



PERÚ

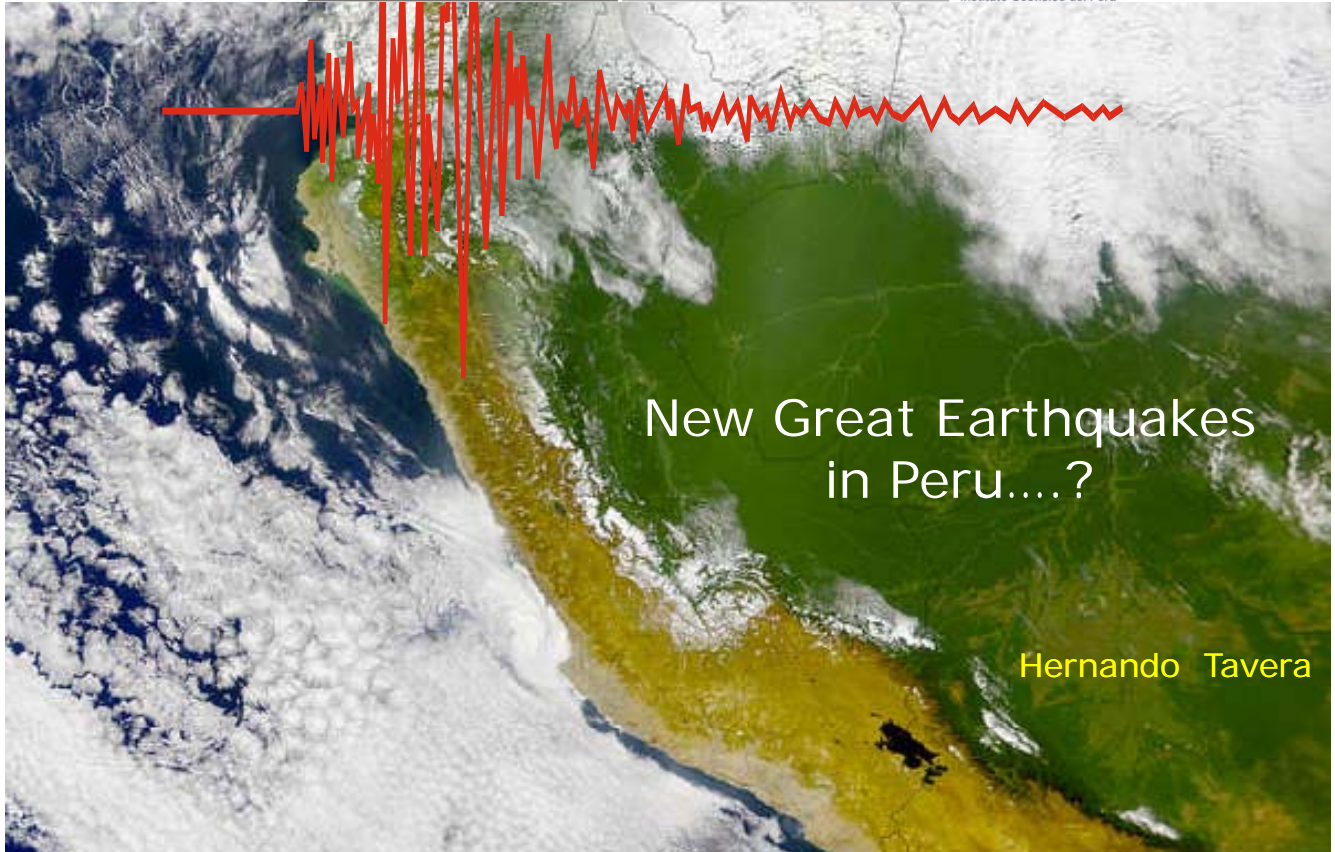
Ministerio  
del Ambiente

Instituto  
Geofísico del Perú



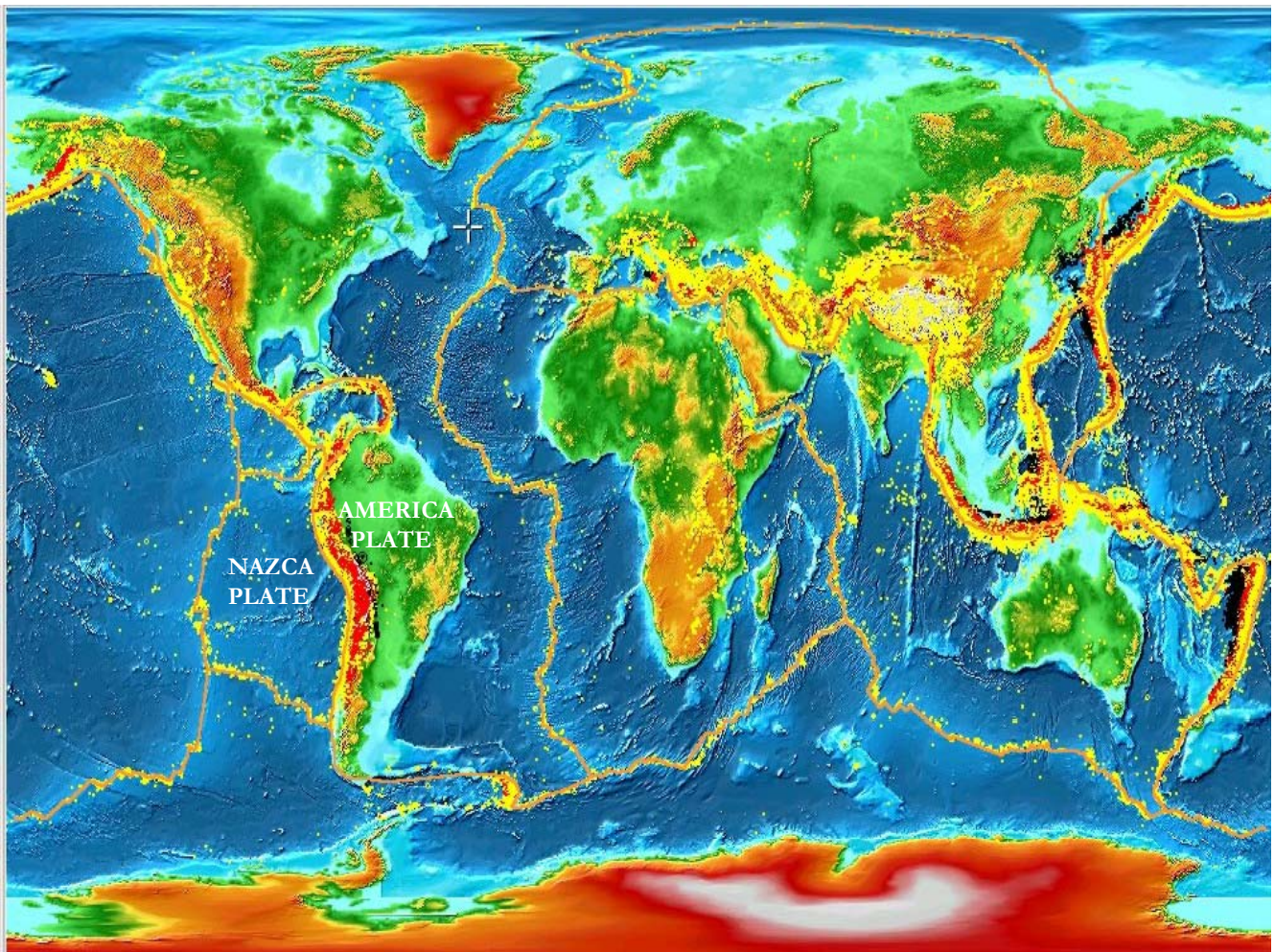
