

# The Eureka Earthquake of January 9, 2010, Recent Tsunamis, and Lessons for California



September 29 M8.0, 7.9 Samoa

QuickTime™ and a  
decompressor  
are needed to see this picture.

April 4 M 7.2 Baja

QuickTime™ and a  
decompressor  
are needed to see this picture.

January 9 M 6.5 offshore Eureka



February 27 M 8.8 Chile

Lori Dengler, Humboldt State University  
Prevention First October 20, 2010



# A Quick Report Card

Earthquake-resistant design QuickTime decompression are needed to see non-structural damage me™ and a npressor see this picture.

What Californians do during the earthquake me™ and a npressor see this picture.

Tsunami education QuickTime decompression are needed to see Educating transients me™ and a npressor see this picture.

The new *advisory* QuickTime decompression are needed to see Understanding what it means me™ and a npressor see this picture.

Beginning to think tsunami when the ground shakes QuickTime decompression are needed to see

Getting in the car to evacuate me™ and a npressor see this picture.

Professional emergency response planning QuickTime decompression are needed to see

Some events will knock your best plans out me™ and a npressor see this picture.

# The earthquake grade

## Earthquake-resistant design

QuickTime  
decompr  
are needed to see

QuickTime™ and a  
decompressor  
are needed to see this picture.

QuickTime™ and a  
decompressor  
are needed to see this picture.

*Concepción*

*Santiago*

# Roads, bridges, lifelines

me™ and a  
pressor.  
see this picture.



*Tabul*

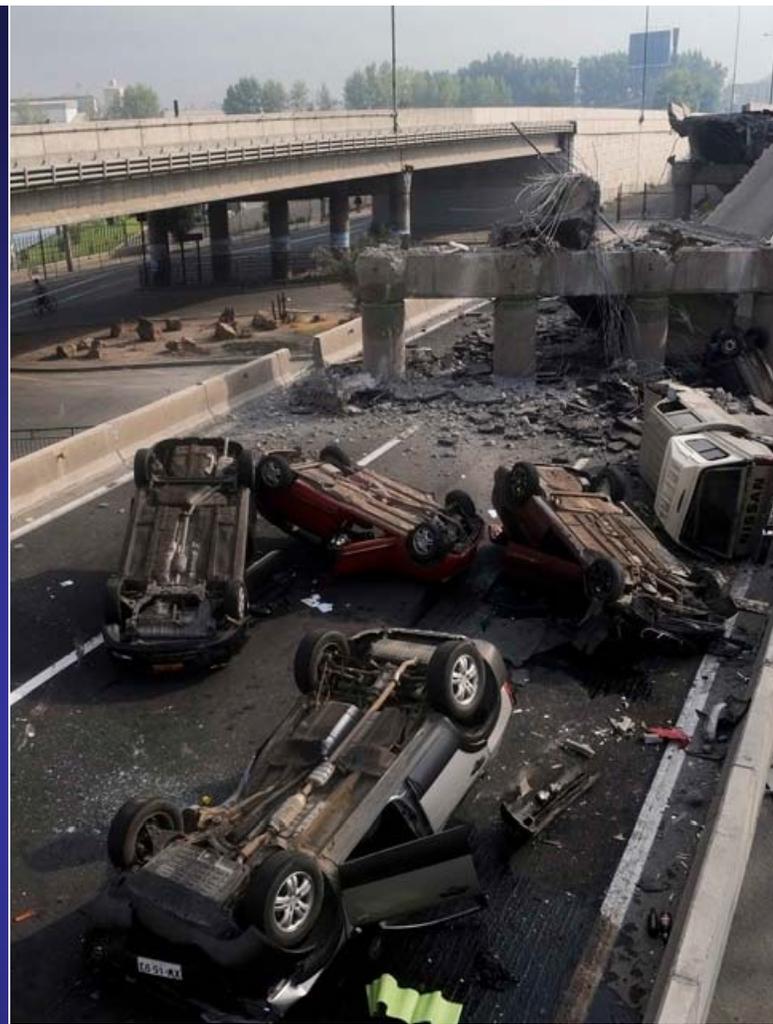
## REGION V

Authorities shut down the Lo Gallardo bridge,  
The road F-98-G closed due to landslides  
Ruta H-40 road's Coinco bridge was shut down.  
Ruta H-634 road was shut down.

