



# NASA Response to 2015 M7.8 Nepal Earthquake

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# Introduction: Response to 2015 Nepal Earthquake



- **What:** M7.8 Nepal Earthquake
- **When:** April 25 2015 (Response through July 2015)
- **Where:** Nepal
  - Response from JPL and across NASA centers
- **Why:** 8,857 dead, humanitarian crisis, extensive infrastructure damage, devastation in rural areas
- **Who:** NASA + volunteer partners + Agencies
- **How:** Generate maps of surface change, observations from satellites, models of the earthquake and distributed information via relief organizations, agencies and Media/press releases

# How Team Functioned



Initial JPL coordination telecon → NASA Coordination → Sub-Groups

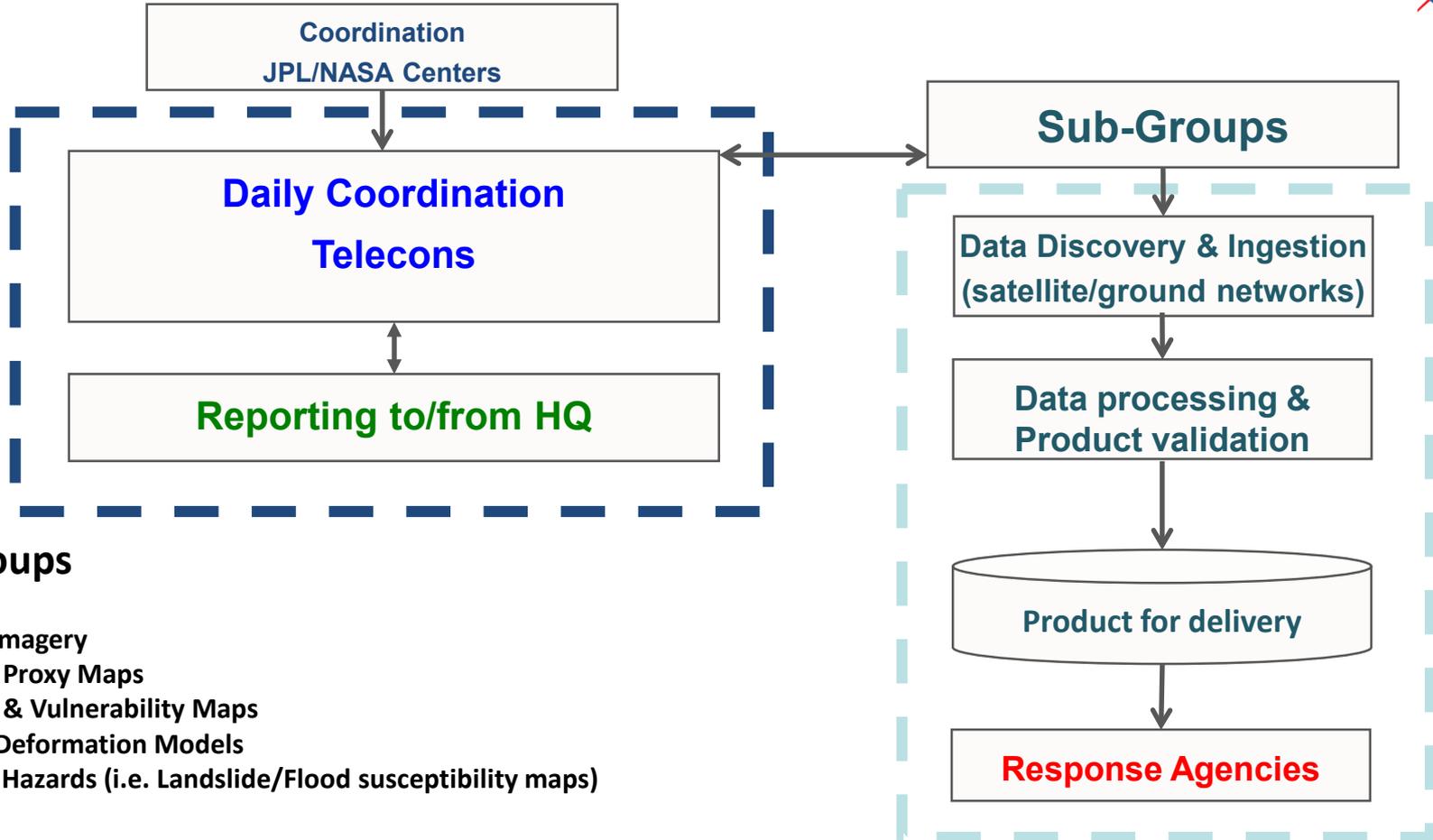
## Coordination

- Organizing and leading daily telecons
- Maintaining a calendar of events and products
- Setting up e-mail lists
- Setting up centralized information hub
- Interfacing with NASA HQ & sub-group POCs