Instituto Geofísico del Perú

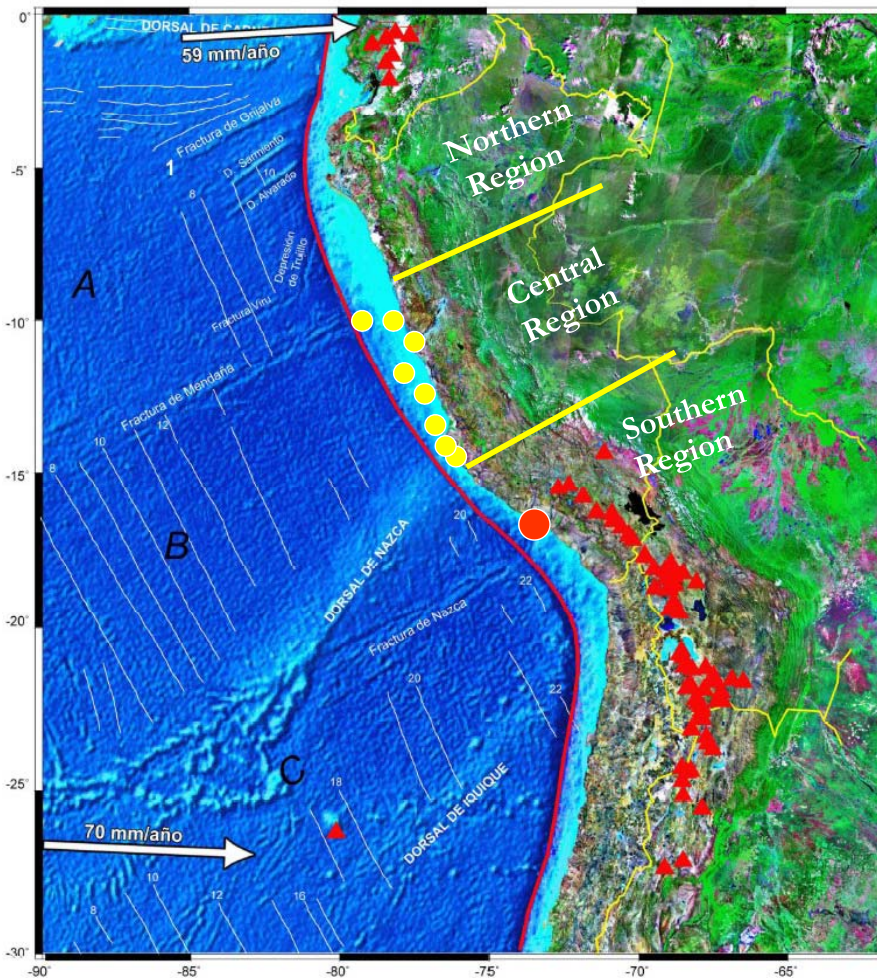
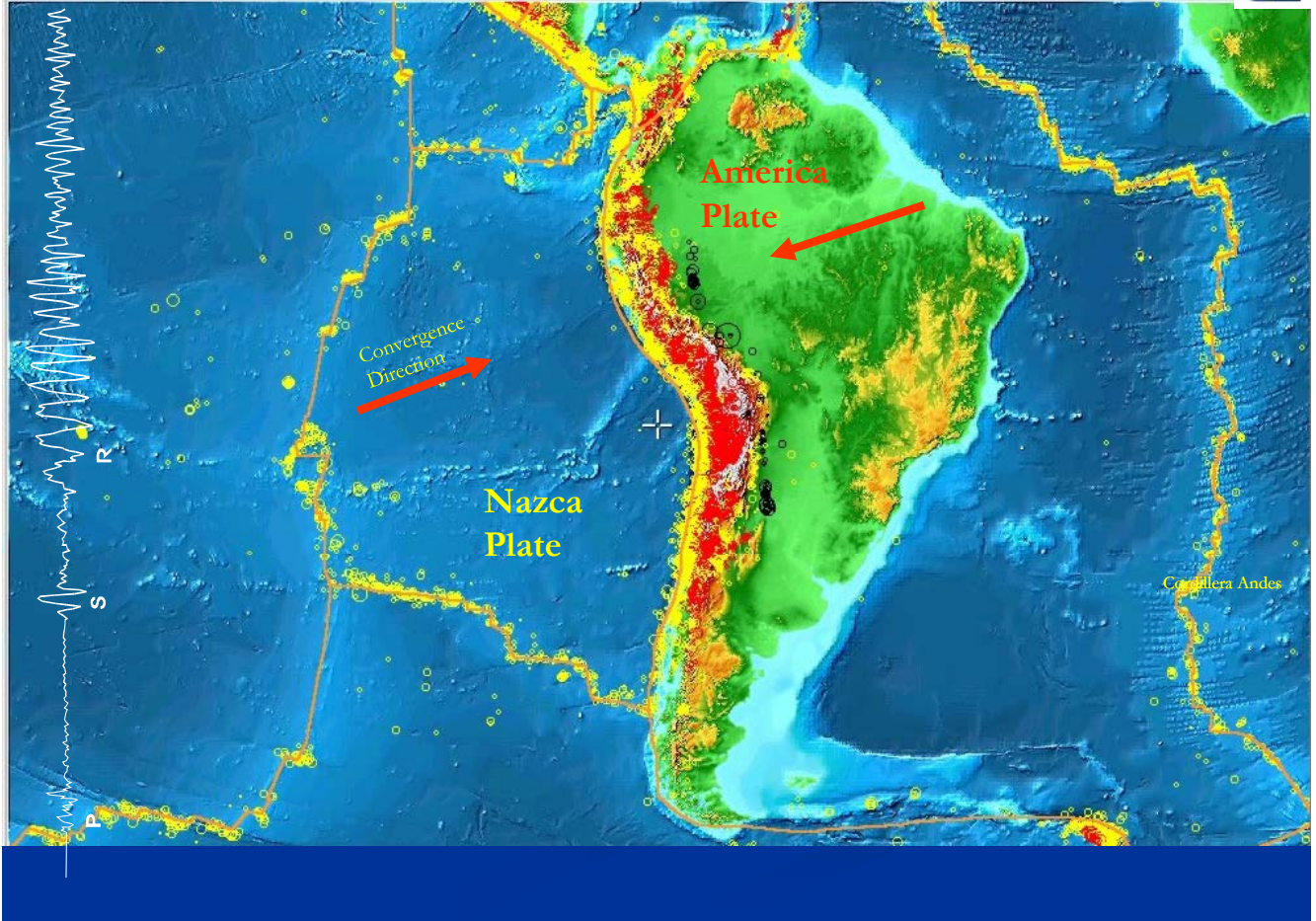
DIRECCIÓN DE SISMOLOGÍA  
Servicio Sismológico



