NASA Response to 2015 M7.8 Nepal Earthquake

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Content

- Introduction

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- Core Products and Timeline

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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

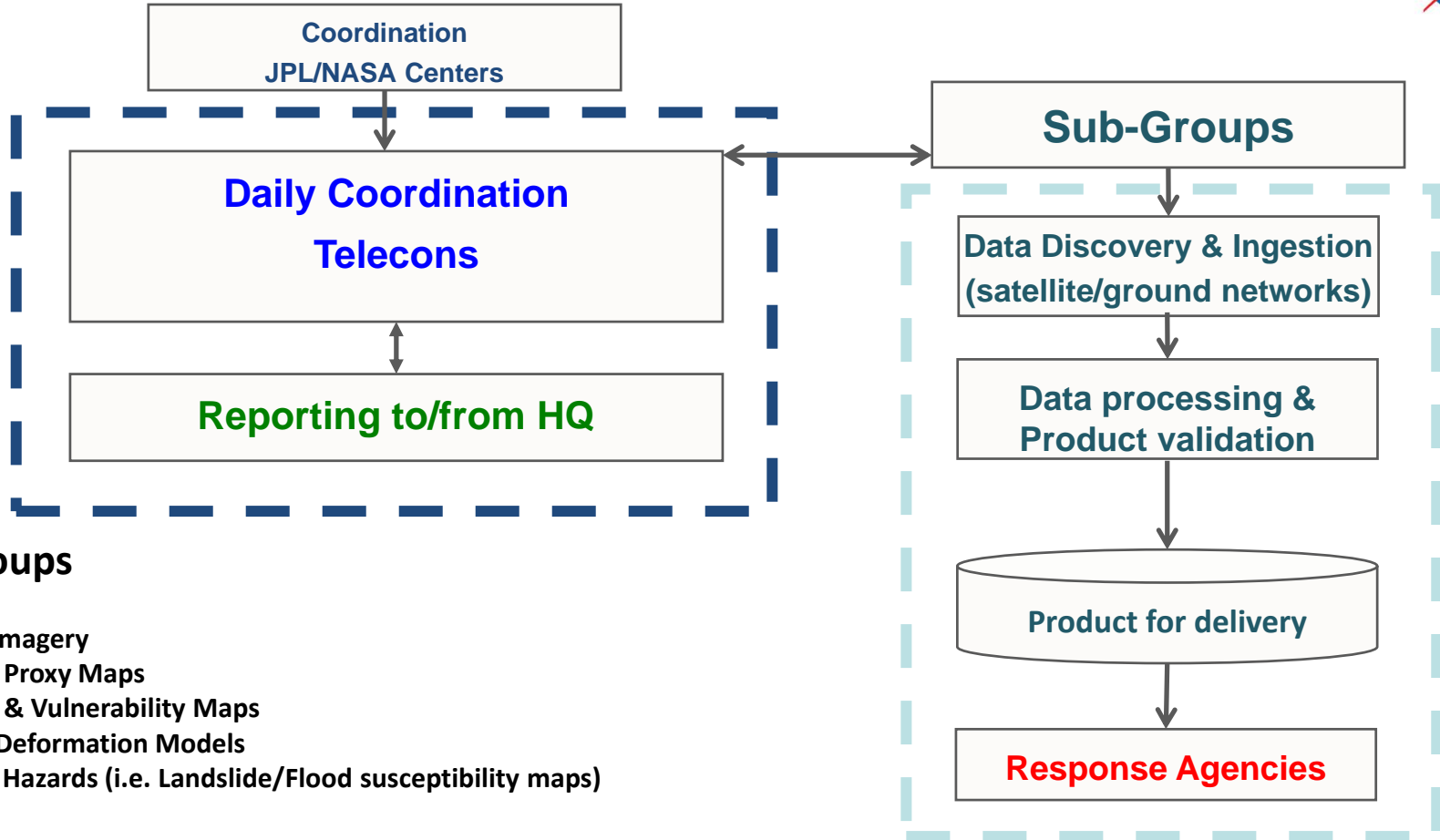Initial JPL coordination telecon → NASA Coordination → Sub-Groups

