



COLOMBIA MI PRONÓSTICO FLOOD APPLICATION

*Updating and improving the Mi Pronóstico Flood Web
Application to Include an Assessment of Flood risk*

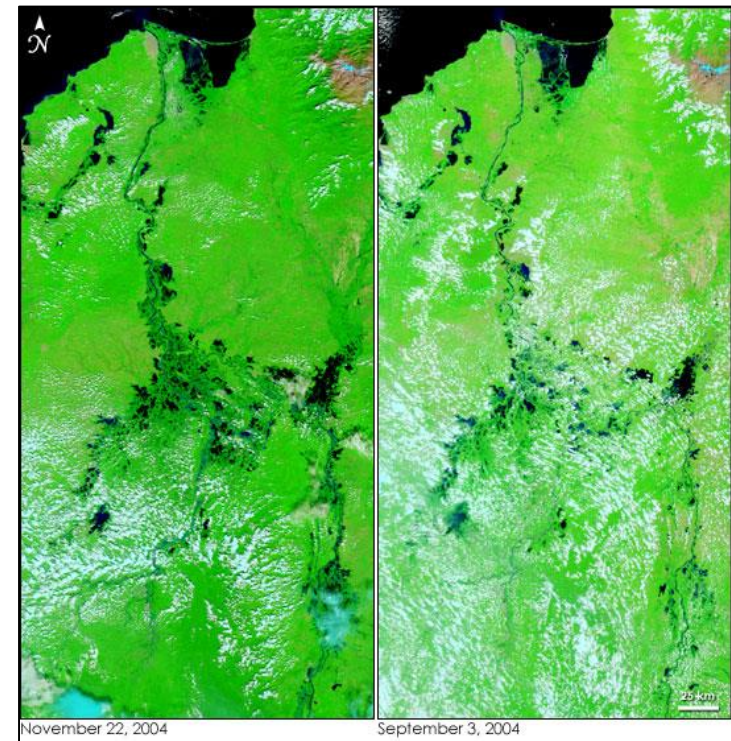
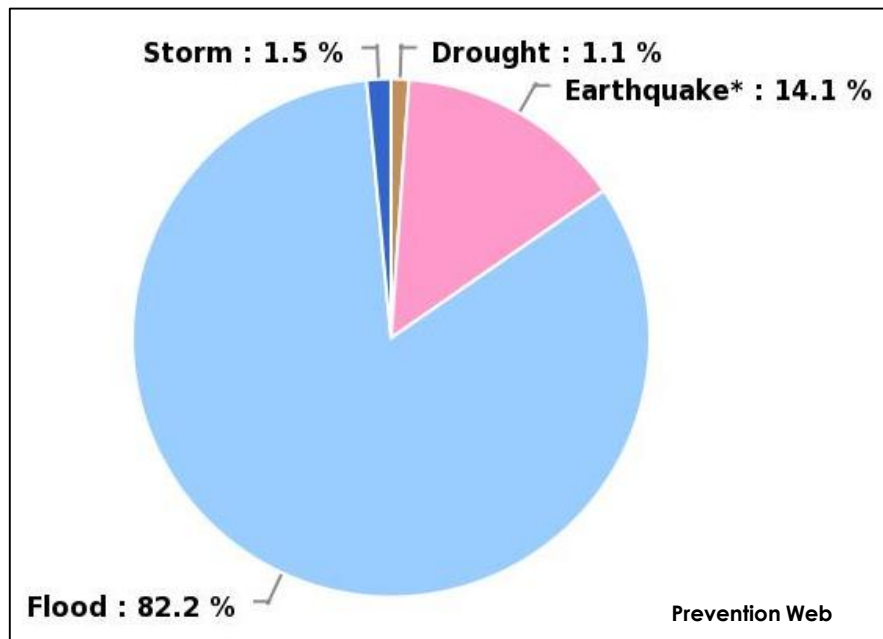
Stephanie Rushley (North Carolina State University)
Matthew Carter (United States Air Force)
Charles Chiou (Old Dominion University)
Kevin Haywood (United States Air Force)
Rick Farmer (Mathews High School)
Anthony Pototzky (Old Dominion University)
Adam White (Christopher Newport University)
Daniel Winker (University of Virginia)

Community Concerns

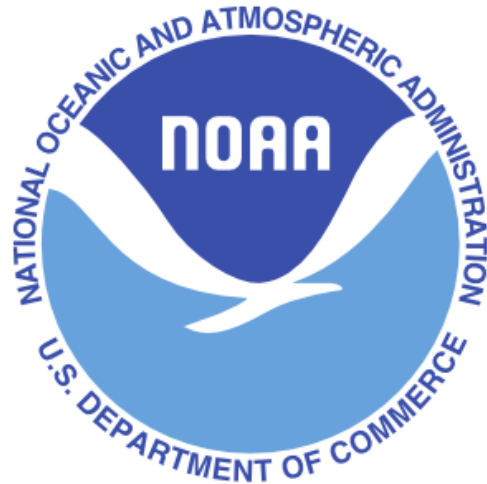


- ▶ Mountainous regions are highly vulnerable to flooding
- ▶ Flood warnings and weather predictions are sent to users through IDEAM's Mi Pronóstico Web Application