# New Great Earthquakes in Peru...?

Hernando Tavera



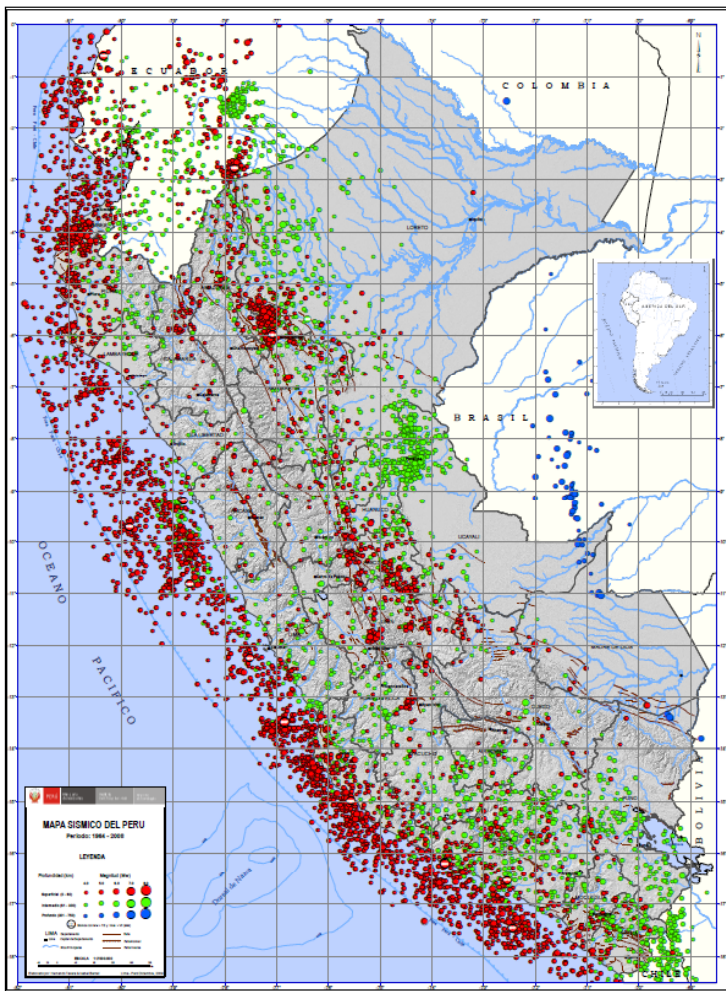


## Great Earthquakes

1900 - 2010

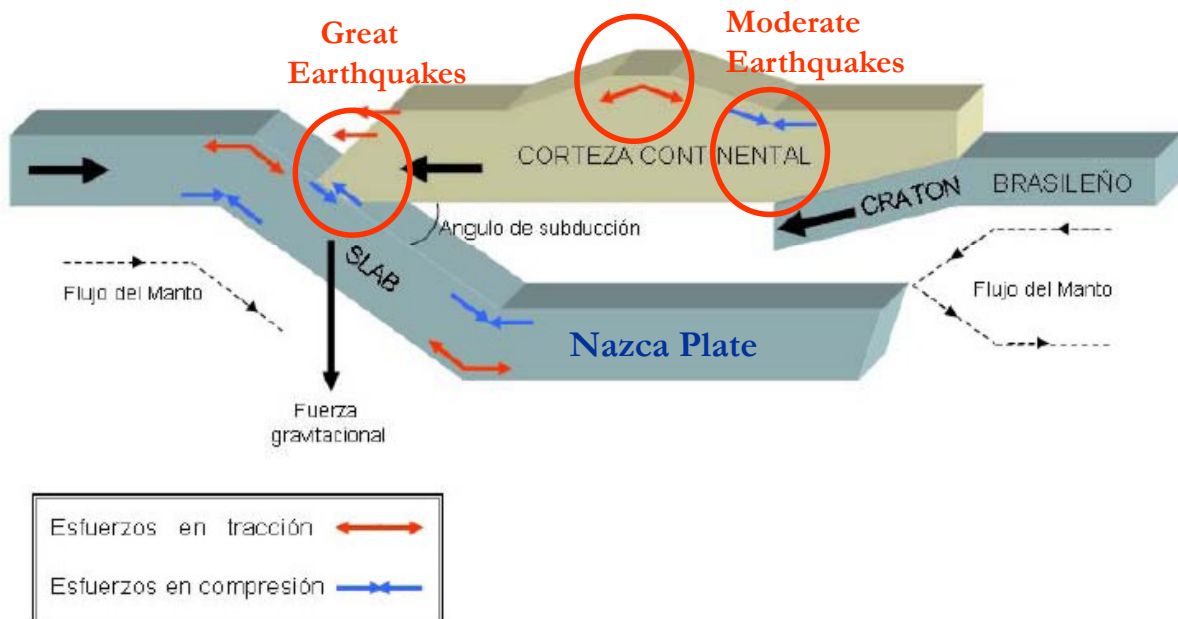
●  $> 8.0 M_w$

●  $7.0 < M_w < 8.0$

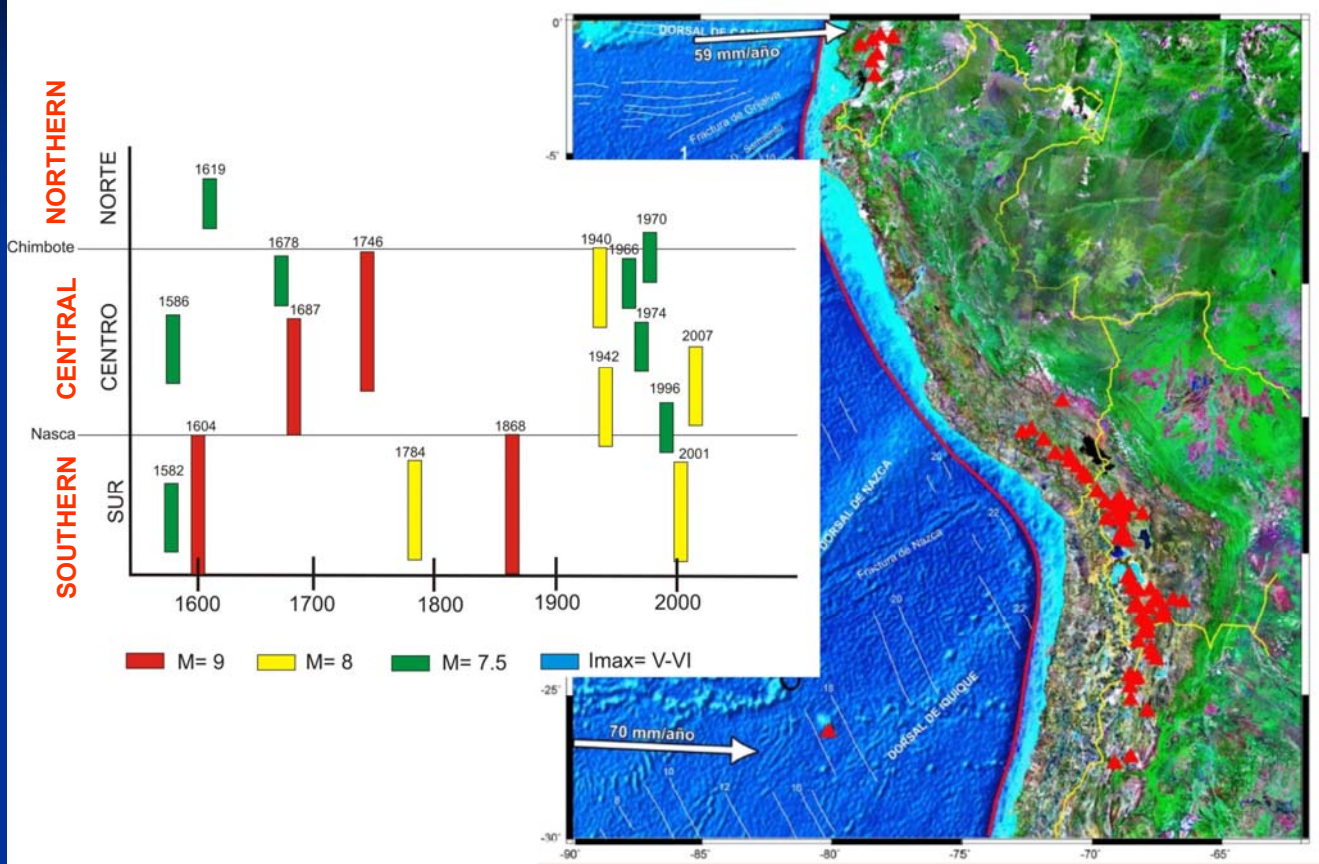


**Peruvian Seismic Map  
1964 - 2008  
(M>4.0)**

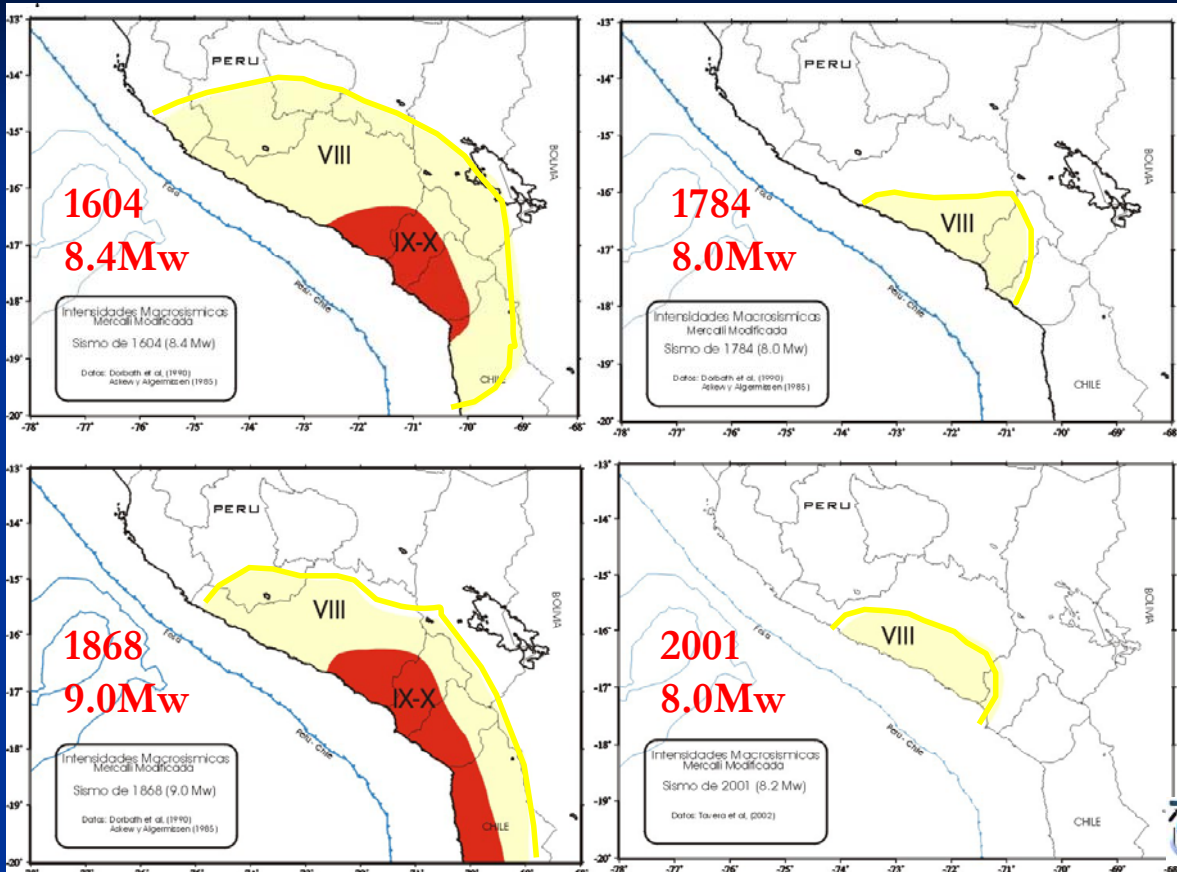
## Seismic Tectonic



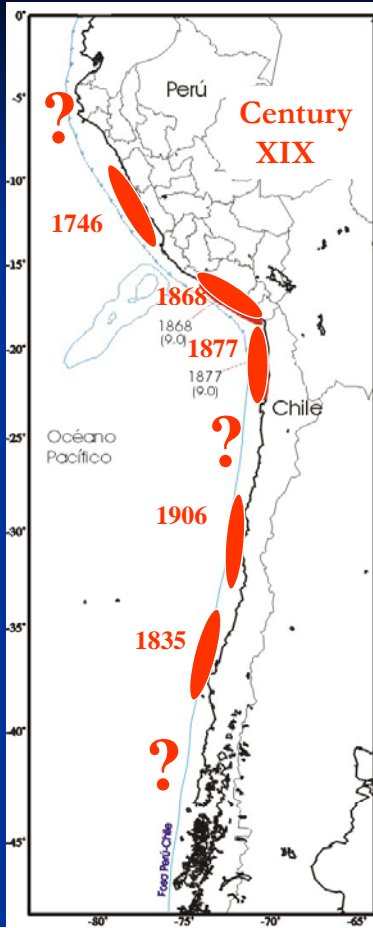