## REGION VII

Ruta K-60 road closed due to collapsed bridges  
Escalones overpass collapsed.....

*Report March 2, 2010*



*Santiago*

# Non-structural damage

me™ and a  
mpressor.  
see this picture.

QuickTime™ and a  
decompressor  
are needed to see this picture.

*Chile*



*Eureka*

QuickTime™ and a  
decompressor  
are needed to see this picture.

*Chile*



*Calexico*

# Responding the wrong way while the ground is shaking

me™ and a  
mpressor  
see this picture.

QuickTime™ and a  
decompressor  
are needed to see this picture.

## North Coast Response

<u>What People Did</u>	<u>Percent</u>
Run outside	10.6%
Walk outside	10.9%
Drop, cover, hold-on	12.1%
Move to doorway	24.6%
Stay in one spot	30.9%
Took no action	10.9%

Chris Durant, Times-Standard reporter runs out of his office on January 9, 2010

**DROP, COVER, HOLD ON !!**

**Register TODAY and participate tomorrow**

**in the Great California ShakeOut      [shakeout.org](http://shakeout.org)**

# The Tsunami Grade

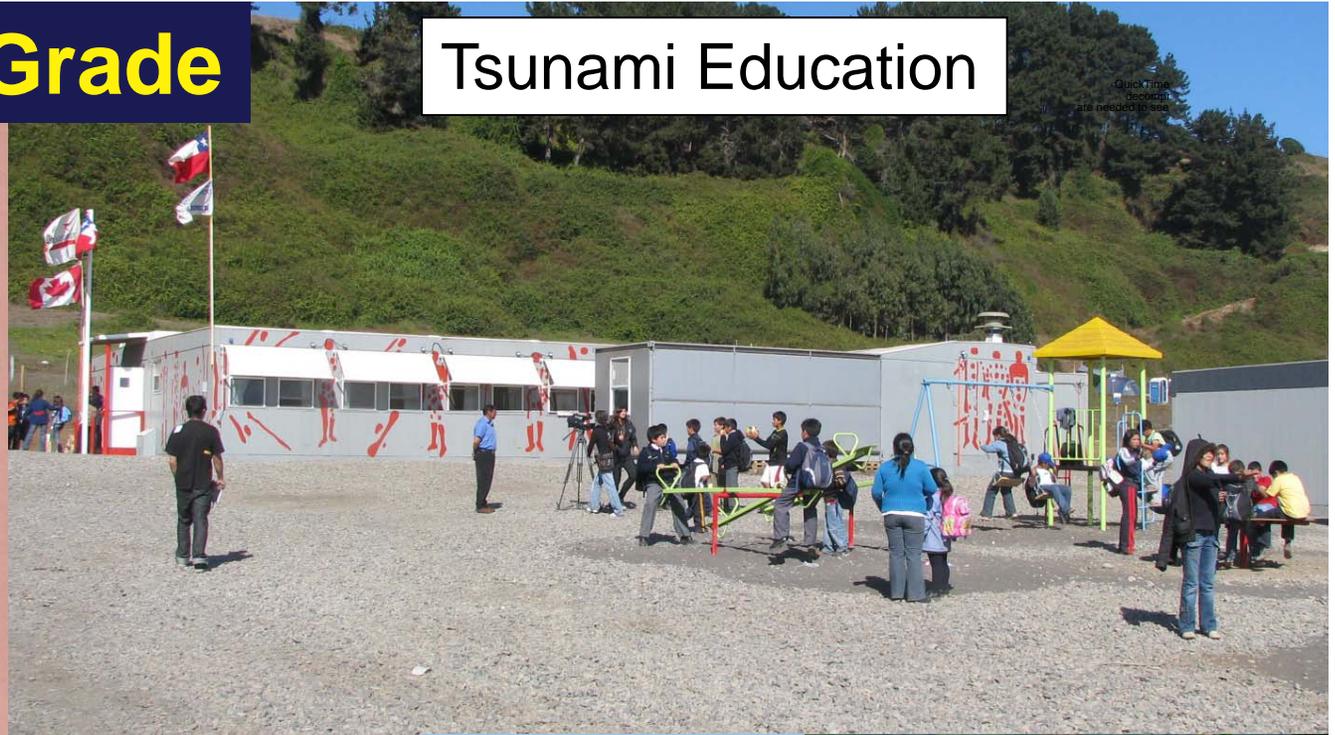
# Tsunami Education

## TERREMOTOS Y TSUNAMIS O MAREMOTOS



ENSEÑANZA MEDIA  
TEXTO GUIA PARA EL PROFESOR

