



GEO-ENGINEERING EXTREME EVENTS RECONNAISSANCE

Turning Disaster into Knowledge

GOOGLE EARTH Reconnaissance **Robert Kayen – US Geological Survey**

- PREPARING FOR THE FIELD
- FIELD MAPPING with Google Earth
- DAILY Google Earth Map
- GEER REPORT .KMZ



Google Earth in GEER Post-Event Reconnaissance

Examples:

- 2007 Niigata Chuetsu Ok, JP
- 2007 Pisco, Peru
- 2008 Iwate-Miyagi Nairiku, JP
- 2009 L'Aquila, IT

GE is Companion to the Traditional Report and provides readers the entire 'file cabinet' of observations.



GEO-EARTHQUAKE ENGINEERING RECONNAISSANCE

Turning Disaster into Knowledge

Geoengineering and Seismological Aspects of the Iwate Miyagi-Nairiku, Japan Earthquake of June 14, 2008 (17 MB)

Version 1.1, September 12

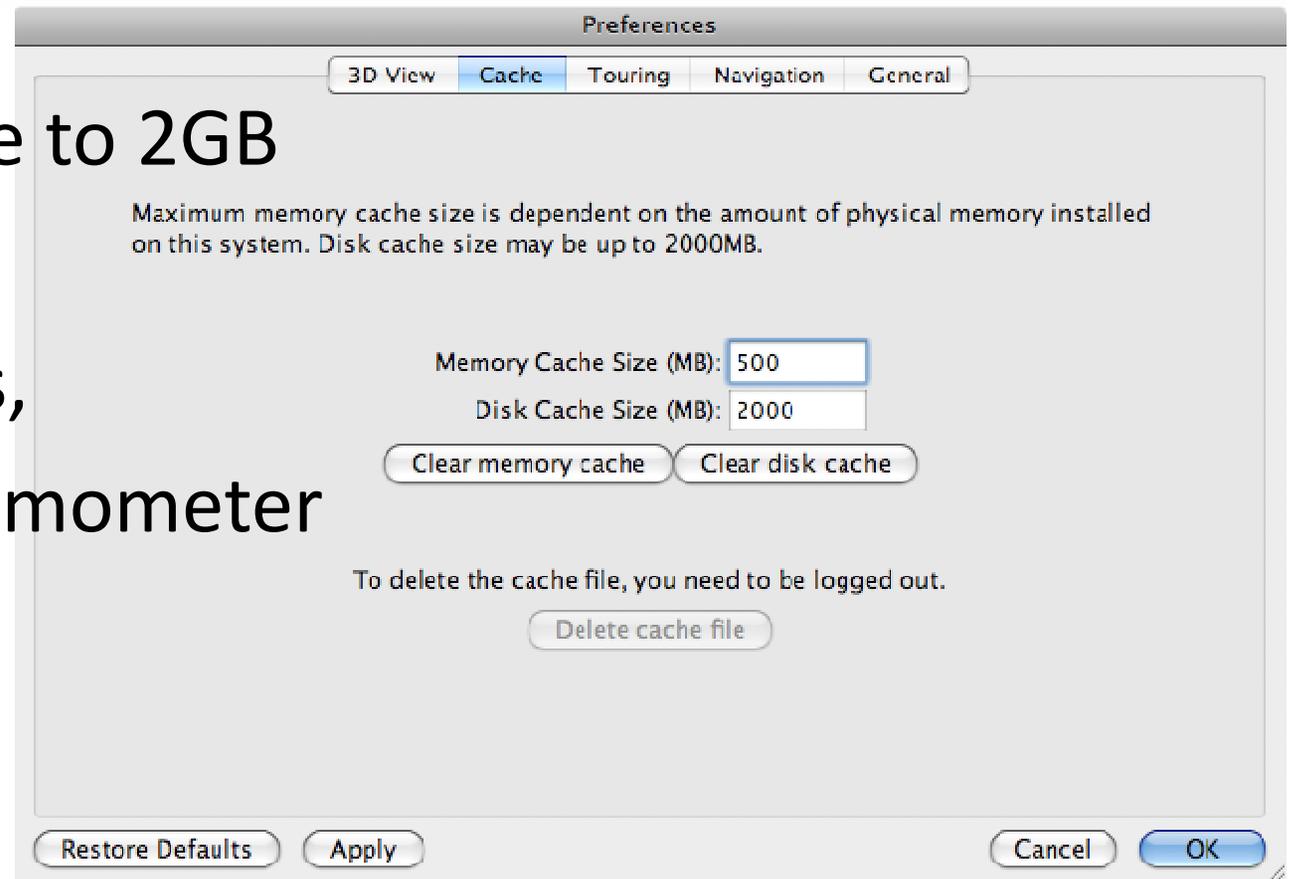
[Google Earth .kmz files here](#) (USGS site, most up-to-date, check firewall if problems)