Percentage of Reported People Affected



Project Partners



Dr. Angelica Gutierrez

Pilar Galindo
Ricardo Quiroga

IDEAM

Objective



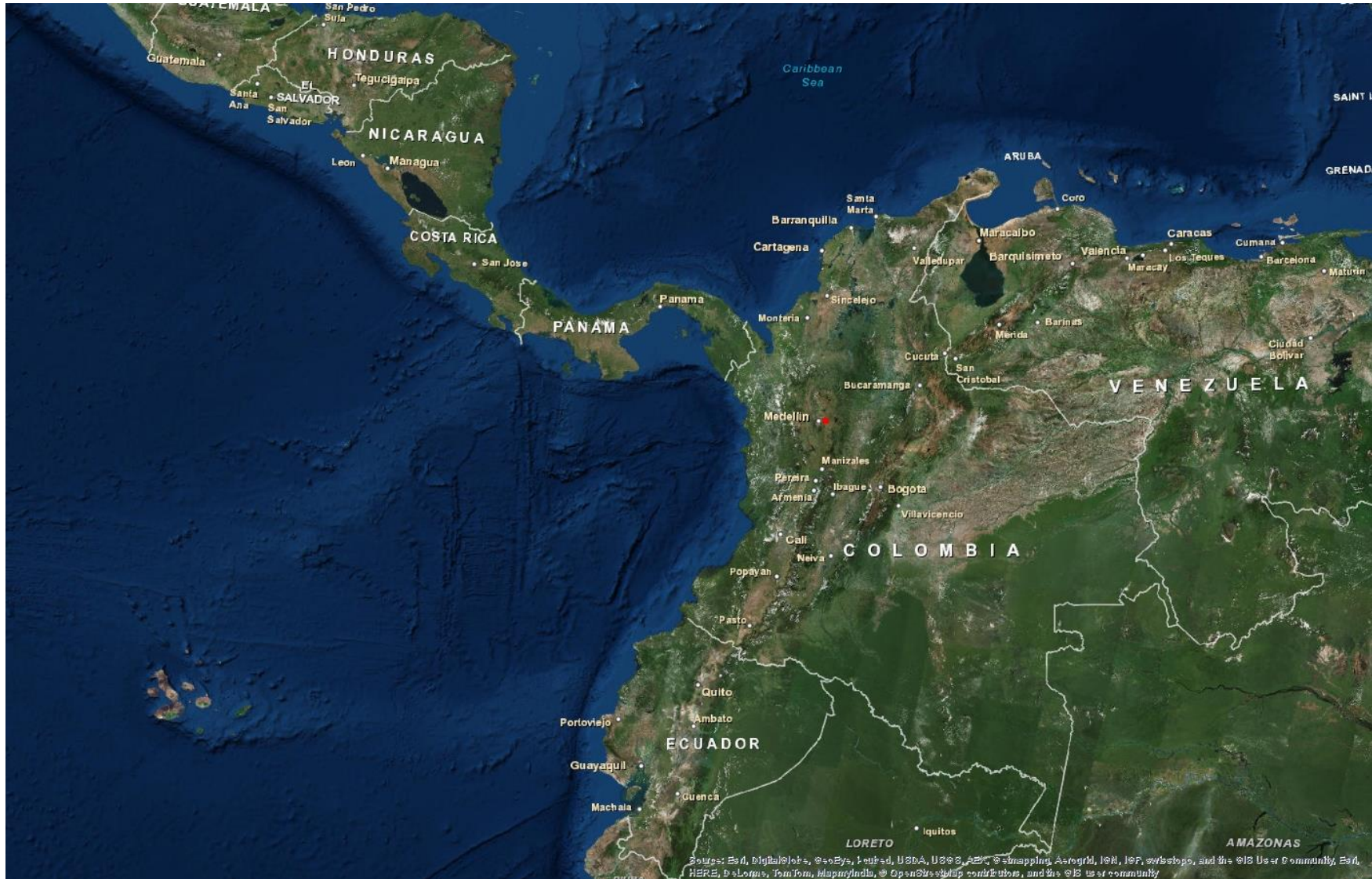
- ▶ Flood Risk Assessment
- ▶ Update existing Mi Pronóstico web application to include flood risk analysis and flood warnings

The screenshot shows the IDEAM (Instituto de Hidrología, Meteorología y Estudios Ambientales) website. The header includes the IDEAM logo and the text 'Pronósticos y Alertas'. Below the header, there are several navigation tabs: 'Presentación del portal', 'Normativa', 'Políticas, Programas y Proyectos', 'Control y rendición de cuentas', and 'Servicios'. The main content area is divided into several sections. On the left, there is a sidebar with links to 'Alertas', 'Meteorología Aeronáutica', 'Ir al portal Institucional', 'Cambio Climático', and 'Búsqueda personalizada'. The central part of the page features a map of the Andean region with weather forecasts for July 16, 2014. The map shows various cities and their corresponding weather conditions. On the right, there is a section for 'Pronóstico para el día de: Hoy' and 'Exportar a PDF los Pronósticos de Región'. The IDEAM logo is visible in the bottom right corner.

Study Area



La Mosca River Basin



Study Area



La Mosca River Basin



ASTER



- ▶ Advanced Spaceborne Thermal Emission and Reflection Radiometer
 - ▶ Terra Satellite
 - ▶ Infrared Cameras
 - ▶ 30-m grid