SERVICIO HIDROGRAFICO Y OCEANOGRAFICO DE LA ARMADA DE CHILE  
COMISION OCEANOGRAFICA INTERGUBERNAMENTAL  
CENTRO INTERNACIONAL DE INFORMACIONES DE TSUNAMI



# No education for transient populations

me™ and a  
repressor  
see this picture.



# The New Advisory Alert Level

QuickTime  
decompr  
are needed to see

QuickTime™ and a  
decompressor  
are needed to see this picture.

Strong currents in ports and harbors. No  
flooding on land normally dry expected.

# LOTS of Confusion about what it means

me™ and a  
pressor  
see this picture.

## Samoa tsunami and the California coast:

TSUNAMI INFORMATION STATEMENT **NUMBER 1**  
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK  
**1104 AM PDT TUE SEP 29 2009**

NO WARNING... NO WATCH AND NO ADVISORY IS IN EFFECT FOR  
THE STATES AND PROVINCES LISTED ABOVE.

### EVALUATION

SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED WHICH  
MAY HAVE BEEN DESTRUCTIVE ALONG COASTS NEAR THE  
EARTHQUAKE EPICENTER.

**A DAMAGING TSUNAMI IS NOT EXPECTED ALONG THE CALIFORNIA/  
OREGON/WASHINGTON/ BRITISH COLUMBIA AND ALASKA COASTS**  
ALTHOUGH SOME OF THESE AREAS MAY EXPERIENCE NON-  
DAMAGING SEA LEVEL CHANGES.