[Google Earth .kmz files here](#) (GEER site)



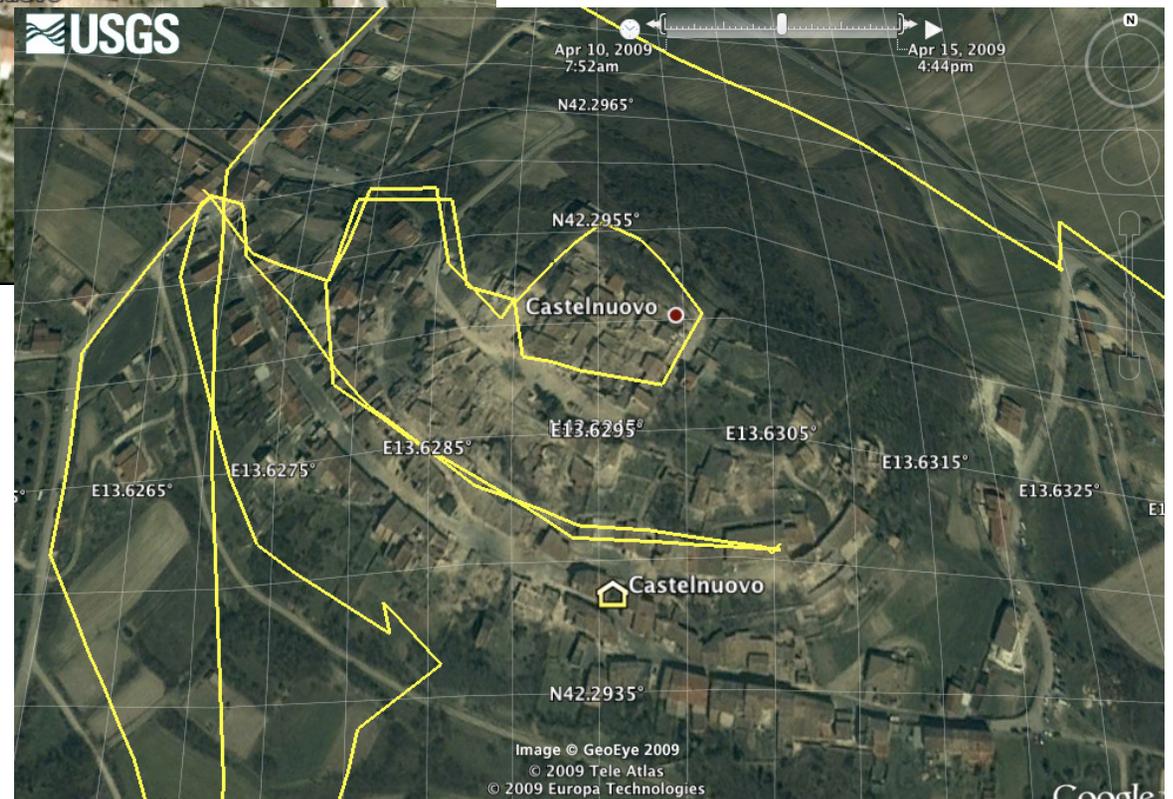
Preparing for the Reconnaissance

- Maximize Cache to 2GB
- Build Cache
- Import overlays, epicenters, Seismometer stations