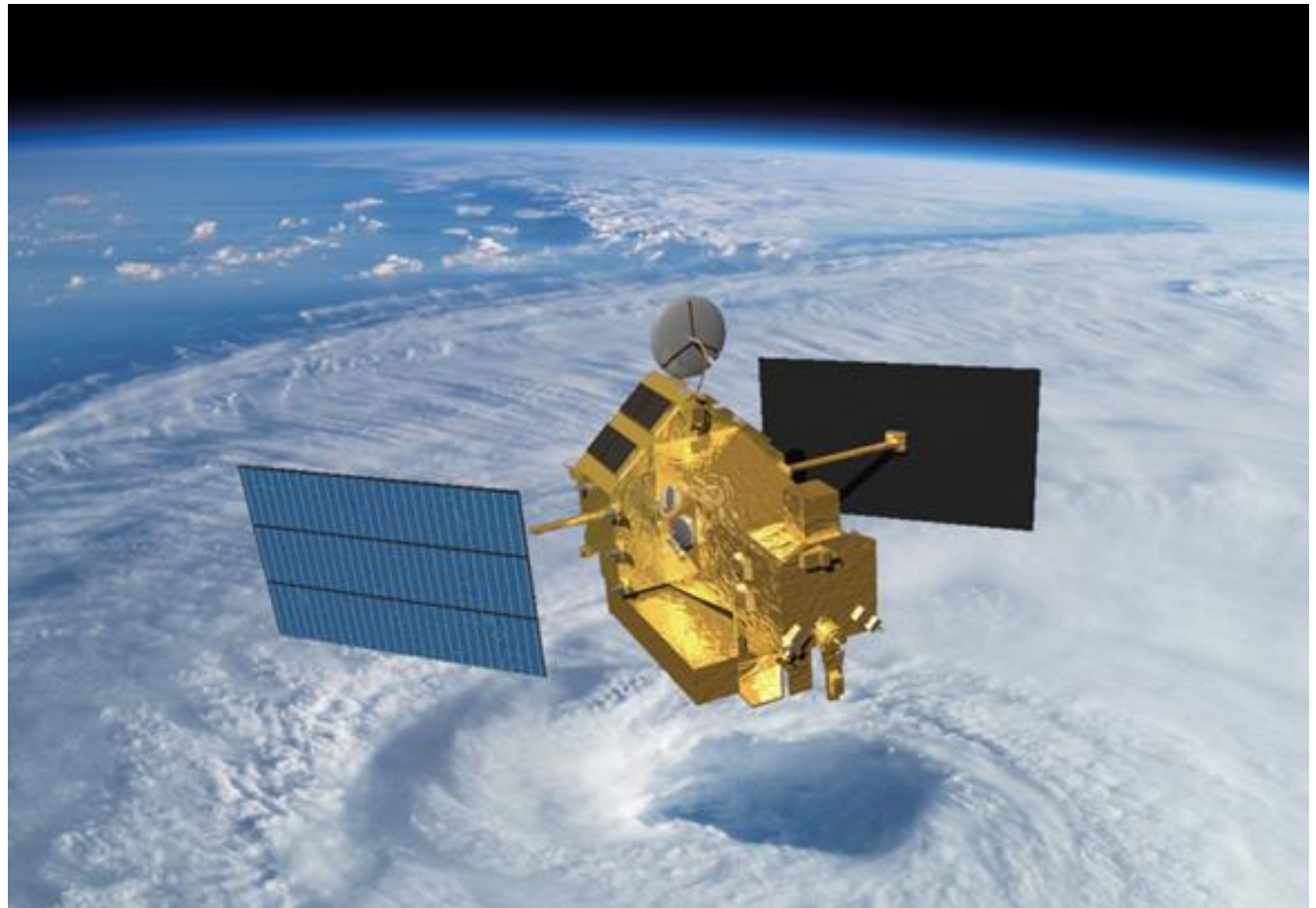


TRMM



▶ Tropical Rainfall Measuring Mission

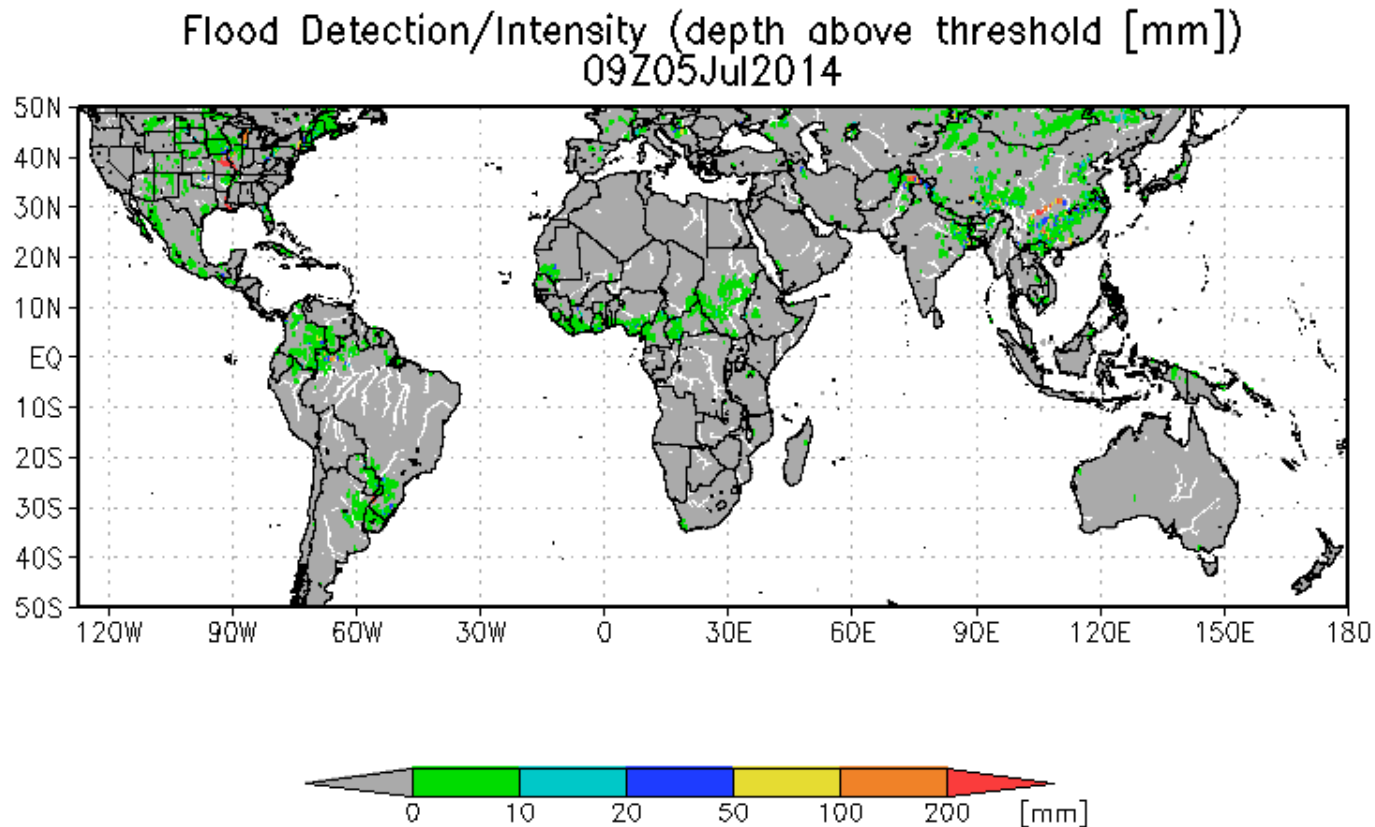
- ▶ Near-real-time dataset
- ▶ Precipitation Radar
- ▶ 0.25° grid