# Historical Great Earthquakes in Peru



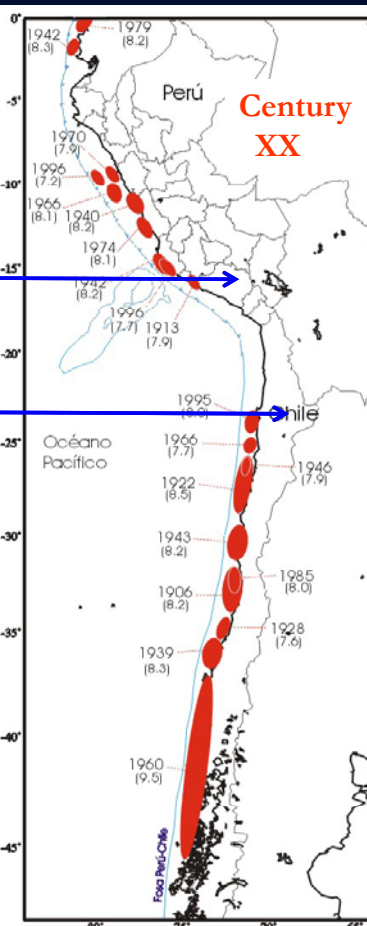
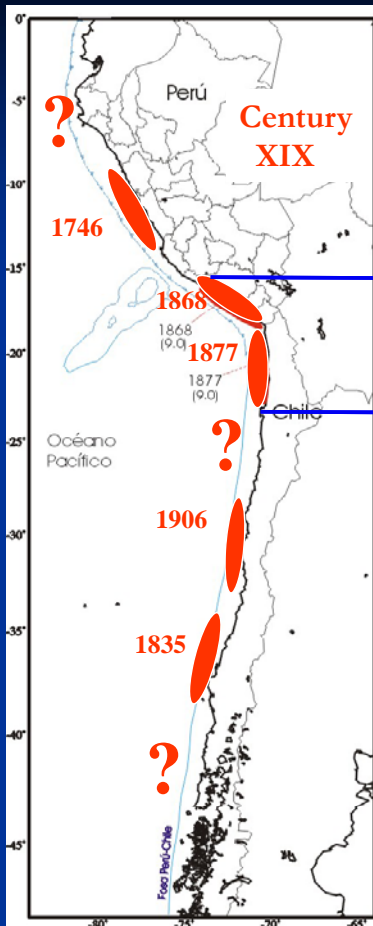
## Great Earthquakes Southern Peru (Giovanni and Beck, 2002)



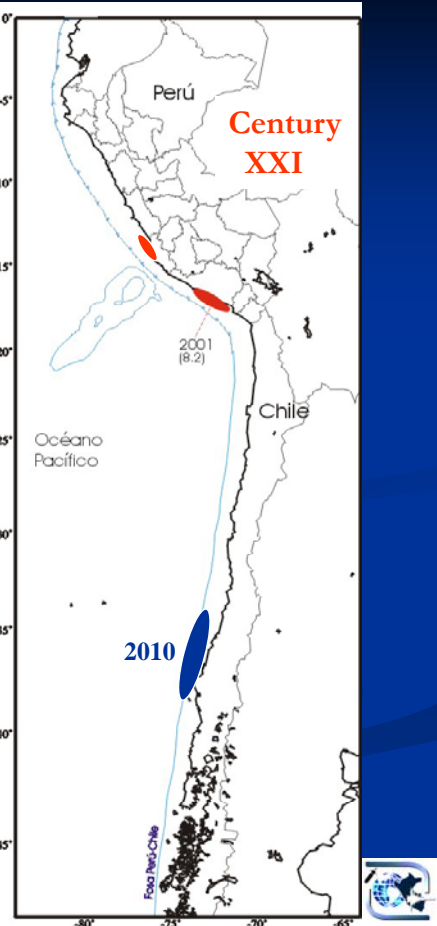
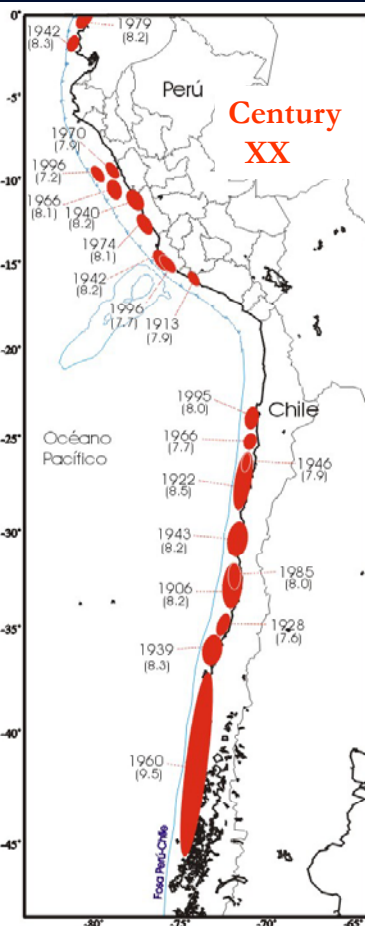
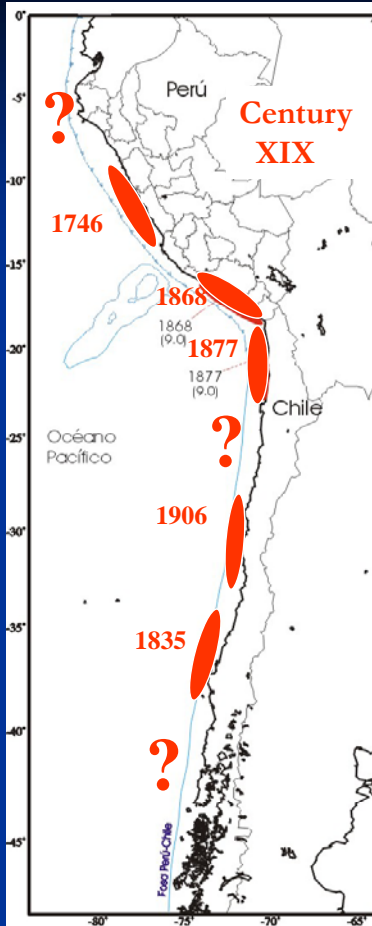
## Great Earthquakes in Chile-Peru