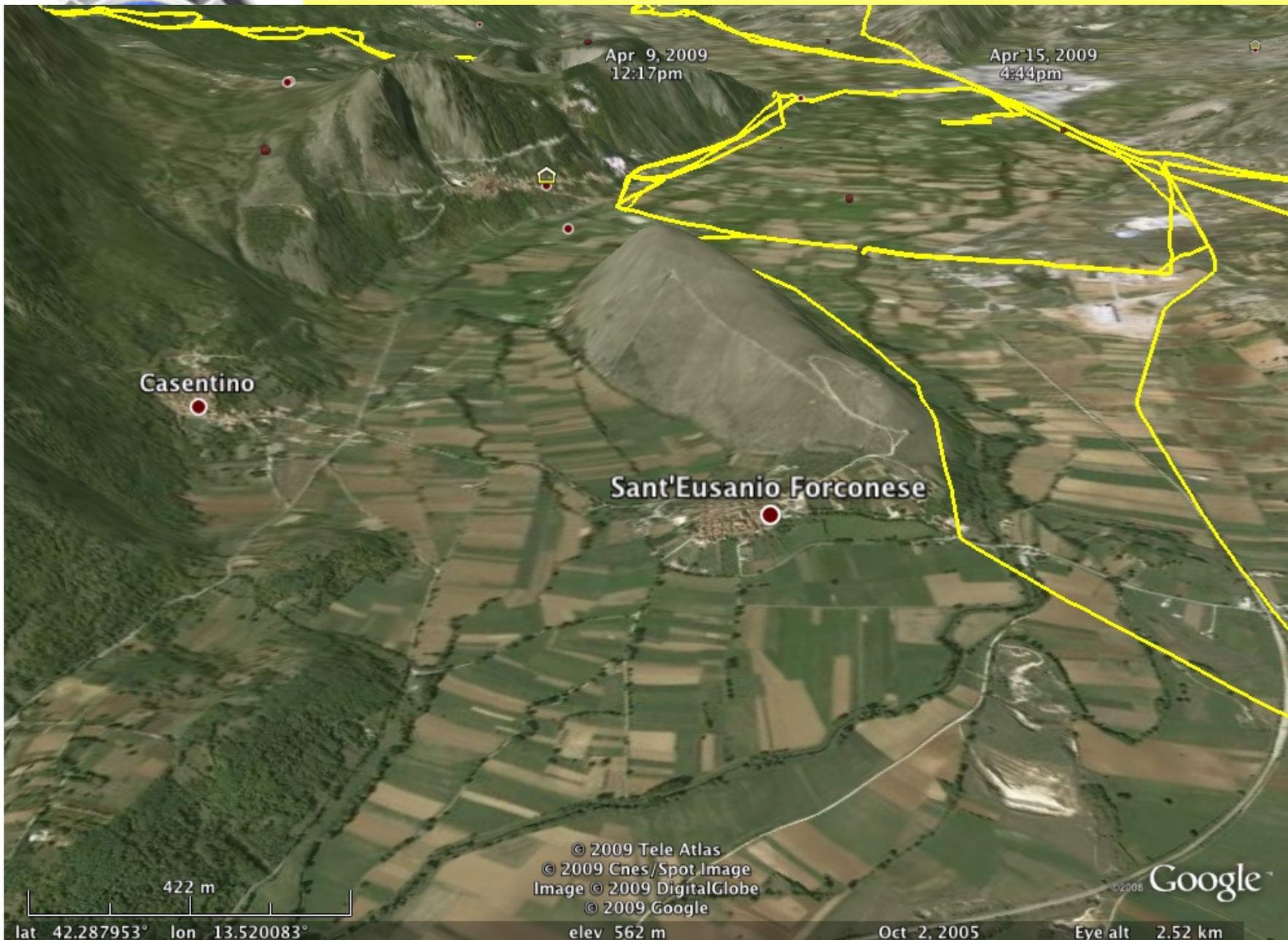


- Overlays of Pre-event and Post event Imagery



Castelnuovo, Abruzzo

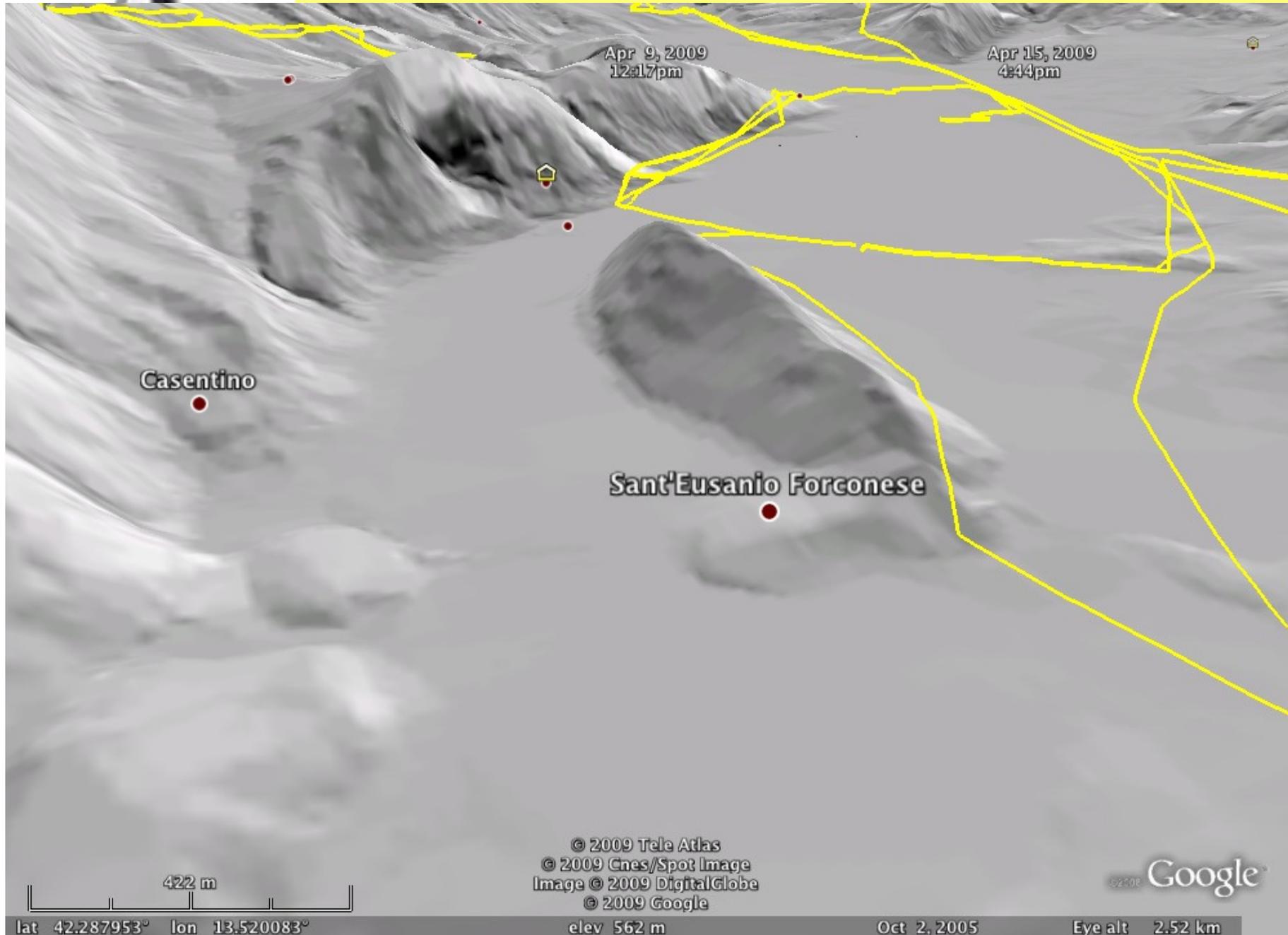