Other Data



- ▶ Streamflow and precipitation (IDEAM)
- ▶ Global Flood Monitoring System and DRIVE model (Dr. Huan Wu, University of Maryland)



Methods



Data

- Slope developed using the ASTER DEM
- Precipitation and streamflow from in situ data

Analysis

- Calculate watershed area
- Calculate flood indices

Application

- Flood Risk Map
- Update Mi Pronóstico web application
- Create visualization of flood indices for users in Colombia

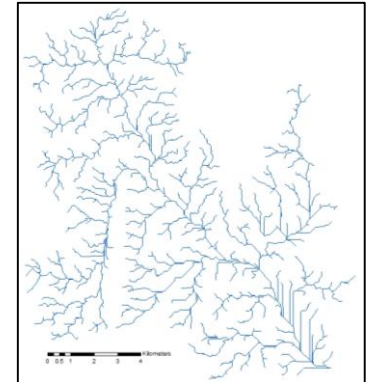
Flood Indices:

Morphometric Classification Torrential Index



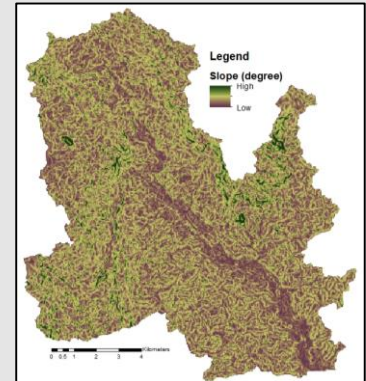
**Drainage Density
(km/km²)**

Total length of all streams and rivers in a drainage basin divided by the total area of the drainage basin