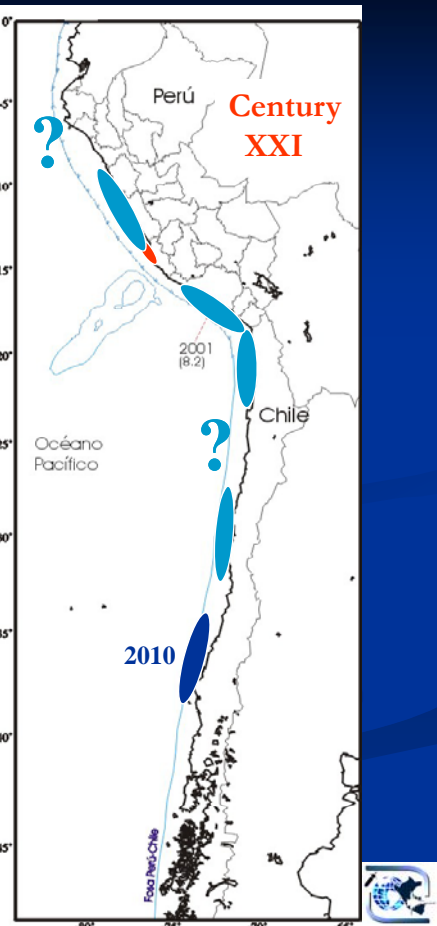
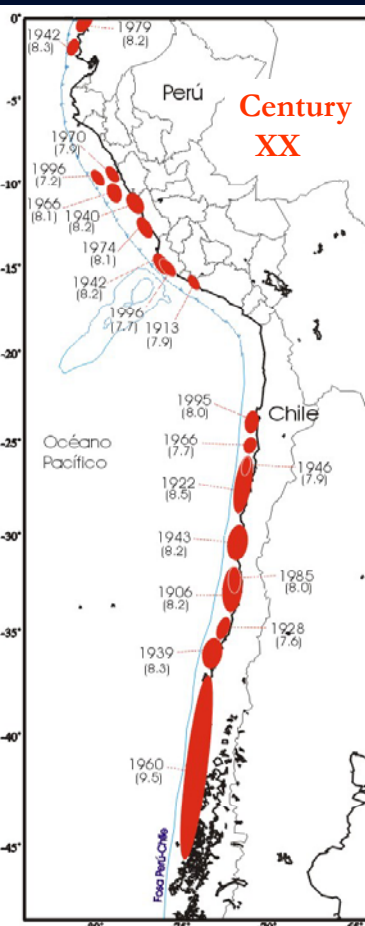
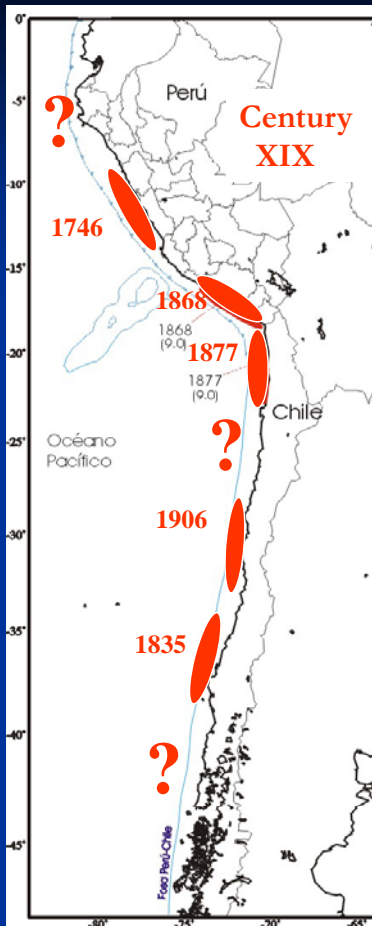
## Great Earthquakes in Chile-Peru



## Great Earthquakes in Chile-Peru

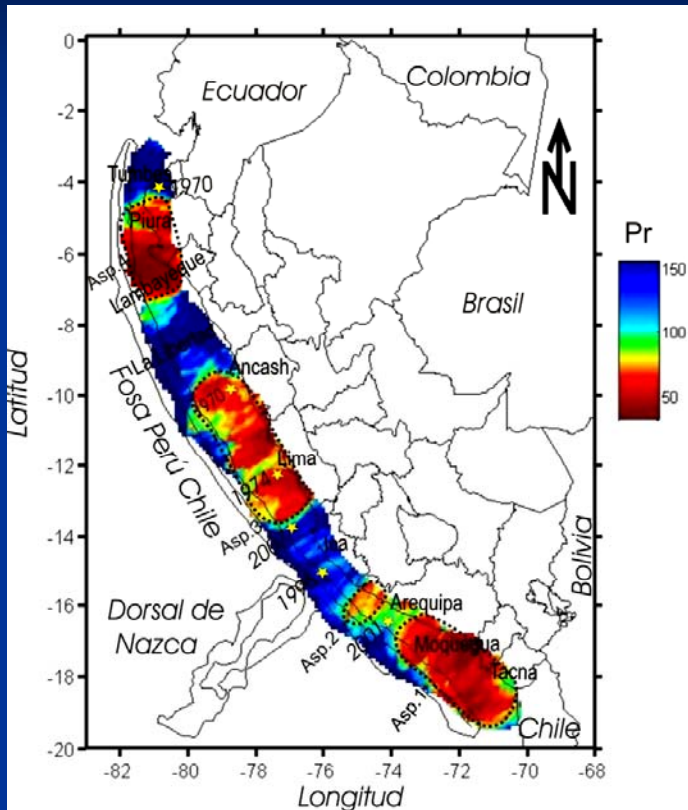


## Great Earthquakes in Chile-Peru



The distribution  
Seismicity analysis →

## “b” Value Distribution in Occidental Border of Peru Prof. Wyss Methodology



### Asperity 4

Piura y Lambayeque  
(4.2° a 7.2°S).

### Asperity 3

Lima y Ancash  
(9.5° a 13.3° S).

### Asperity 2

Norte de Arequipa  
(15.3° S a 16° S).

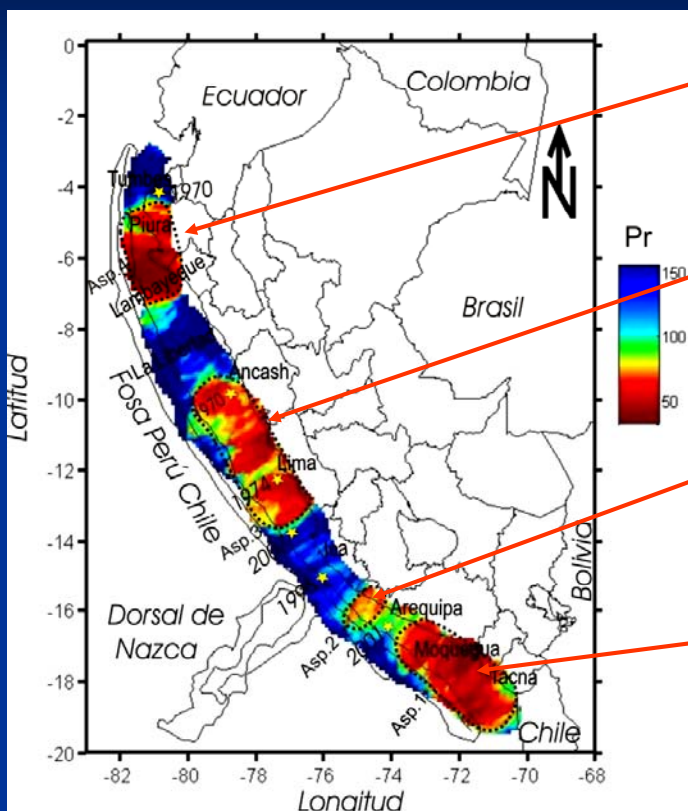
### Asperity 1

Arequipa, Moquegua y Tacna  
(16.5° a 19° S).

Condori et al 2011

13

## “b” Value Distribution in Occidental Border of Peru



### Asperity 4 8.0-8.5 Mw

Piura y Lambayeque  
(4.2° a 7.2°S).