- Overlays drape the terrain



- Overlays drape the terrain



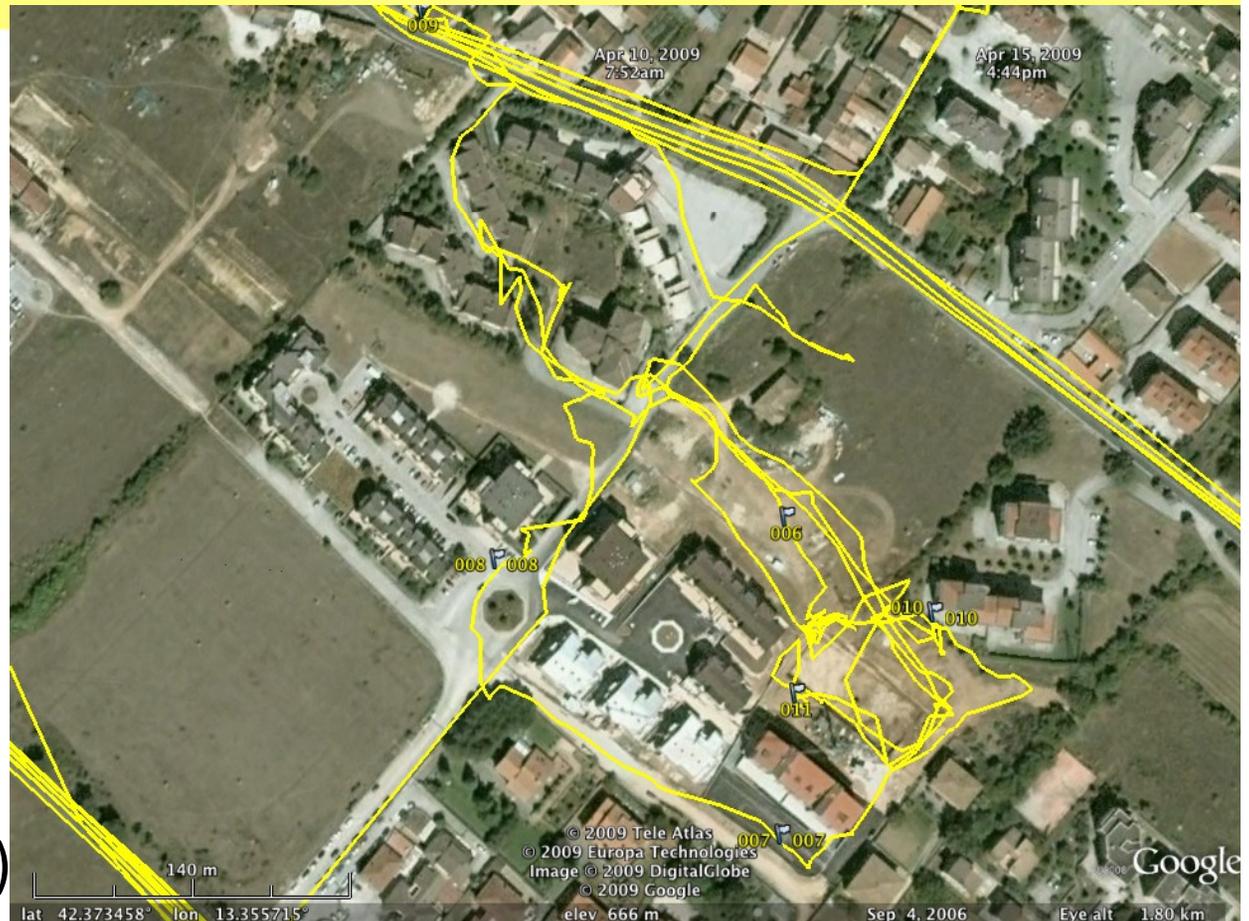
- Overlays drape the terrain





Google Earth Mapping During the Reconnaissance

- Direct GPS logging
- Relate damage to overlays
- Build waypoints & observations
- Import .gpx files
(L'Aquila, Italy)