  - Create guidelines or “manual” for product posting
- Editing and approving releases to NASA website
- Managing e-mail traffic and directing content to the appropriate sub-group or decision makers

## Sub-Groups

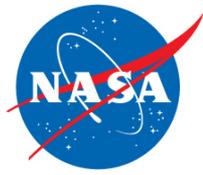
- Data discovery & ingestion
- Data Processing
- Products
- Interface with end users & product dissemination

# How the Team Functioned



# Core Products & Timeline

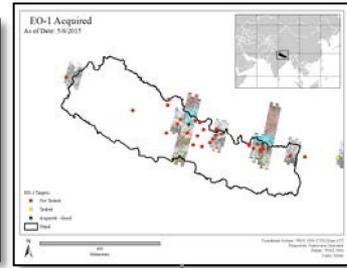
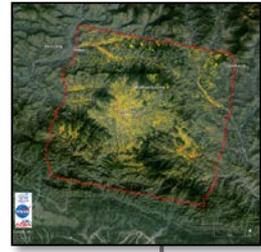




# M7.8 Earthquake & 1<sup>st</sup> coordination call



**CSK Damage Proxy Map (DPM)**  
 - Delivered to NGA, OFDA/USAID  
 - Publicly released

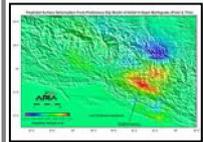
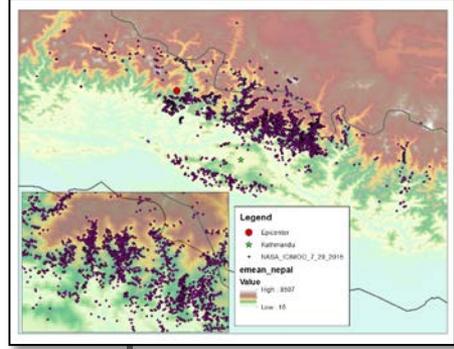


**Products include:**  
 Surface deformation maps (interferograms),  
 Optical imagery  
 Damage Proxy Maps  
 Damage & Vulnerability Maps  
 Surface Deformation Models  
 Induced Hazards (i.e. Landslide/Flood susceptibility maps)

