GPS Early Warning System for S. California

Yehuda Bock and Brendan Crowell

Cecil H. and Ida M. Green Institute of Geophysics and Planetary Physics Scripps Institution of Oceanography La Jolla, California

> 2007 HPWREN Users Meeting Point Loma November 6, 2007

GPS RT Monitoring

Applications Earthquake Geodesy

- Earthquake Geodesy (coseismic motions)
- GPS Seismology (dynamic motions)
- Volcano monitoring
- Landslide monitoring
- Tsunami warning
- Structural monitoring
- Glaciology





Displacement waveforms, 2004 Parkfield event

LA freeway after 1994 Northridge earthquake

California Real Time Network



(http://sopac.ucsd.edu/projects/realtime/)

 Stations span major faults of southern San Andreas fault system

 Combination of PBO and SCIGN stations

 Stations stream over dedicated radio links 1 Hz GPS data with a latency of a fraction of a second using HPWREN and other communications infrastructure

• Displacement waveforms are generated independently every second by instantaneous positioning

Imperial Valley Subnetwork



• Imperial Valley installations are ongoing (blue circles are active sites, gray ones will be upgraded)

• Latest addition to CRTN. Collaboration of PBO and SOPAC. Use HPWREN infrastructure

 Narrowest part of the North America – Pacific plate boundary in southern California

• Mw 6.4 strike slip earthquake in 1979 at a depth of 6 km, ruptured 45 km with 0.6 m slip

(http://sopac.ucsd.edu/projects/realtime/)

Typical CRTN Site Infrastructure



Banner Communications Hub











Palomar Observatory (PMOB)



Triangulation Scheme

- Create a Delaunay triangulation of the network every second
- Compute relative positions of each triangle
- Convert to principal components of strain (2D)
- Establish detection criteria to isolate an event
- Determine an anchor point for computing absolute positions