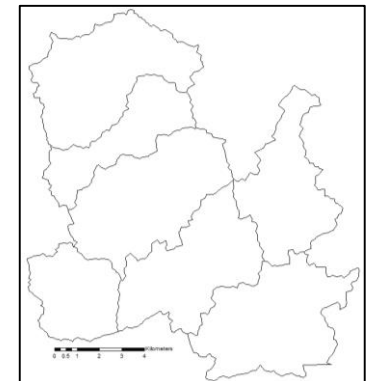
**Mean Basin Slope
(degree)**

Average slope of the drainage basin



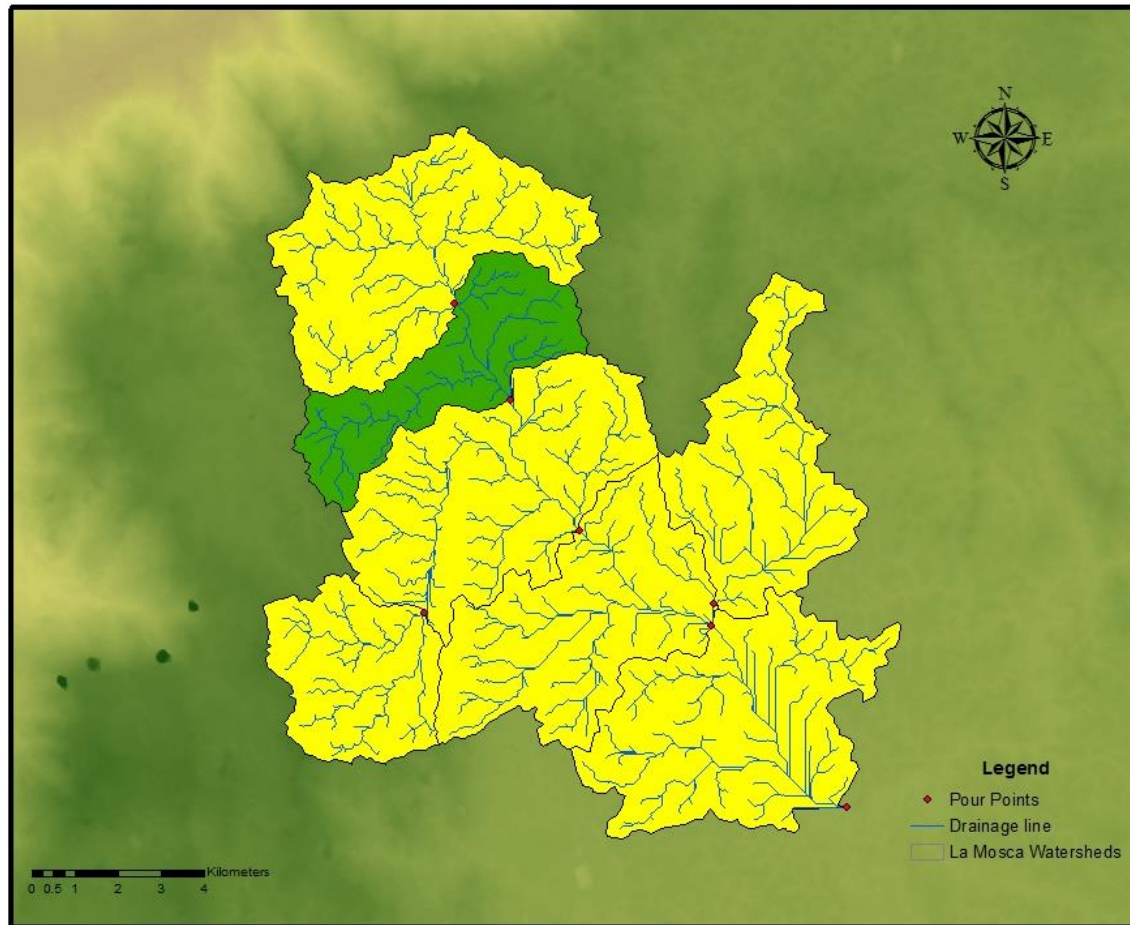
Coefficient of shape

The coefficient of the shape of the drainage basin. Shape values range from round to oval to rectangular



Morphometric Classification

Torrential Index

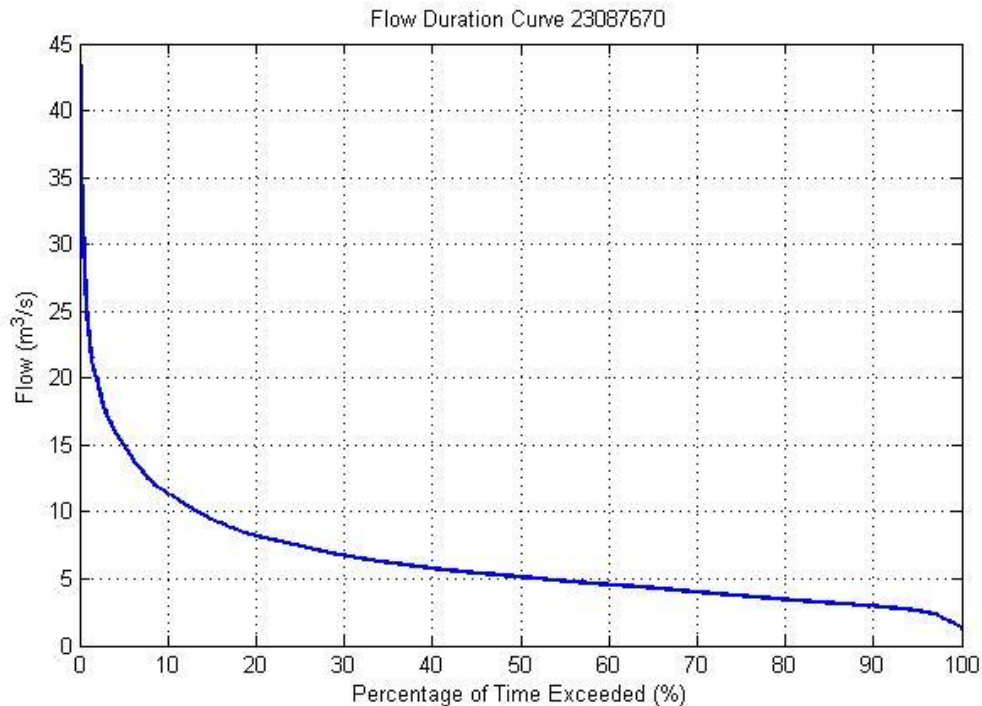


		Mean Basin Slope					
		1	2	3	4	5	
1	Drainage Density	111	121	131	141	151	1
		112	122	132	142	152	2
		113	123	133	143	153	3
		114	124	134	144	154	4
		115	125	135	145	155	5
2	Drainage Density	211	221	231	241	251	1
		212	222	232	242	252	2
		213	223	233	243	253	3
		214	224	234	244	254	4
		215	225	235	245	255	5
3	Drainage Density	311	321	331	341	351	1
		312	322	332	342	352	2
		313	323	333	343	353	3
		314	324	334	344	354	4
		315	325	335	345	355	5
4	Drainage Density	411	421	431	441	451	1
		412	422	432	442	452	2
		413	423	433	443	453	3
		414	424	434	444	454	4
		415	425	435	445	455	5
5	Drainage Density	511	521	531	541	551	1
		512	522	532	542	552	2
		513	523	533	543	553	3
		514	524	534	544	554	4
		515	525	535	545	555	5

Coefficient of Shape



Index of Variability



Variability Index	Vulnerability
<10°	Very Low
10.1° - 37°	Low
37.1° - 47°	Average
47.1° - 55°	High
>55°	Very High