### Asperity 3 8.5-9.0 Mw

Lima y Ancash  
(9.5° a 13.3° S).

### Asperity 2 7.0 Mw

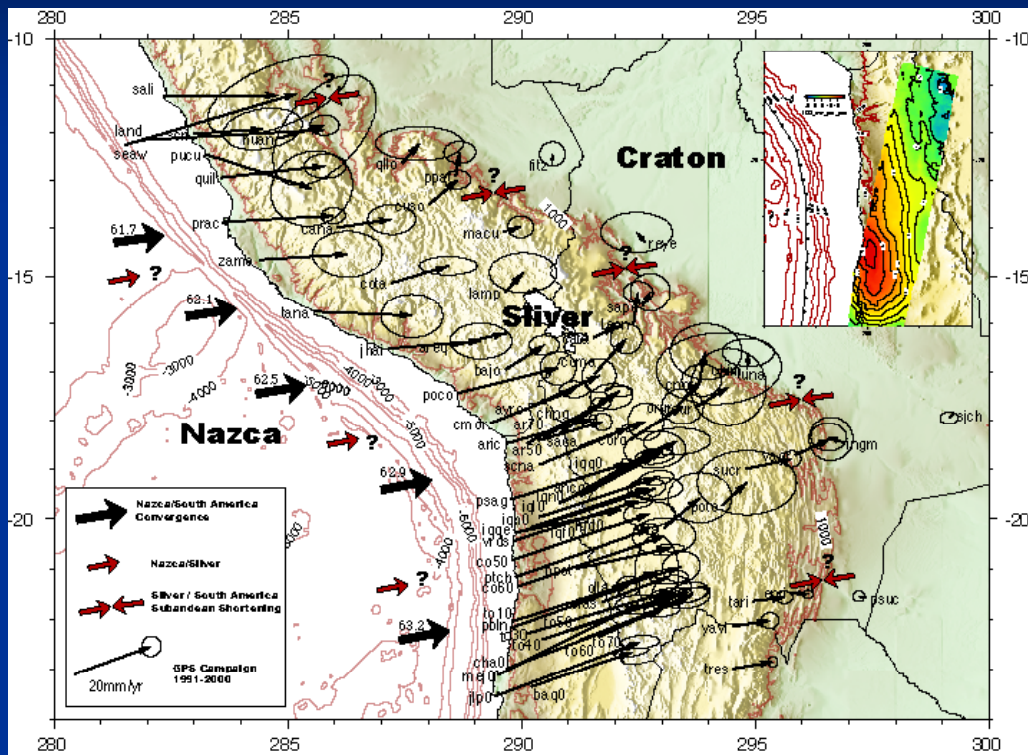
Norte de Arequipa  
(15.3° S a 16° S).

### Asperity 1 8.5.9.0 Mw

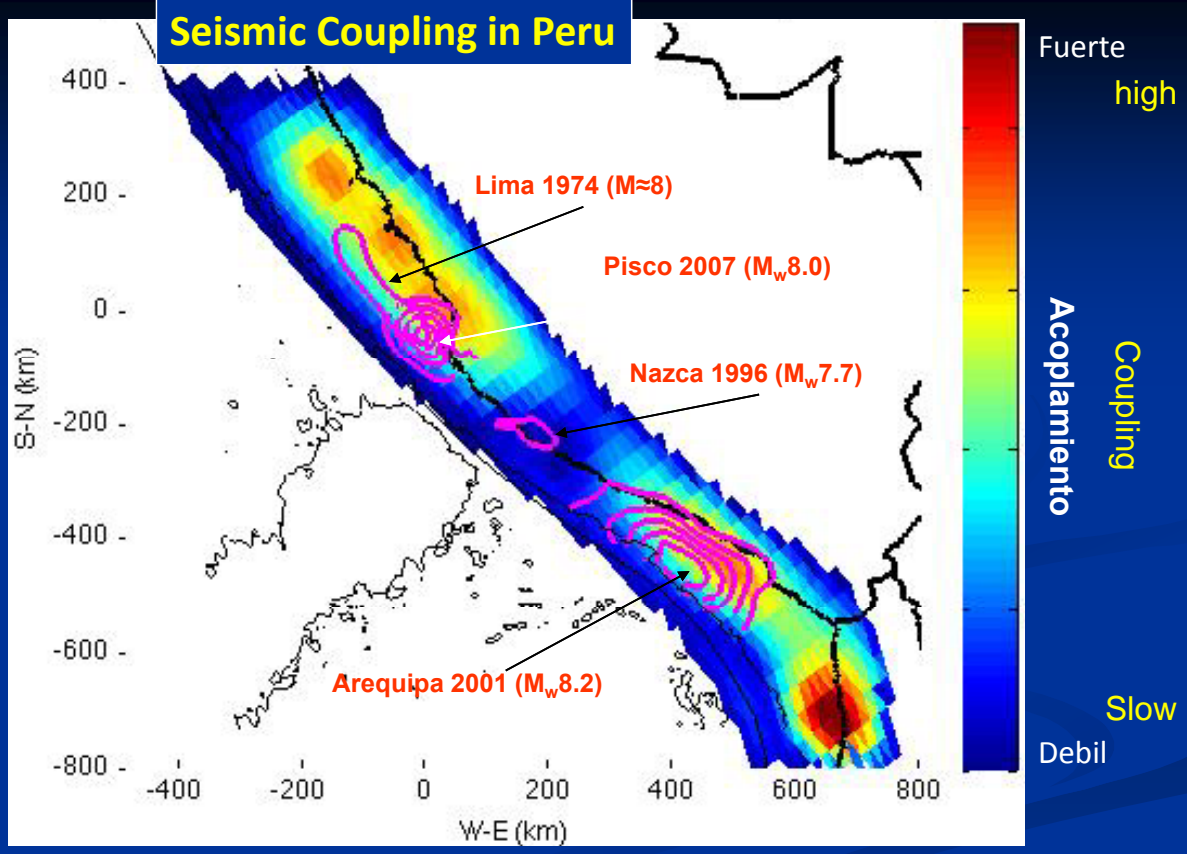
Arequipa, Moquegua y Tacna  
(16.5° a 19° S).