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

Coordination
JPL/NASA Centers

Daily Coordination Telecons

Reporting to/from HQ

Sub-Groups

Data Discovery & Ingestion (satellite/ground networks)

Data processing & Product validation

Product for delivery

Response Agencies

Sub Groups

- **Optical imagery**
- **Damage Proxy Maps**
- **Damage & Vulnerability Maps**
- **Surface Deformation Models**
- **Induced Hazards (i.e. Landslide/Flood susceptibility maps)**
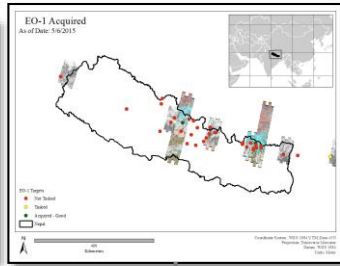- **Media**

# Core Products & Timeline

M7.8 Earthquake & 1st coordination call

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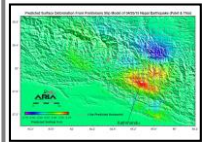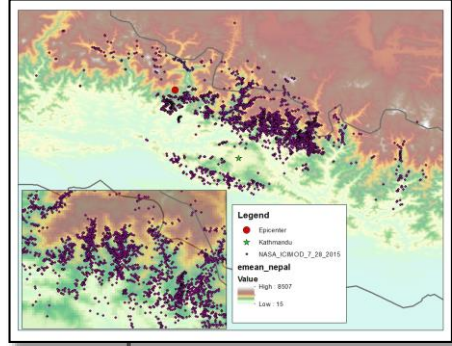- Delivered to NGA, OFDA/USAID
- Publicly released

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
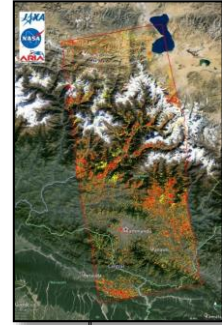
Landslide mapping +
Susceptibility Maps
SERVIR/ICIMOD

Initial quake models
Interferograms
tilt maps

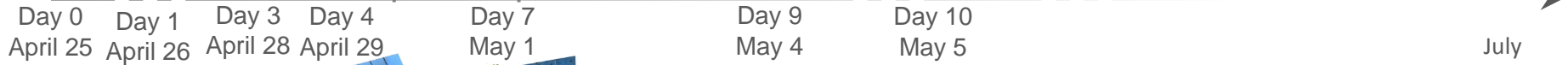GPS Surface Deformation
- Delivered to USGS
- Publicly released
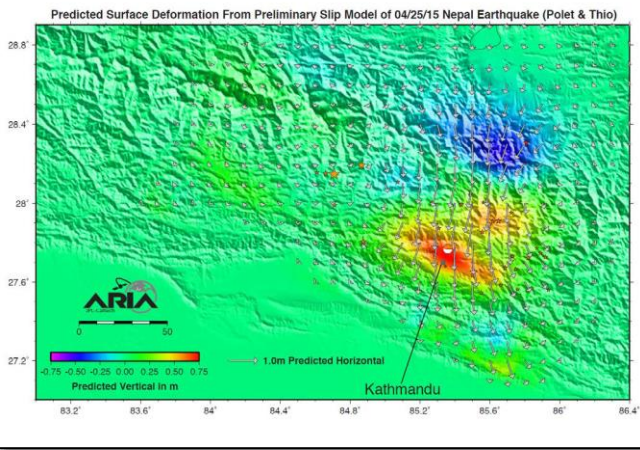
First Radar Surface
Deformation – S1A
publicly released

