1) Landslides are one of the most widespread natural hazards on Earth, responsible for thousands of deaths and billions of dollars in property damage every year.

2) In U.S. alone landslides can occur in any state, and they cause an estimated $2 billion in damages and 25–50 deaths each year (FEMA).

3) Rainfall is the primary causative factor.

4) Currently, no system exists at regional or global scale to detect heavy rainfall that may trigger landslides.

### Landslides Death Toll

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962-1970</td>
<td>Peru (Ancash)</td>
<td>5,000 death</td>
</tr>
<tr>
<td>10/30/1998</td>
<td>Nicaragua</td>
<td>&gt;2000 death</td>
</tr>
<tr>
<td>10/08/2005</td>
<td>Solola, Guatemala</td>
<td>&gt;1800 death</td>
</tr>
<tr>
<td>2/17/2006</td>
<td>Layte, Philippines</td>
<td>buried entire village( 1500)</td>
</tr>
<tr>
<td>1/10/2005</td>
<td>La Conchita, CA</td>
<td>12 death</td>
</tr>
<tr>
<td>01/04/2006</td>
<td>Jakarta, Indonesia</td>
<td>entire village</td>
</tr>
</tbody>
</table>
Global Rainfall-induced Landslide Monitoring System

Surface controlling factors

- Topography: DEM, Slope, Aspect
- Soil Property: Sand, Foam, Silt, Clay
- Land Cover: Shrub, barren, built-up
- Geology: Lithological makeup
- Morphology: Curvature, Concavity
- Hydrology: Soil Moisture, FD, FA

Landslide Susceptibility

- Rainfall Trigger: Intensity-Duration
- Slope-Stability: Hierarchical Decision Tree
- Classification: Soil Moisture
- Decision Making: Inventory Data

Detection/Warning
- When
- Where
- Damage

Enhance, Correct, and Validate

Local Inventory Database

Regional Decision Support System
Global Landslide Hot Spots (warm color) Map Developed NASA GSFC

Philippines Landslide and TRMM Rainfall Accumulation

Philippines
Feb 8-17, 2006
Near Real-time Global Rainfall-induced Landslide Monitoring/Warning System

Rainfall Map $\Rightarrow$ Intensity-Duration $\Rightarrow$ Susceptibility/ $\Rightarrow$ Landslide Warning

TRMM Near Real-Time Rainfall at location 76.875 W, 4.125 N
1) the last 24 hour rainfall accumulation $> 103$mm
2) The Susceptibility Map shows high or very high susceptibility

News Report: 13 Apr 2006, At least 34 people missing in Colombian mudslide