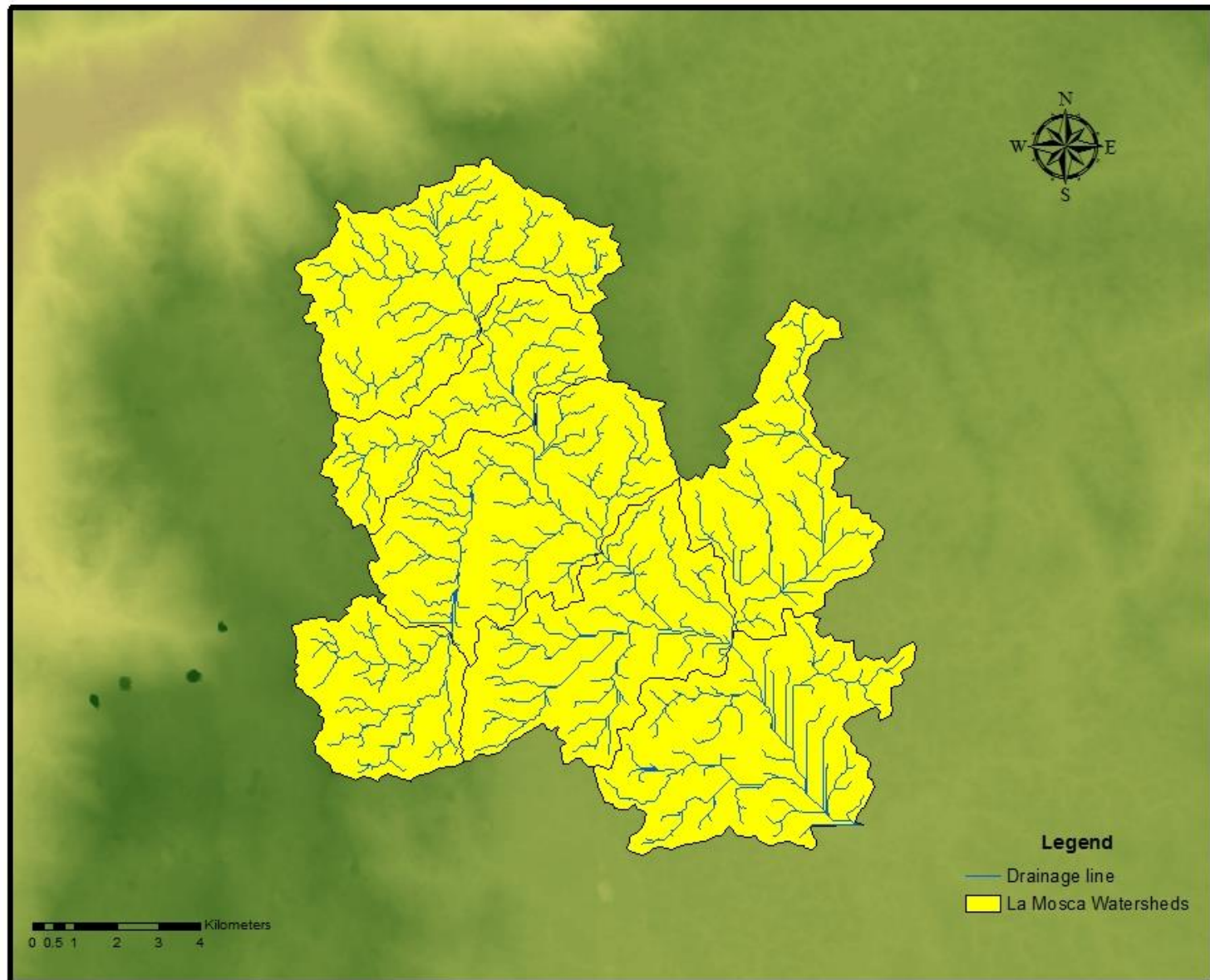
Variability Index	Station 23087670	Station 23087860	Station 23087170	Station 23087030
40%-60%	30.2022°	38.9326°	30.4553°	38.2458°
30%-70%	31.7183°	35.2720°	29.2970°	38.0296°
20%-80%	32.0733°	32.8636°	27.3563°	36.2351°
10%-90%	31.5347°	31.0470°	26.5651°	34.7007°

Vulnerability Index for Torrential Events



Variability Index	Morphometric Classification Torrential Index				
	Very Low	Low	Medium	High	Very High
Very low	Very Low	Very Low	Medium	High	High
Low	Low	Medium	Medium	High	Very High
Medium	Low	Medium	High	High	Very High
High	Medium	Medium	High	Very High	Very High
Very high	Medium	High	High	Very High	Very High

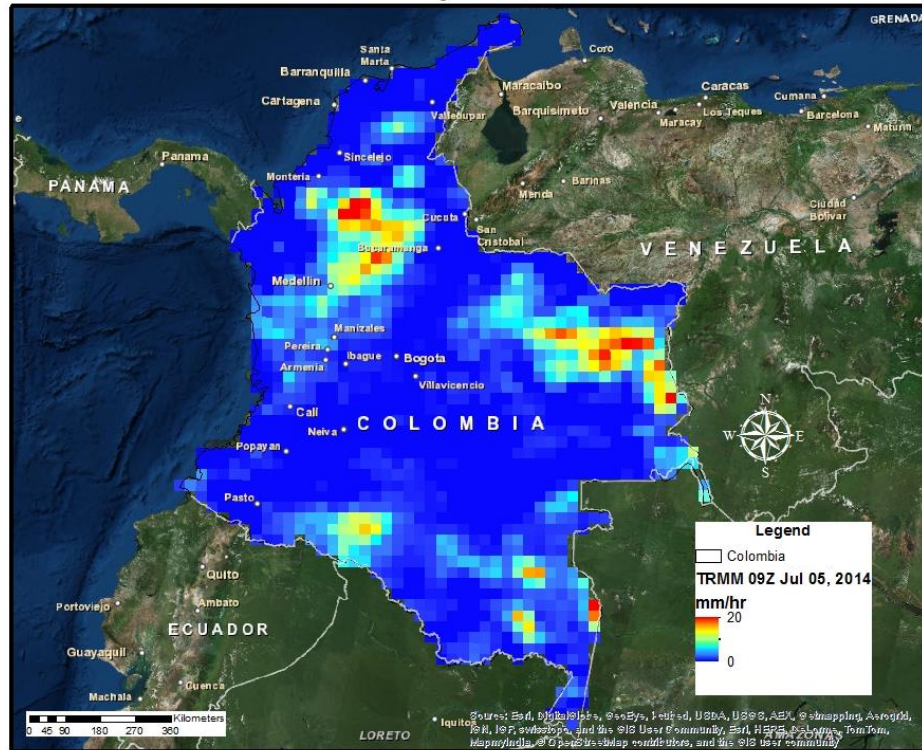
Vulnerability Index of Torrential Events