## But then the analysis changes:

BULLETIN

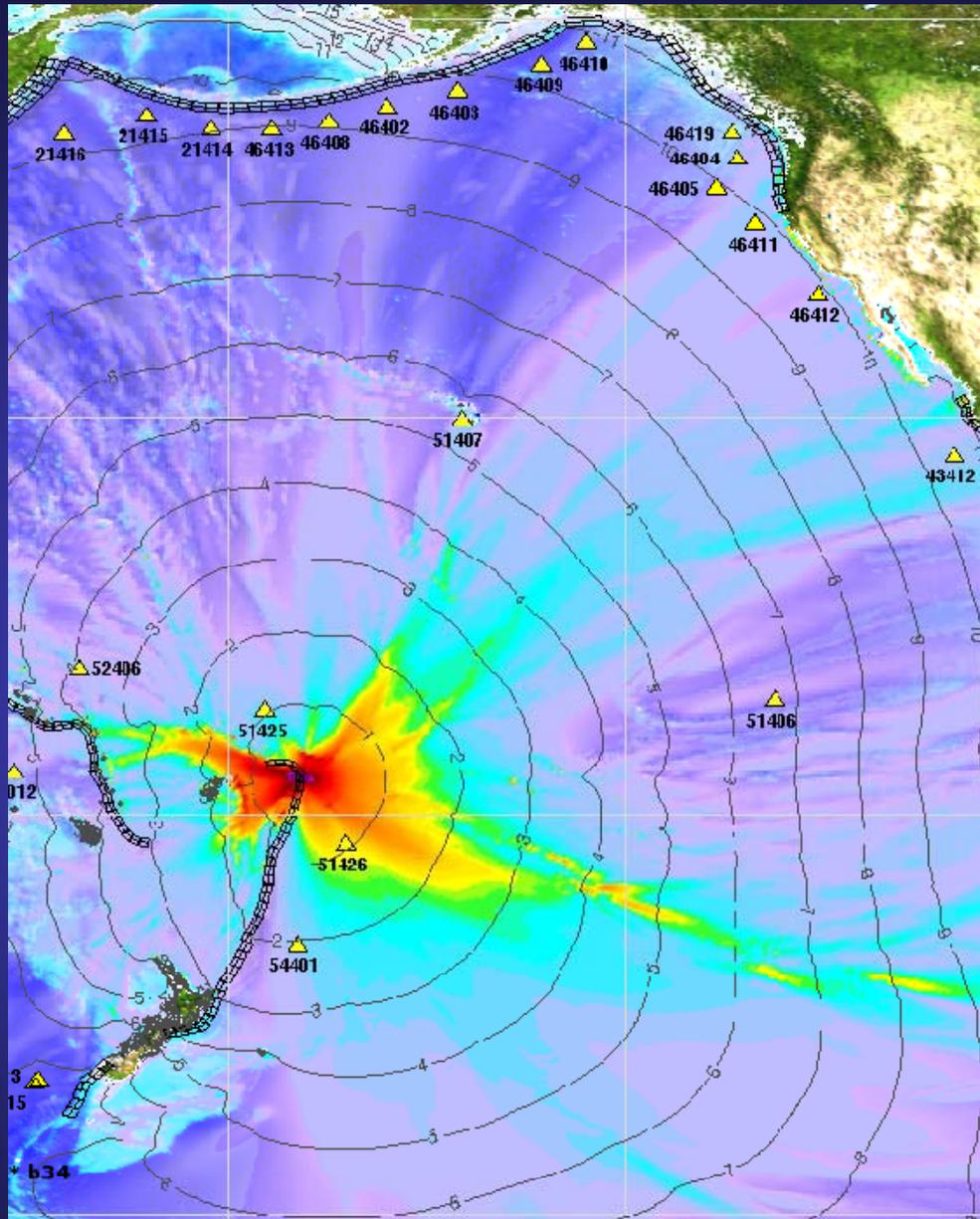
TSUNAMI MESSAGE NUMBER 3

NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK  
302 PM PDT TUE SEP 29 2009

...A TSUNAMI ADVISORY IS IN EFFECT WHICH INCLUDES THE  
COASTAL AREAS OF CALIFORNIA AND OREGON FROM THE  
CALIFORNIA-MEXICO BORDER TO THE OREGON-WASHINGTON  
BORDER...