**ALOS-2 DPM**  
 - Delivered to NGA, OFDA,  
 DigitalGlobe, Esri  
 - Publicly released



**Landslide mapping +  
 Susceptibility Maps  
 SERVIR/ICIMOD**



Initial quake models  
 Interferograms  
 tilt maps

**GPS Surface Deformation**  
 - Delivered to USGS  
 - Publicly released

**First Radar Surface  
 Deformation – S1A**  
 publicly released

**Sub-Groups formed  
 & First optical images**

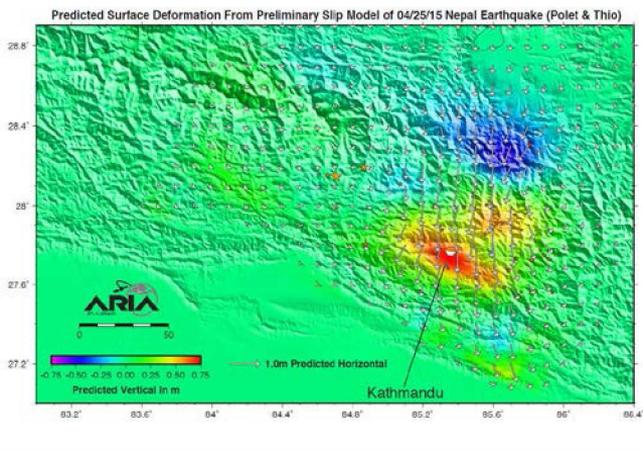
**Optical Imagery: Landsat,  
 ASTER, EO-1 Tasking**