14

# GPS inter-seismic Deformation in Central and Southern Peru



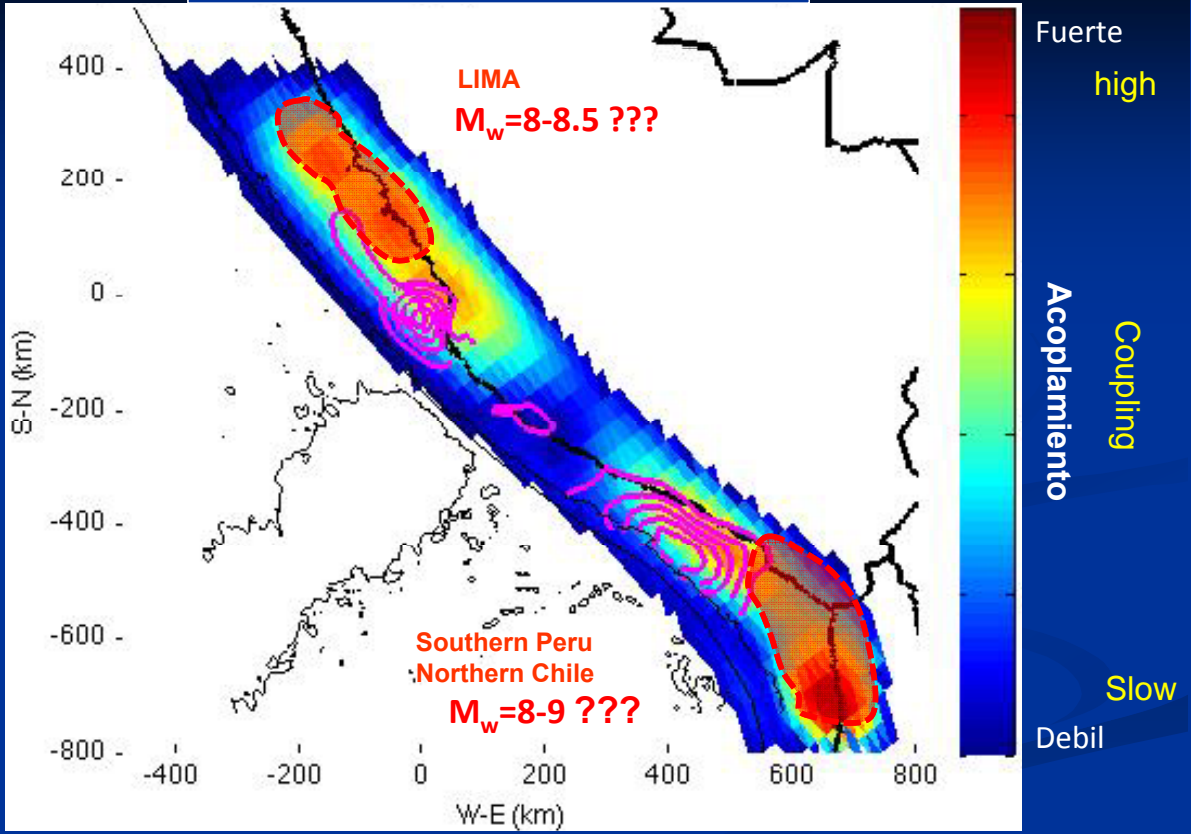
## Seismic Coupling in Peru



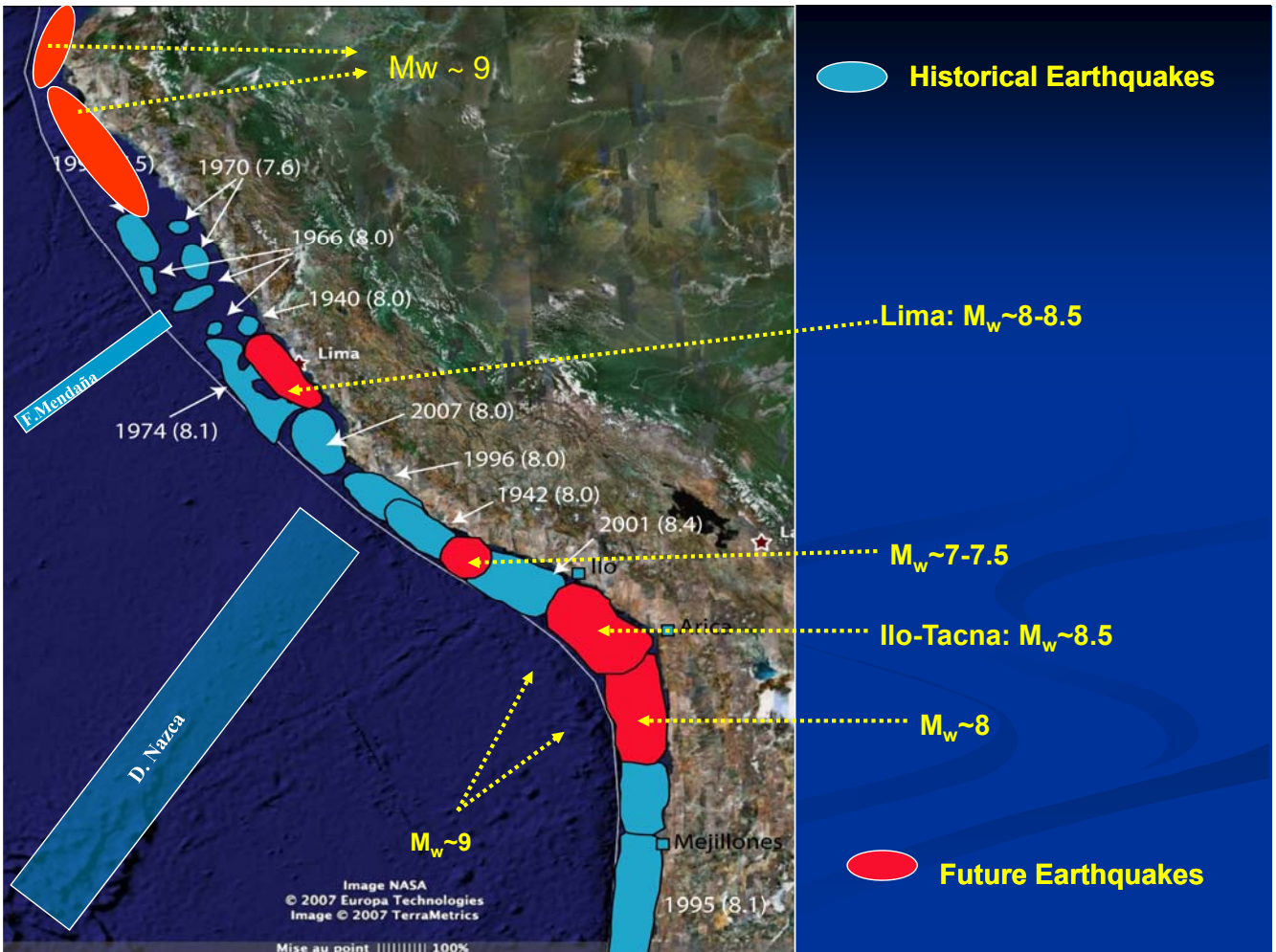
The historical great earthquakes is in high coupling zone

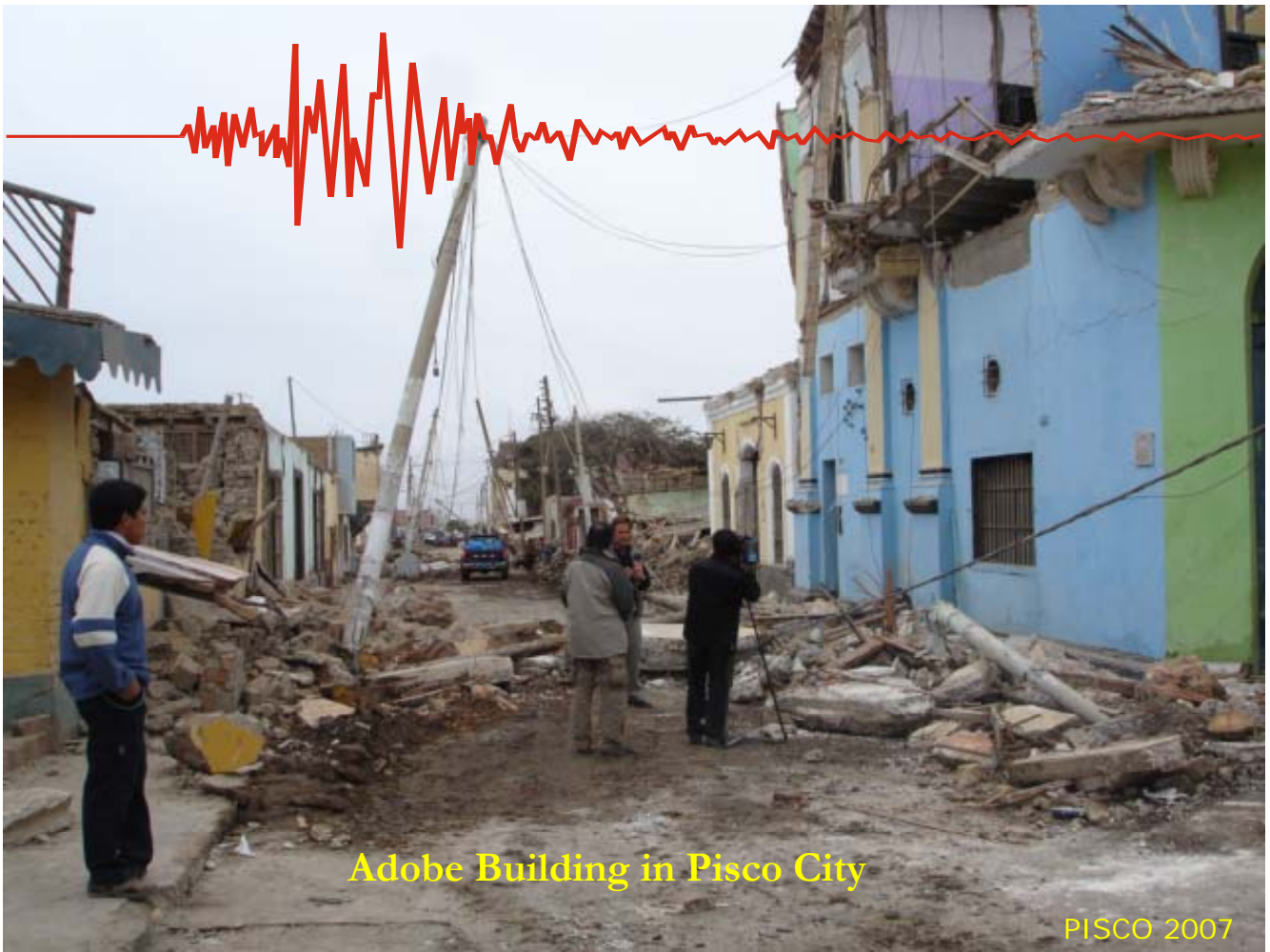


# New high coupling zones in Peru



Perfettini et al (2010)





Adobe Building in Pisco City

PISCO 2007



Adobe Building in Lima City...?