TRMM and DRIVE

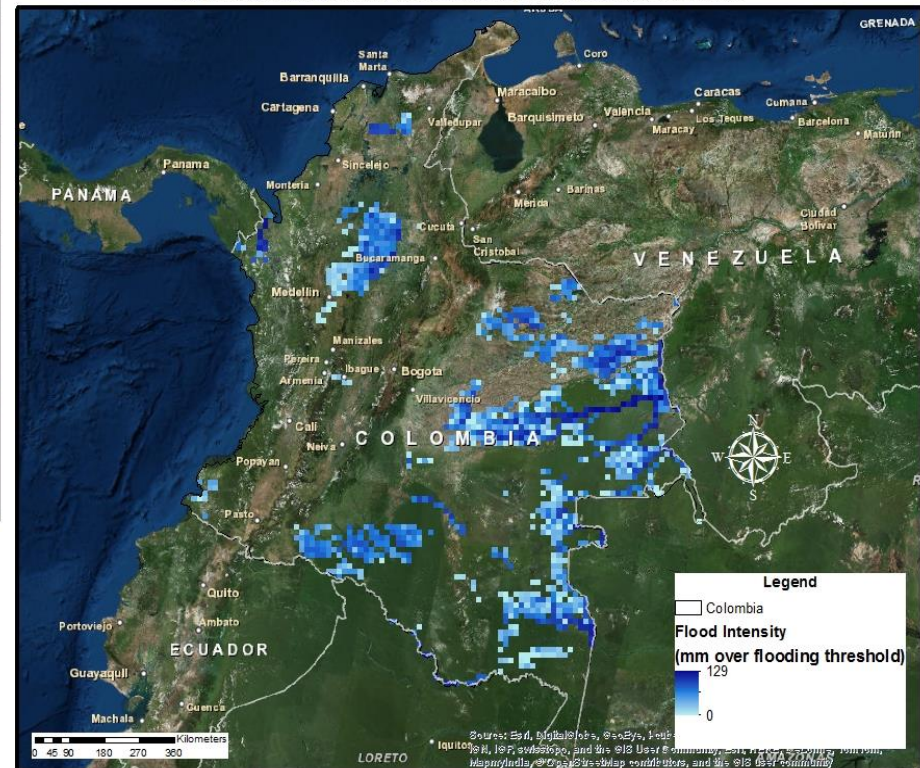


TRMM Near-Real-Time Precipitation 09Z July 05, 2014



DRIVE Model 09Z July 05, 2014

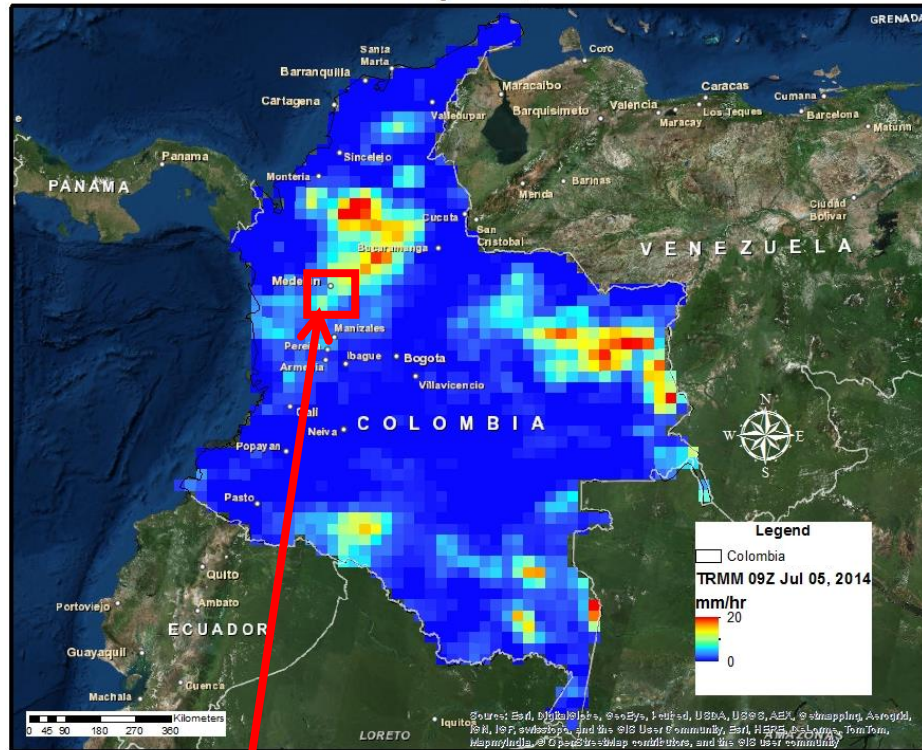
Data Source: Dr. Huan Wu et al., University of Maryland, flood.umd.edu