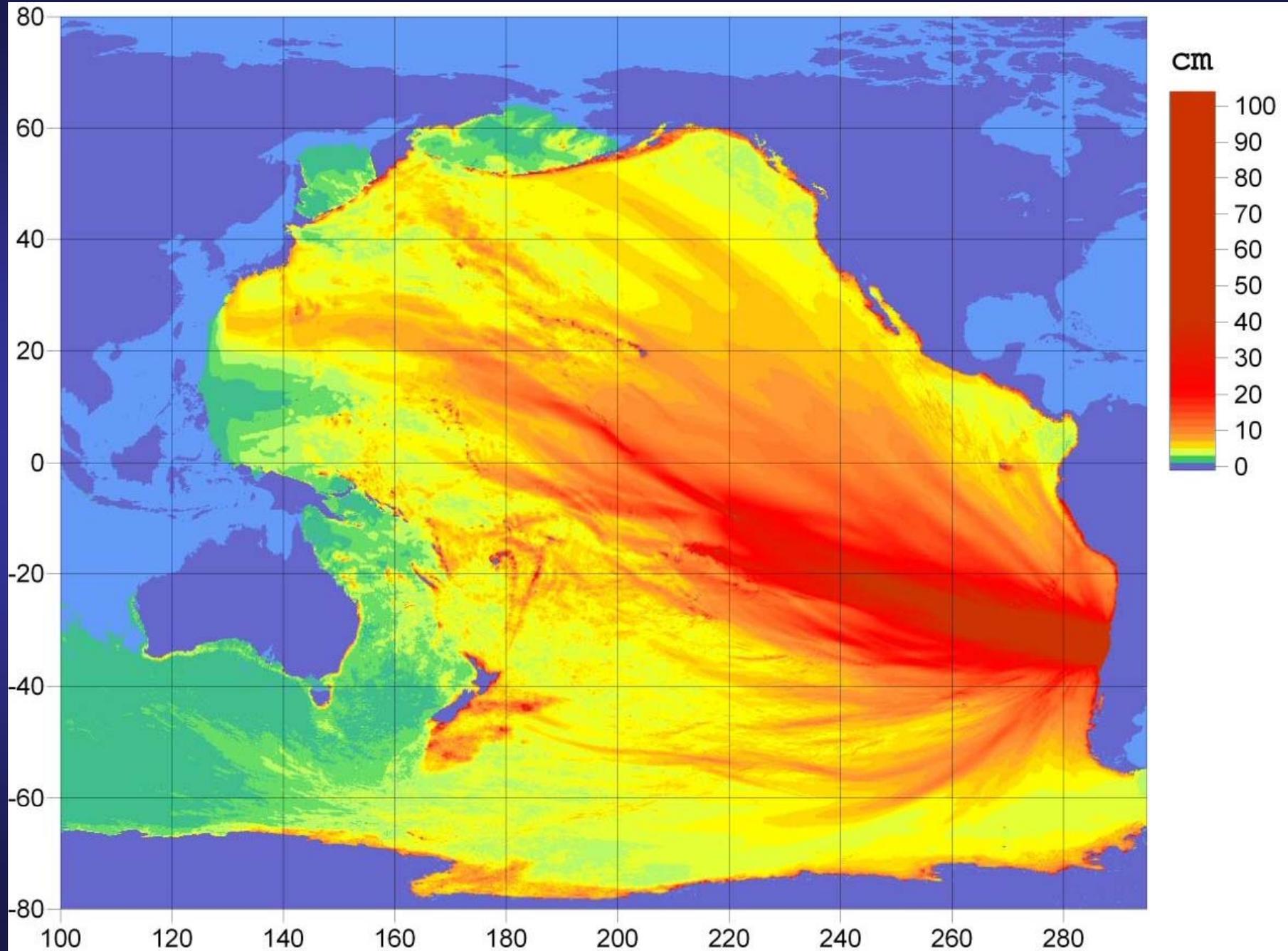
...THIS MESSAGE IS INFORMATION ONLY FOR COASTAL AREAS OF  
WASHINGTON - BRITISH COLUMBIA AND ALASKA FROM THE  
OREGON-WASHINGTON BORDER TO ATTU ALASKA...

First time the new *advisory* bulletin issued by WCATWC



QuickTime™ and a  
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## Similar story for Chile

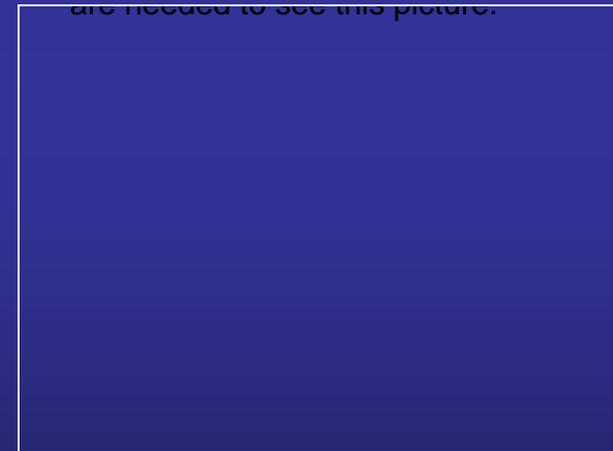


# .....But with greater impact

QuickTime™ and a decompressor are needed to see this picture.



