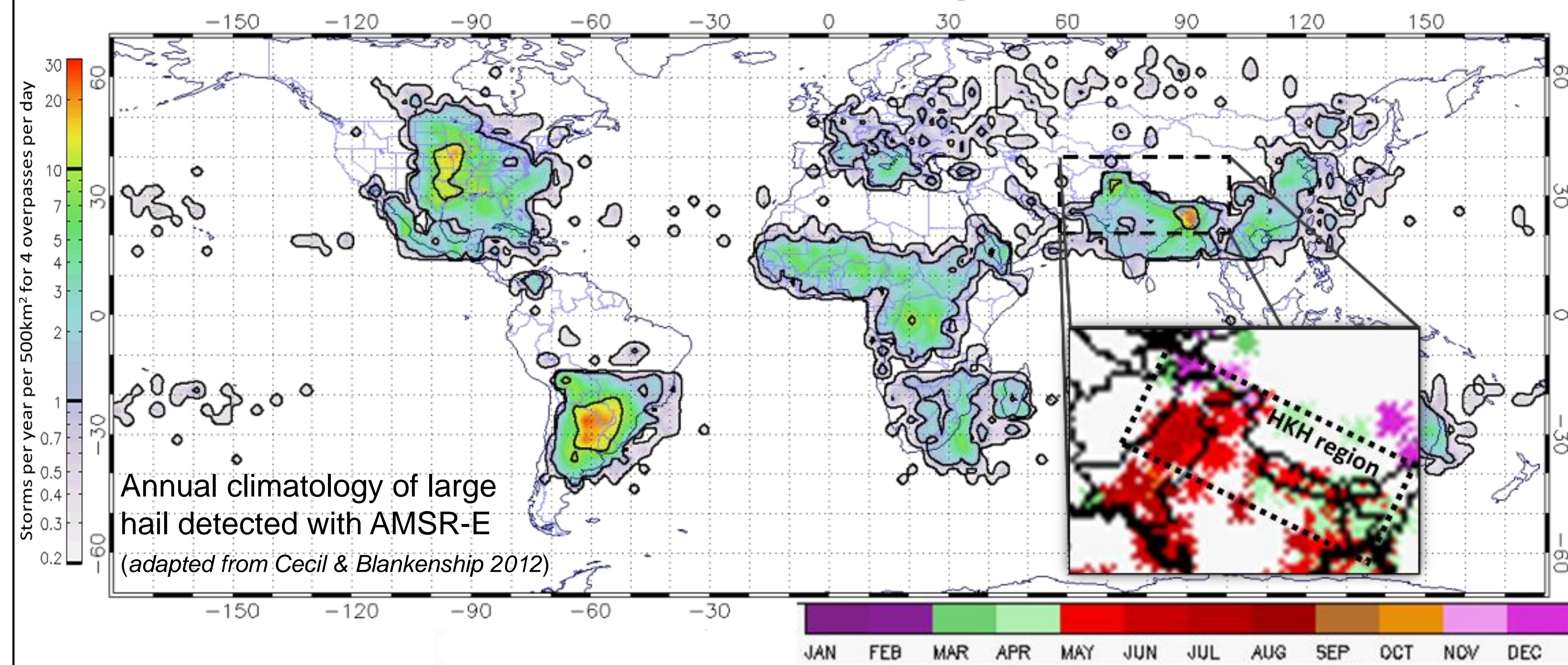


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**Abstract.** Some of the most extreme thunderstorms on the planet routinely occur in the Hindu-Kush Himalaya (HKH) region—where many government organizations lack the resources needed to fully assess the risk associated with hazards that result from high impact convective weather. This project combines innovative numerical weather prediction, satellite-based precipitation and land imagery techniques into a high impact weather assessment toolkit (HIWAT) that is building the capabilities of national meteorological departments and other weather sensitive agencies in the HKH region to predict, observe and effectively respond to threats and impacts posed by thunderstorms that affect the region, thereby enhancing extreme weather resilience in the region.

## Intense Thunderstorm Activity in the HKH Region



## HIGH IMPACT WEATHER ASSESSMENT TOOLKIT (HIWAT)

### REGIONAL WRF MODEL

10.0-h WRF model SBCAPE & 0-3 km SRH valid 04z 13 May 1996

CAPE: Instability  
SRH: Shear

CAPE > 5000 J/kg  
SRH > 250 m<sup>2</sup>/s<sup>2</sup>

### HIGH IMPACT WEATHER ENSEMBLE DIAGNOSTICS

*Situational Awareness*

(b) Strong Winds  
(c) Hail Swath  
(d) Mesocyclone Path

### GPM SATELLITE OBSERVATIONS

*Threat Assessment*

GPM Constellation Status  
GMI 37-GHz PCT  
Hail signatures

### SATELLITE LAND IMAGERY

*Impact Assessment*

SENTINEL 2  
DCM  
FLOOD INUNDATION MAPPING  
Hail Damage

## EXTREME WEATHER RISK ASSESSMENT USE CASE: 30 March 2018

Ensemble Forecast of Day 1 Intense Thunderstorm Potential

HIWAT

Select a Data/Interval Type: Ensemble Day 1

Select a Variable: Prob. of Reflectivity > 50 dBZ (%)

Coordinates: Latitude: 27.83908, Longitude: 94.65820

Current Opacity: 0.4

App developed in the Tethys platform

### 1. Hazardous Weather Forecast

Point-based forecast

Chance of Intense Storms  
Chance of Frequent Lightning  
Chance of Hail  
Chance of Damaging Winds

→ Ensemble WRF forecasts intense thunderstorms across eastern Nepal, northern Bangladesh and NE India.  
→ Main hazards: Lightning, Hail, Damaging Winds

## 2. Near-Real Time Observations

GPM Passive Microwave Measurement @ 37GHz

Microwave  $T_B$  measurement translated to hail probability (Bang & Cecil 2018)

### Large Hail Probability Maps

GMI 0805 UTC  
AMSR2 0720 UTC

→ Large hail-producing thunderstorms moving N→S across eastern HKH region

Satellite snapshot of total lightning activity

ISS-LIS 1030 UTC

Daily summary of lightning activity

ENTLN NRT 30 March 2018

Severe weather reports (30 March 2018)

Ensemble-based numerical weather prediction combined with near-real time satellite observations over a data sparse region presented efficiently, enhances extreme weather resilience in the HKH region.

### Ongoing Activities:

- HIWAT validation
- End-user evaluation
- Training
- Pathway to implementation

