm season precip. is difficult to forecast

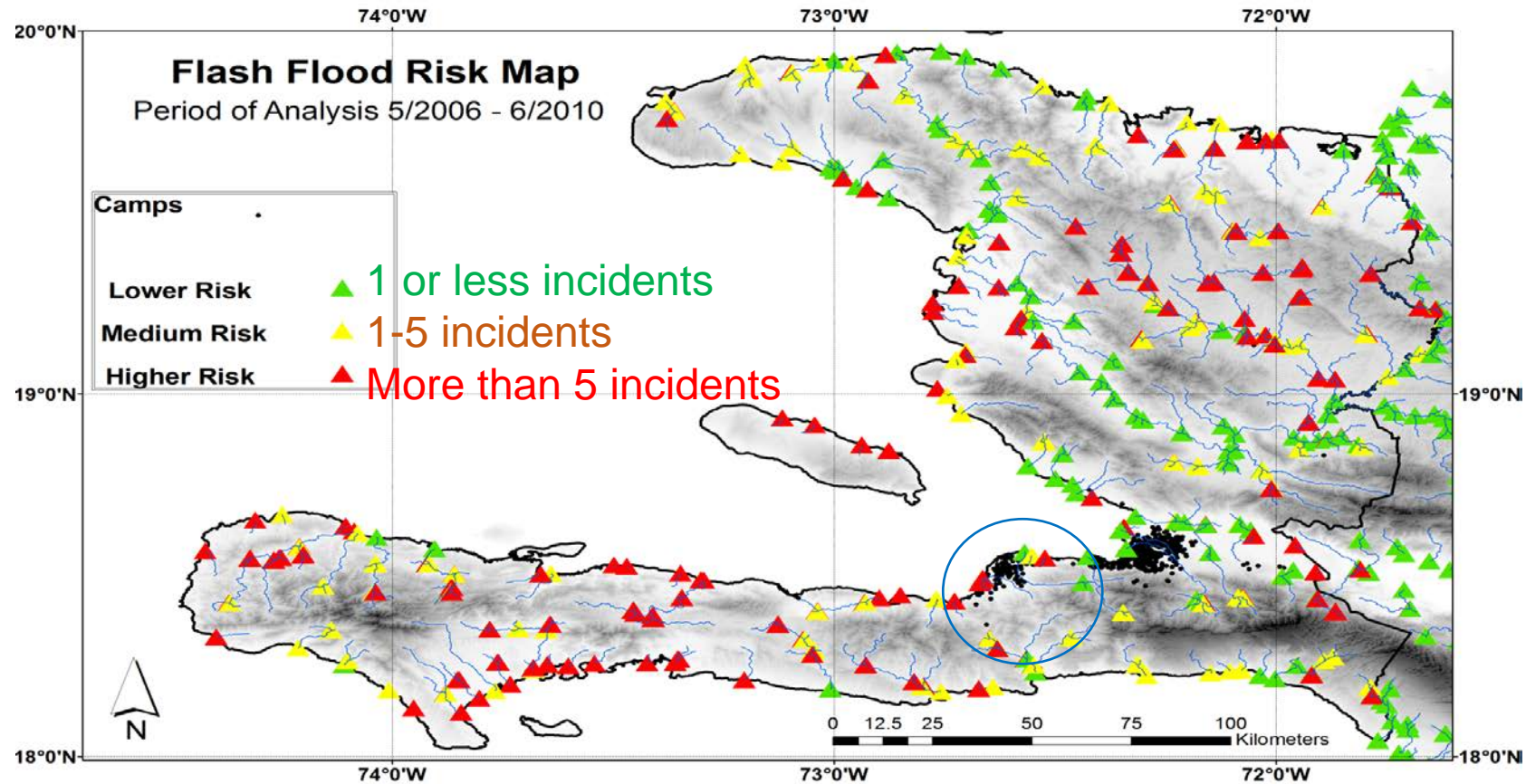
Numerical Weather Prediction

http://www.emc.ncep.noaa.gov/mmb/mpyle/haiti_prod/secured site: Other forecasted variables may provide additional valuable information



Flash Flood Risk Assessment

Entire Haiti (Average Basin Area: 72 km²)



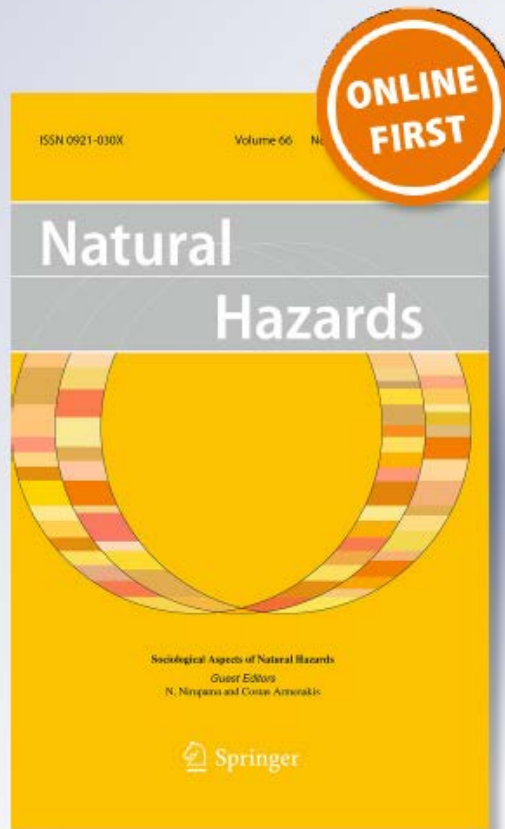
Evaluation of real-time flash flood forecasts for Haiti during the passage of Hurricane Tomas, November 4–6, 2010

**E. Shamir, K. P. Georgakakos,
C. Spencer, T. M. Modrick, M. J. Murphy
& R. Jubach**

Natural Hazards
Journal of the International Society
for the Prevention and Mitigation of
Natural Hazards

ISSN 0921-030X

Nat Hazards
DOI 10.1007/s11069-013-0573-6



Hurricane Tomas Affected Haiti November 5-6, 2010