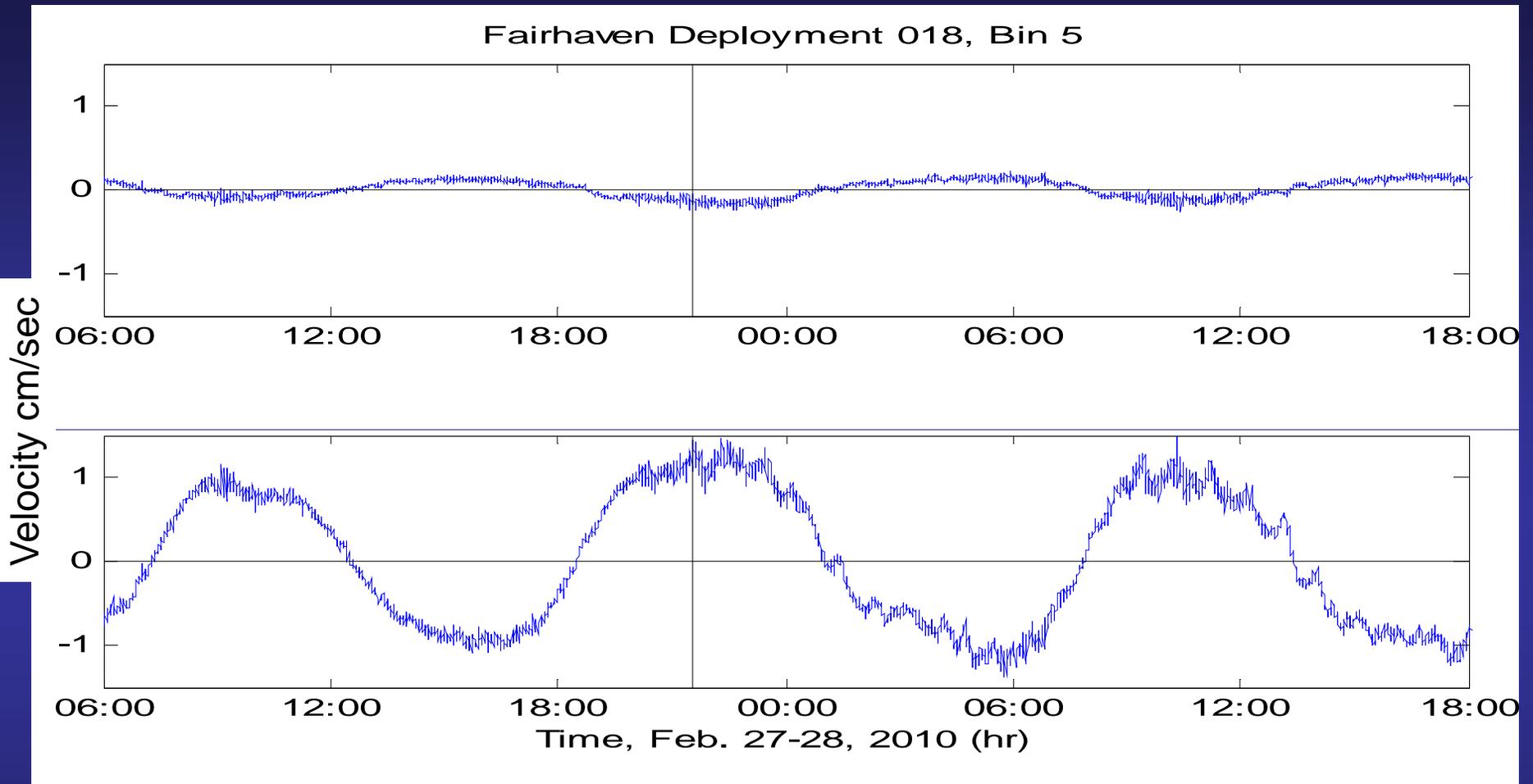
QuickTime™ and a



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## Measuring currents

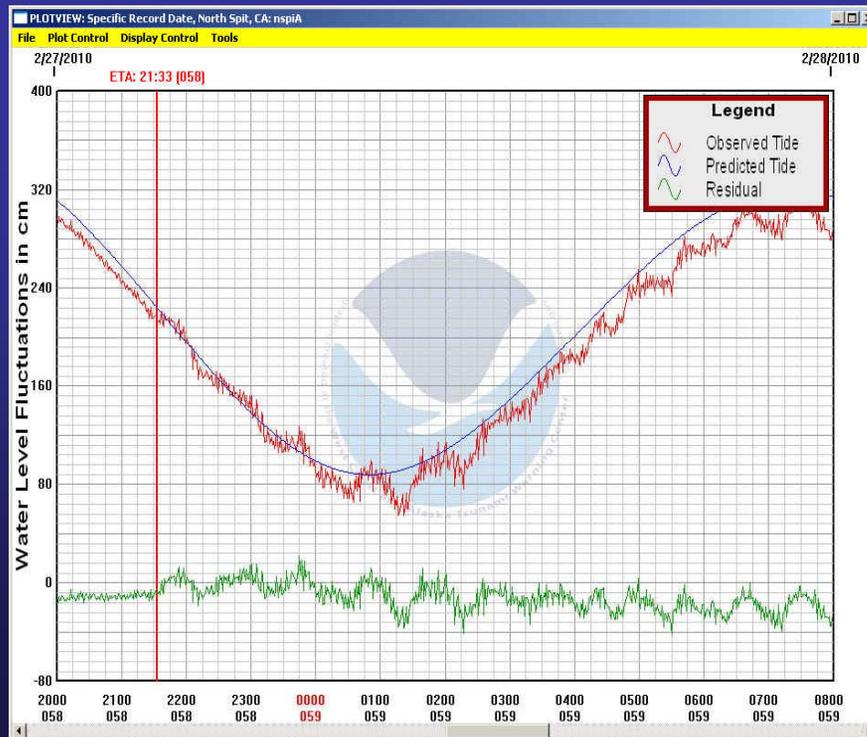


First Acoustic Doppler Current Profiler deployed to specifically study tsunamis  
Fairhaven dock, Humboldt Bay

# Measuring currents

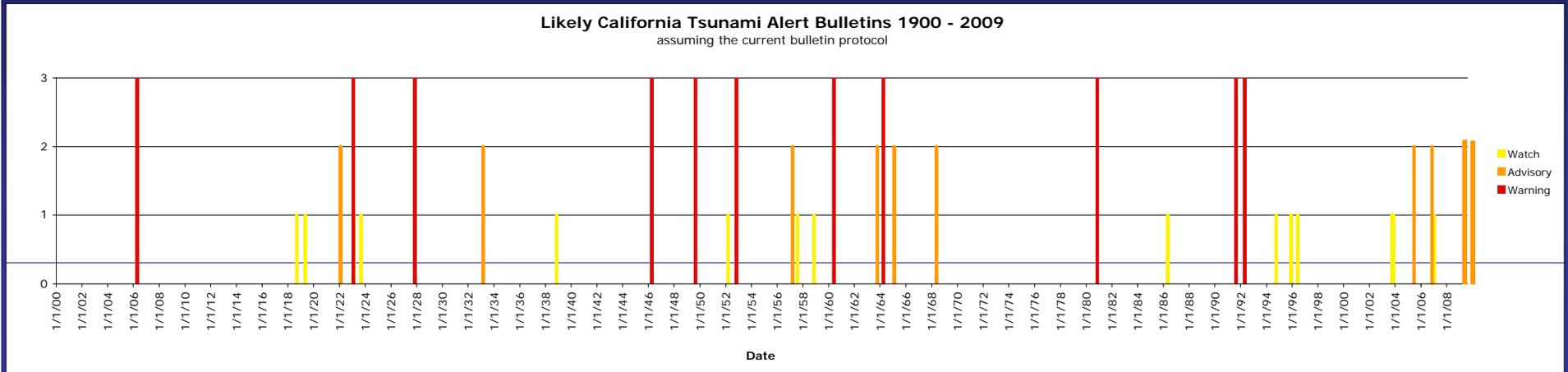
are needed to see the picture.

ADCP



North Spit tide gauge

# Alert bulletins aren't as uncommon as you may think. So you better learn to understand them and have a response plan in place!



11 tsunami warning bulletins - 4 distant, 7 local

100% of distant events (1946, 1953, 1960, 1964) caused damage

0% of local events caused damage

10 tsunami advisory bulletins - 8 distant, 2 local

3 distant events (1957, 2006, 2010) caused damage

13 tsunami watch bulletins - all distant

*There is a 16% chance that a new dispatcher will receive an alert bulletin in their first 6 months on the job*