Sub-Groups formed
& First optical images

Landslide Identifications
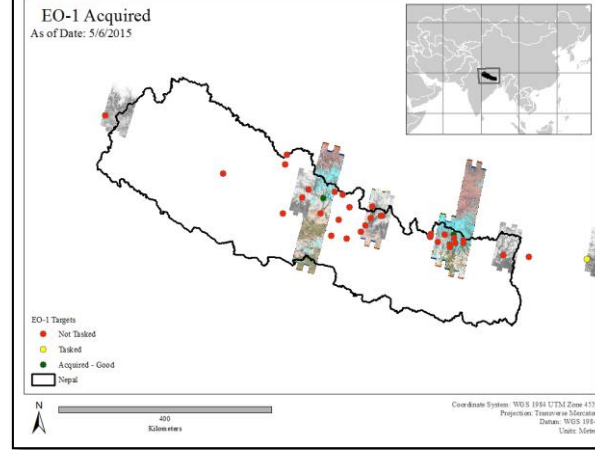
Optical Imagery: Landsat,
ASTER, EO-1 Tasking

Last telecon

Day 0
April 25

Day 1
April 26

Day 3
April 28

Day 4
April 29

Day 7
May 1

Day 9
May 4

Day 10
May 5

July

COSMO-SkyMed images Nepal   ALOS-2 images Nepal

Predicted Surface Deformation From Preliminary Slip Model of 04/25/15 Nepal Earthquake (Polet & Thio)

Initial quake models
Interferograms
tilt maps

EO-1 Acquired
As of Date: 5/6/2015

Optical Imagery: Landsat,
ASTER, EO-1 Tasking

Landslide mapping +
Susceptibility Maps
SERVIR/ICIMOD
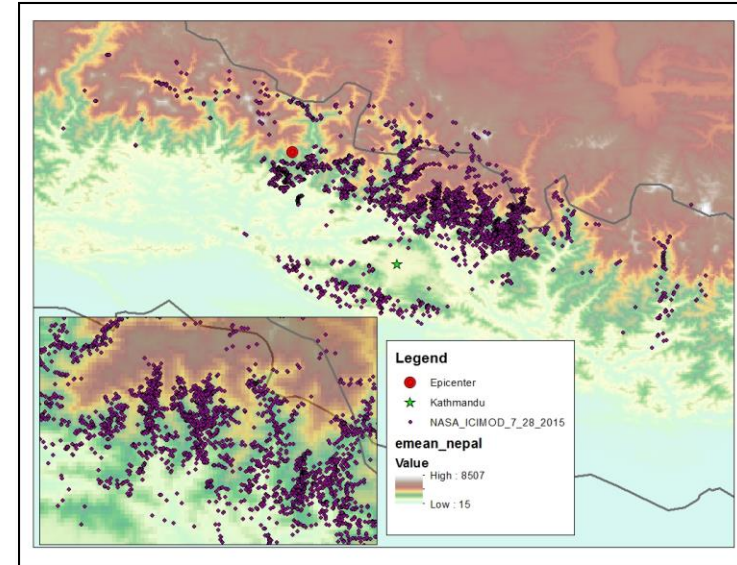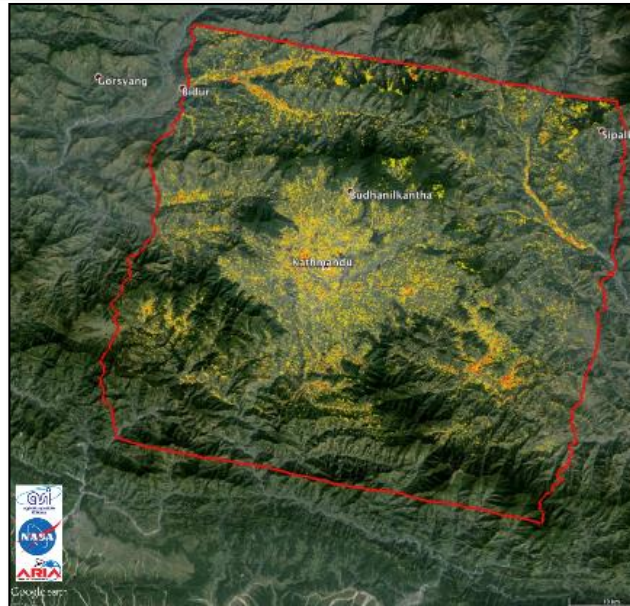
CSK Damage Proxy
Map (DPM)
- Delivered to NGA,
OFDA/USAID
- Publicly released

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?

Users	Examples of how they are used
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