TRMM and DRIVE



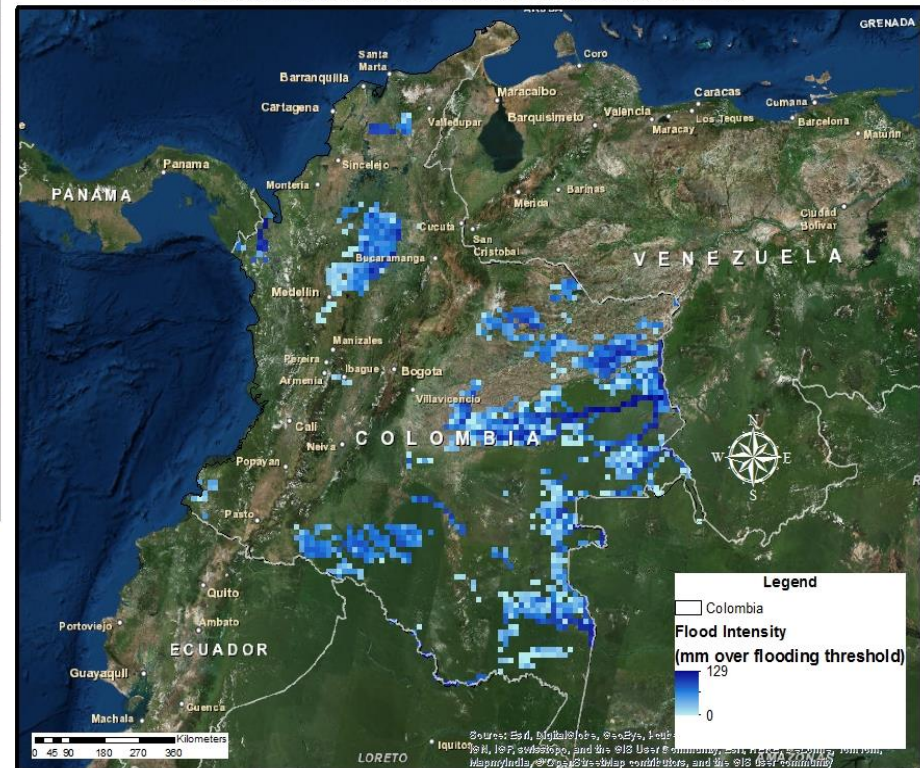
TRMM Near-Real-Time Precipitation 09Z July 05, 2014



La Mosca
Watershed

DRIVE Model 09Z July 05, 2014

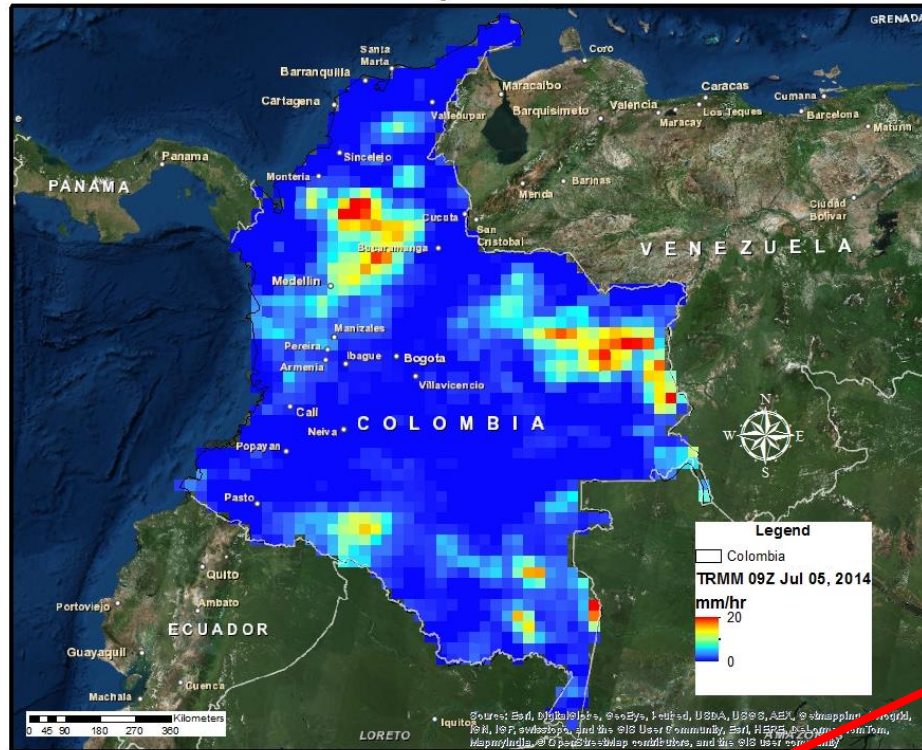
Data Source: Dr. Huan Wu et al., University of Maryland, flood.umd.edu



TRMM and DRIVE



TRMM Near-Real-Time Precipitation 09Z July 05, 2014



La Mosca
Watershed

DRIVE Model 09Z July 05, 2014

Data Source: Dr. Huan Wu et al., University of Maryland, flood.umd.edu



Future Work



- ▶ Streamline use of DRIVE and TRMM in the application
- ▶ Expand Pilot Study area to watersheds and sub basins across Colombia
- ▶ Update the Mi Pronóstico Web and mobile Application



Acknowledgements



Dr. Kenton Ross

NASA DEVELOP National Science Advisor

Lauren Childs

NASA DEVELOP Operations Lead