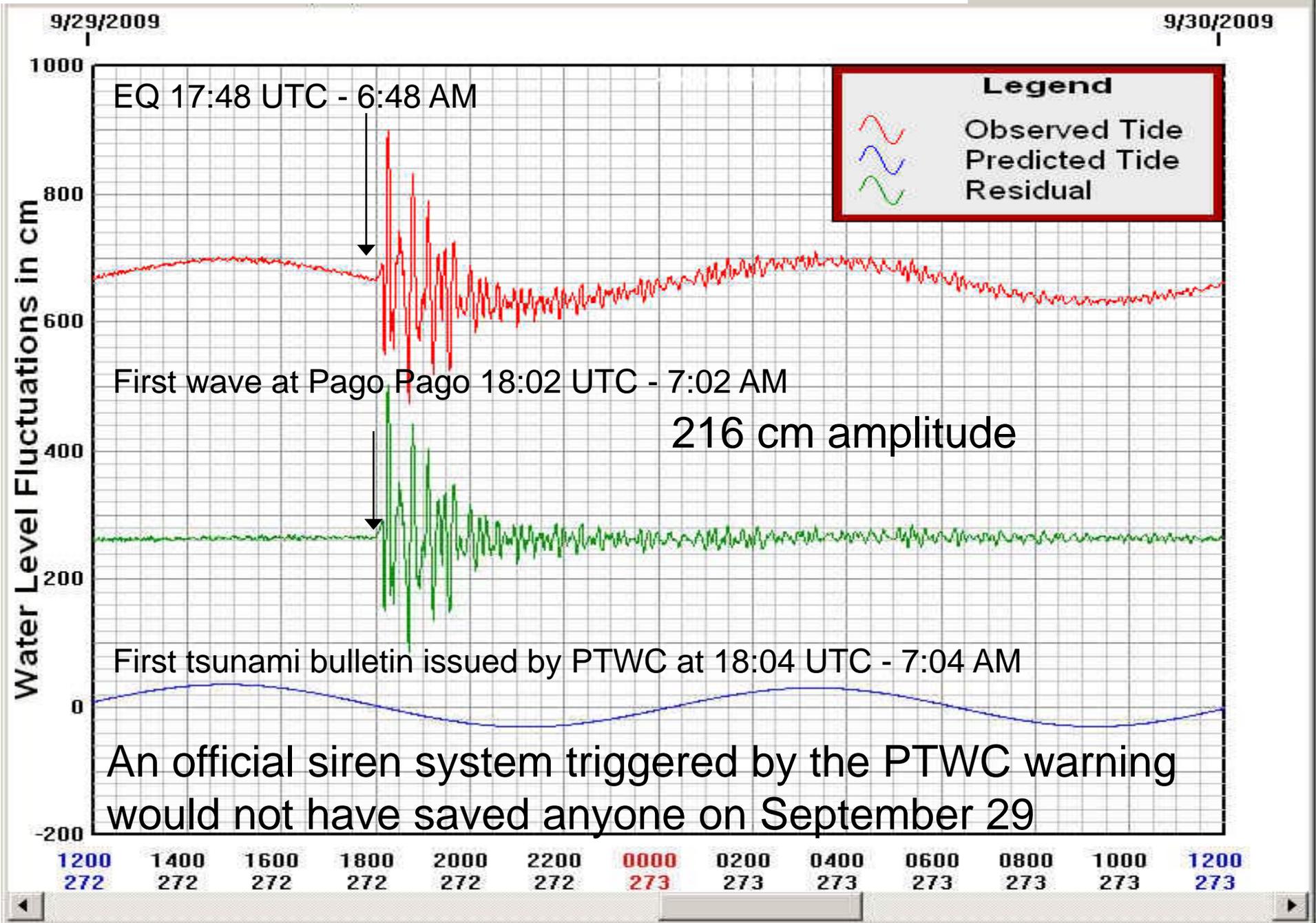
# Beginning to think tsunami when the ground shakes

QuickTime  
decompri  
are needed to see



Responding quickly to the *Natural Warning* saved lives in Samoa

# Why You Shouldn't WAIT for an Official Warning



# Driving cars to evacuate caused problems

me™ and a  
npressor  
see this picture.



# Emergency training and response planning

QuickTime  
decompi  
are needed to see



*Policeman in Iloca*



*Director of Radio Bio Bio, Concepción*



**Some events will knock your best plans out**

**Important Lessons:**

**Be able to improvise**

**Hold exercises where you cannot access  
technology**

**Expect to be on your own for days!!**