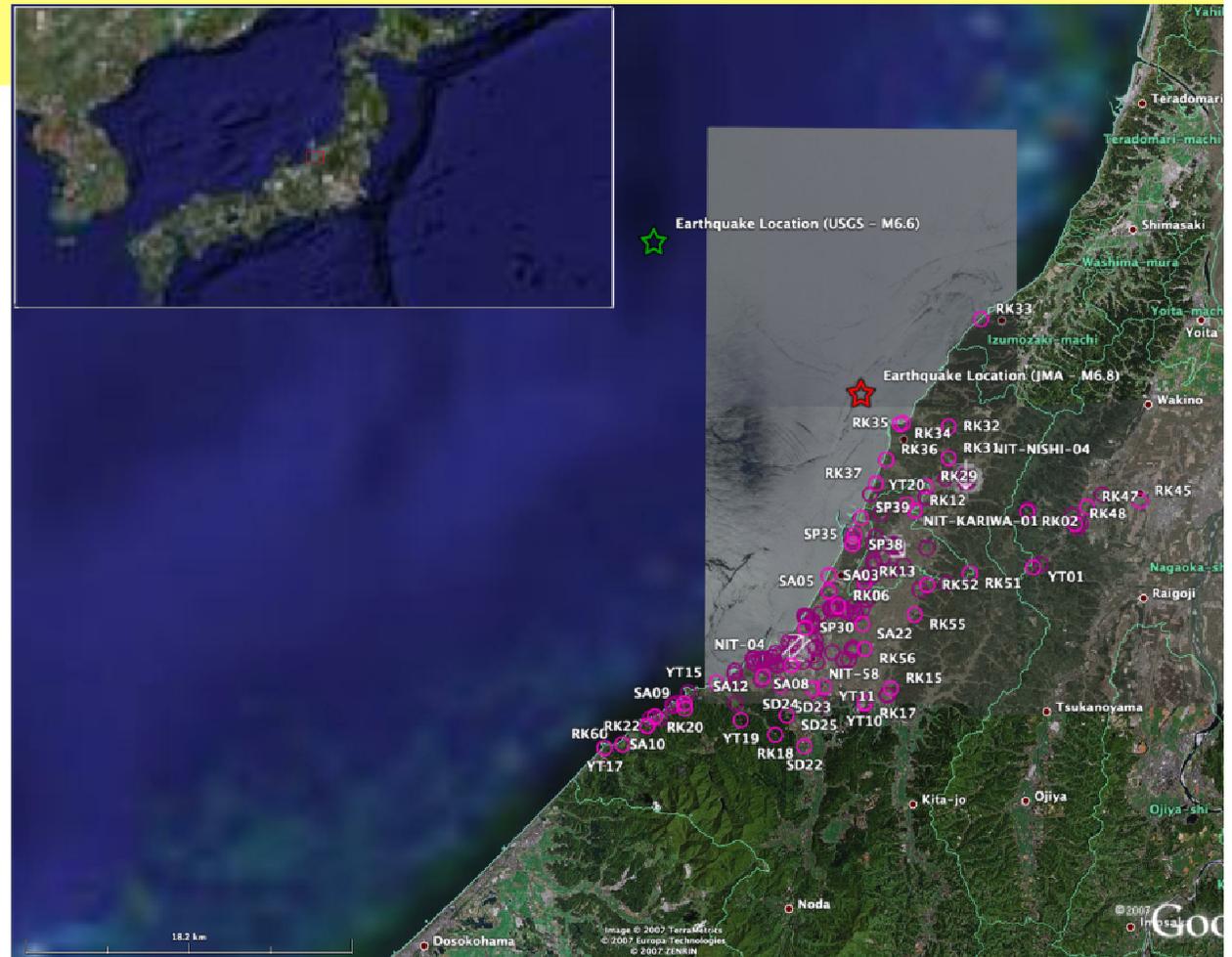
Google Earth Mapping During the Reconnaissance

- <ftp://ftp.geerassociation.org>
- Upload & download of all digital data, images, maps, .kml/.kmz files



Final Reporting: The Google Earth Map

- Companion to hygraded web report
- Available to everyone and contains the entire data collection of the reconnaissance