**Landslide Identifications**

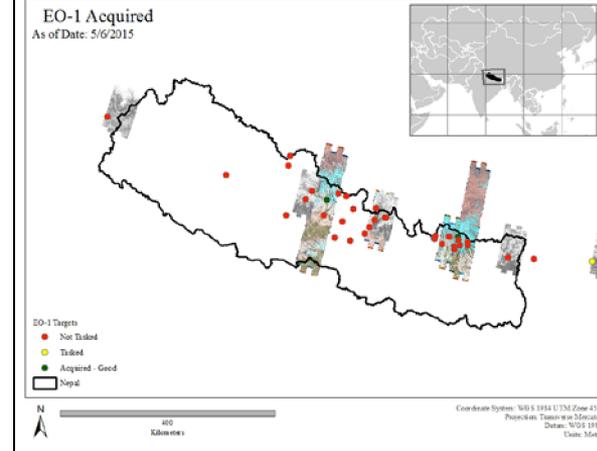
Last telecon



COSMO-SkyMed images Nepal ALOS-2 images Nepal

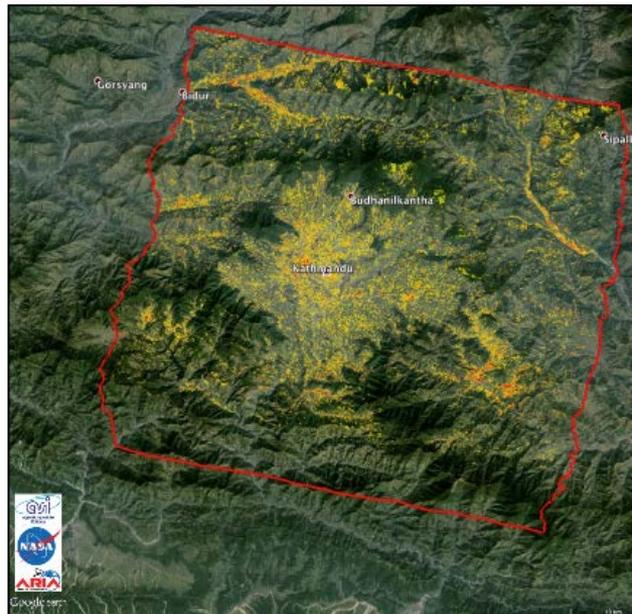


Initial quake models  
Interferograms  
tilt maps

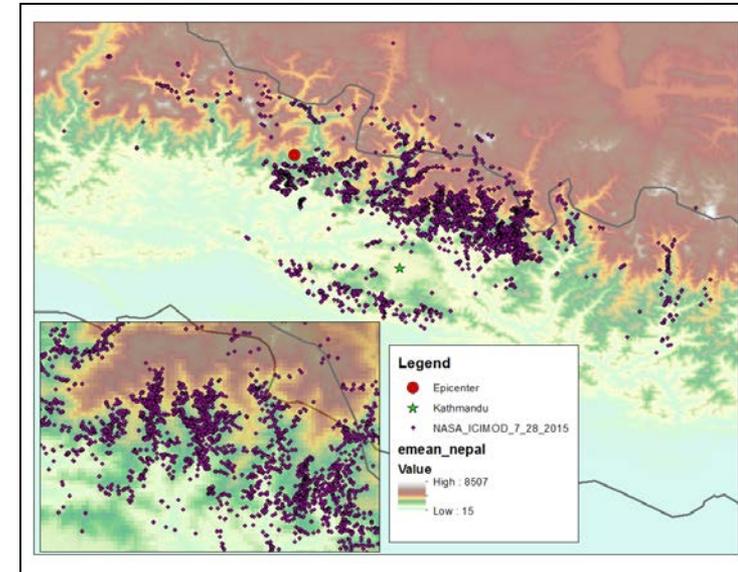


Optical Imagery: Landsat,  
ASTER, EO-1 Tasking

Landslide mapping +  
Susceptibility Maps  
SERVIR/ICIMOD



CSK Damage Proxy  
Map (DPM)  
- Delivered to NGA,  
OFDA/USAID  
- Publicly released



# Interfaces Used & Delivery Mechanism



## Interfaces

- NASA HQ
- ASI → COSMO-SkyMed
- JAXA → ALOS-2
- USGS → NGA
- SERVIR → ICIMOD
- In country sources via Jeff Kargel

## Delivery Mechanisms

- USGS, SERVIR/ICIMOD and NASA media interfaces (articles)
- Sub-Group derived products stored in local servers
- Products emailed to key users
- Then released through links on NASA/Marshall website

# Who Used the Products and How?



<b>Users</b>	<b>Examples of how they are used</b>
World Bank	Damage assessment for economic loss
NGA	Determine priority areas for analysis
USGS	Search for land damage and surface rupture in their fieldwork
OFDA/USAID	Damage assessment for response on the ground
ICIMOD	Search for land damage, landslides, and river blockage
GEER	Guidance for geotechnical engineer reconnaissance fieldwork
DigitalGlobe	Determine priority areas for high-resolution image acquisition
UNICEF	Exposure and damage assessment for response on the ground
ESRI	Post on their interface for sharing

# What Worked



- Rapid infusion and coordination of Agency/Inter-Agency effort
- Telecons
- People were generally very responsive and eager to participate
  - Volunteerism and Commitment
- Product generation
- Self assessment – Post event workshops

# Lessons Learned



- Establishing relationships and protocols with response organizations prior to an event is key
- Assemble a roster for different disaster types
- Assemble playbooks for different disaster types
- Need more than 1 coordinator established at the beginning
  - Single point failure, leaves of absence
- Establish guidelines for telecons and product posting early on to increase the effectiveness of telecons
- Automation for situational awareness and product generation is high priority:
  - “I am only as useful as the quality of my sleep.”
- Need to define entry and exit strategies
  - How to decide on when to engage and disengage when there are many users, leaders, team members, with all their own capabilities, constraints, etc.
  - Sustainability/feasibility of volunteer effort of this magnitude going forward is limited

# Lessons Learned



- Need to engage with end-users to identify which products are useful and what delivery mechanisms they need
- Subgroups should not operate as silos, and neither should any one topical area moving forward
- Media
  - Quickly establish and communicate a procedure for release of information/data to the public. The approval cycle for such products should be streamlined.
  - Develop and distribute talking points to the entire group.
  - Establish designated spokespeople and limit media interactions to those people.
  - Ensure there is a mechanism in place so that contributors are properly acknowledged for their work.

# Plans moving forward



- Developing playbooks for different disaster types
  - Definition of entry/exit strategies
  - Key response products
  - End-user contacts
- Improve communication and response infrastructure
  - Disaster response website
  - Coordination tools
    - Centralized information hub, file sharing etc.
- Strengthen inter-agency and end-user relationships
  - Meetings/exercises