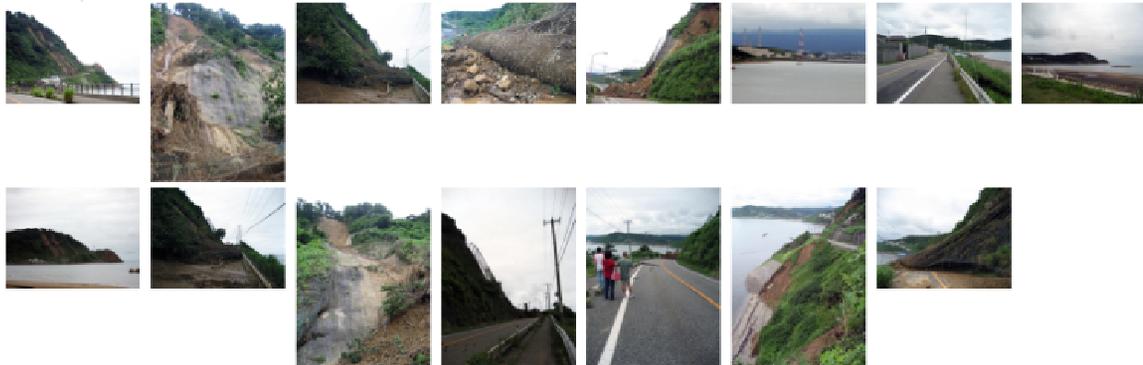


Final Reporting: The Google Earth Map



RK34

- Site Number -- RK34
- Name -- Coastal Landslides South of Route 373 - Several colluvial/residual slides in this area. Beginning in the north, five small (volume Less than 25 m³ each), shallow failures were observed behind some nearby structures. These are considered minor failures. Several other major failures were observed and investigated in more detail. The road in this location were closed due to Slides 1, 2, 3 as described below:
 - Slide 1 - Located in previous area of instability, a shotcrete stabilization system is in effect for the bottom 50 m of this slope (total slope height is ~115m), and overlain with a wire-mesh rock deflection system. Slide is 50-60 m wide, 65 m long, Less than 1m thick. Slide initiated above shotcrete slope, moved into wire-mesh, causing failure of meshing and pulling out of steel wire-mesh steel supports. Wire-mesh caught most of debris, depositing the majority on the road, with only slight quantity of debris over road edge. Failure plane has approximate 60° inclination.
 - Slide 2 - Similar to Slide 1. Slide is 10 m wide, 15 m long, 0.5m thick. Failure plane has approximate 70° inclination.
 - Slide 3 - Similar to Slide 1. Slide is 10 m wide, 15 m long, 1 m thick. Failure plane has approximate 50° inclination. At this location, the wire-mesh and supports were torn away from the slope.
 - Slide 4 - Similar to Slide 3, however slide debris did not reach wire-mesh protection, and was instead deposited in the middle of the slope. Slide is 10 m wide, 25 m long, 0.5 m thick. Failure plane has approximate 50° inclination.
 - Slide 5 - Slide area is below road with head scarp located in the coast-side lane of the road. Site could not be photographed, and failure dimensions are unknown.
 - Slide 6 and 7 - Slide area consists of two slopes with raveling failures that toe onto the beach. Only minimal debris was observed on the beach, suggesting that this slope has undergone failure in the recent past. Failure plane has approximate 55° inclination.
 - Slide 8 - Several additional areas of shallow landsliding were observed to the south in this area, no additional details were noted.
- Lat (dec. deg.) -- 37.48455
- Lon (dec. deg.) -- 138.62435
- Photos -- RK, BC
- Noted -- Landslide
- Noted -- Road Embankment Failure
- Noted -- Pavement Failure
- Click site photo for full resolution view



- [Search InfoBank](#)

SA03 RK40 SP33 RK44 RK01
RK41 RK51

Final Reporting: The Google Earth Map

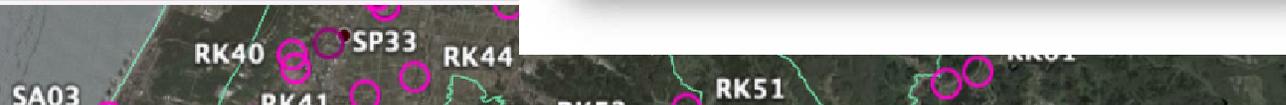


RK34

- Site Number -- RK34
- Name -- Coastal Landslides South of Route 373 -- Several colluvial/residual shallow failures were observed behind some nearby structures. These are more detail. The road in this location were closed due to Slides 1, 2, 3 as:
 - Slide 1 - Located in previous area of instability, a shotcrete sta ~115m), and overlain with a wire-mesh rock deflection system. Slid moved into wire-mesh, causing failure of meshing and pulling out of majority on the road, with only slight quantity of debris over road edge
 - Slide 2 -- Similar to Slide 1. Slide is 10 m wide, 15 m long, 0.5 m thick
 - Slide 3 -- Similar to Slide 1. Slide is 10 m wide, 15 m long, 1 m thick supports were torn away from the slope.
 - Slide 4 -- Similar to Slide 3, however slide debris did not reach wire-wide, 25 m long, 0.5 m thick. Failure plane has approximate 50° in
 - Slide 5 -- Slide area is below road with head scarp located in the col unknown.
 - Slide 6 and 7 -- Slide area consists of two slopes with raveling failure that this slope has undergone failure in the recent past. Failure plan
 - Slide 8 -- Several additional areas of shallow landsliding were observed
- Lat (dec. deg.) -- 37.48455
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Final Word: The Google Earth Map Requires a Perpetual Server Presence

- .kmz files are too large. Server links are necessary.
- Data reports are preserved on USGS servers 'forever'
- CMG INFOBANK is a highly structured and well managed data storage and delivery platform.
- GEER needs to rely on, or duplicate this USGS capability

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InfoBank Terms: [Activity ID](#) [activity overview](#) [crew](#) [formal metadata](#) [lines](#) [metadata](#) [NGDC](#) [port stops](#)
[project/theme](#) [region](#) [ship](#) [stations](#) [time](#) [virtual globe](#) [year](#)

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Data Formats: [ARC coverage](#) [E00](#) [FGDC metadata](#) [gridded/image](#) [imaging](#) [material](#) [scattered/swath](#) [Shapefile](#)
[vector/polygon](#)

Keyword First Letter: [A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#) [J](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [Q](#) [R](#) [S](#) [T](#) [U](#) [V](#) [W](#) [X](#) [Y](#) [Z](#)

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