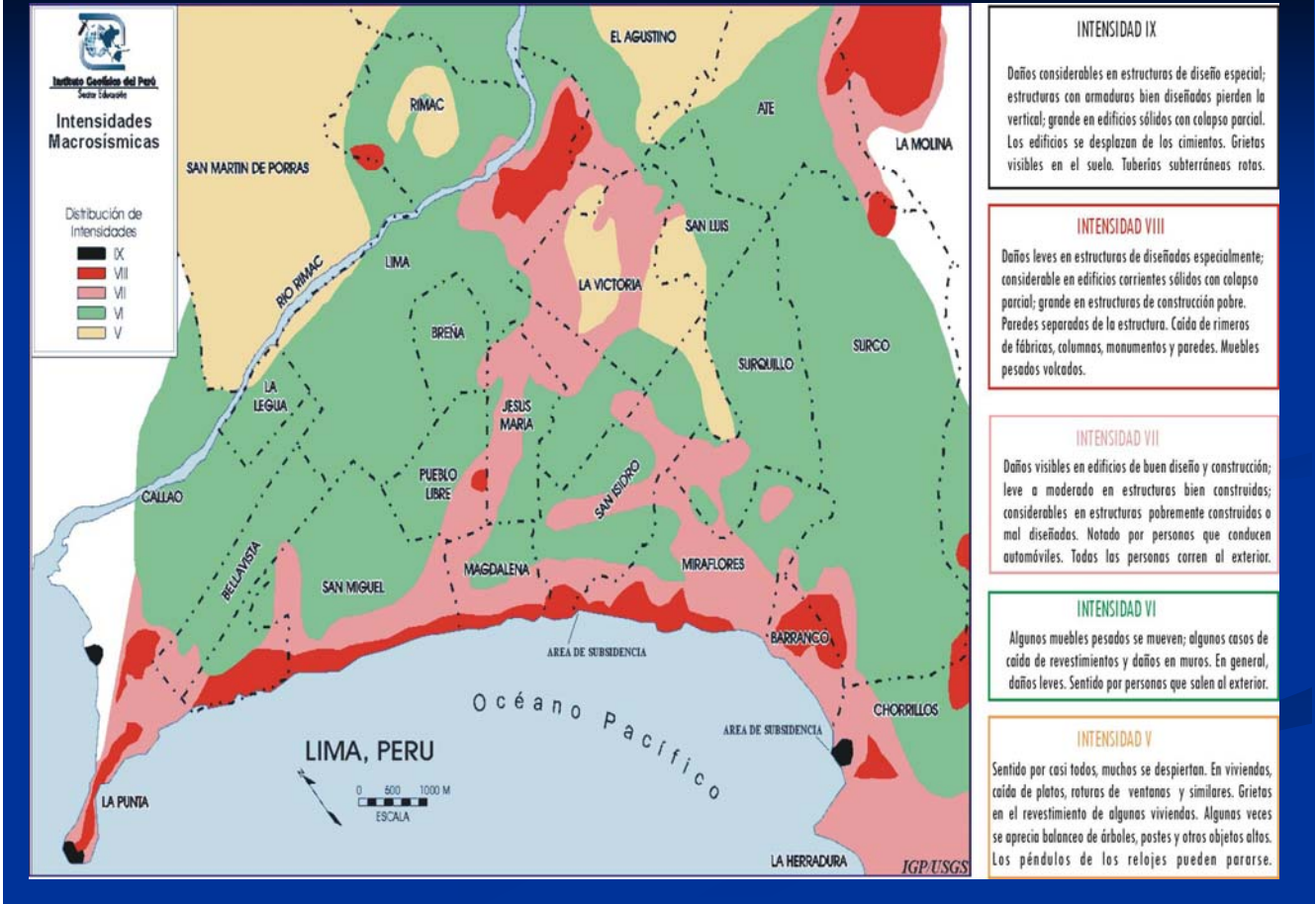
## Lima City – Miraflores and “costanera” zone



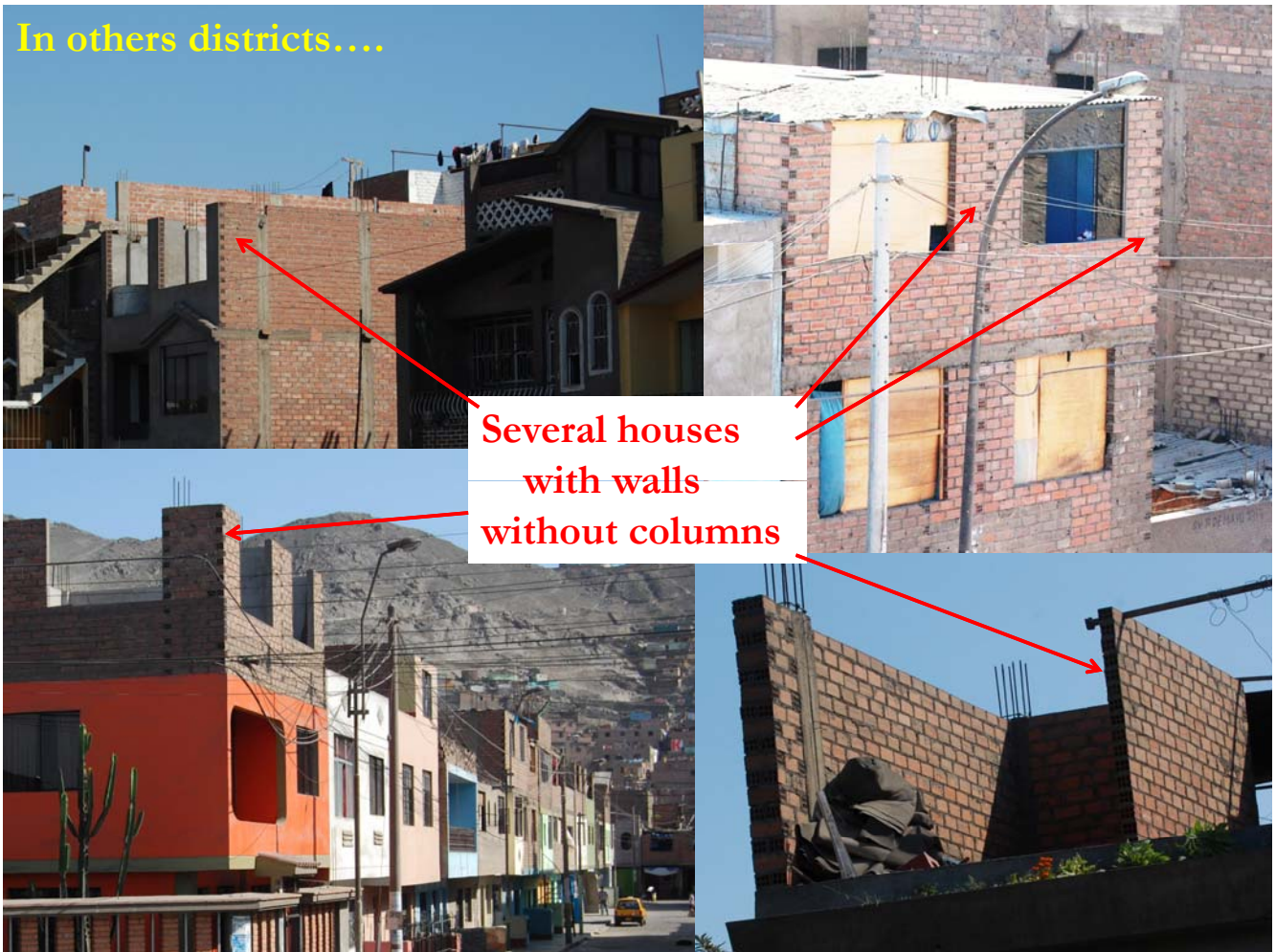
## New building, Miraflores, Lima City



## Seismic Intensity – Lima Earthquake ,October 1974



In others districts....

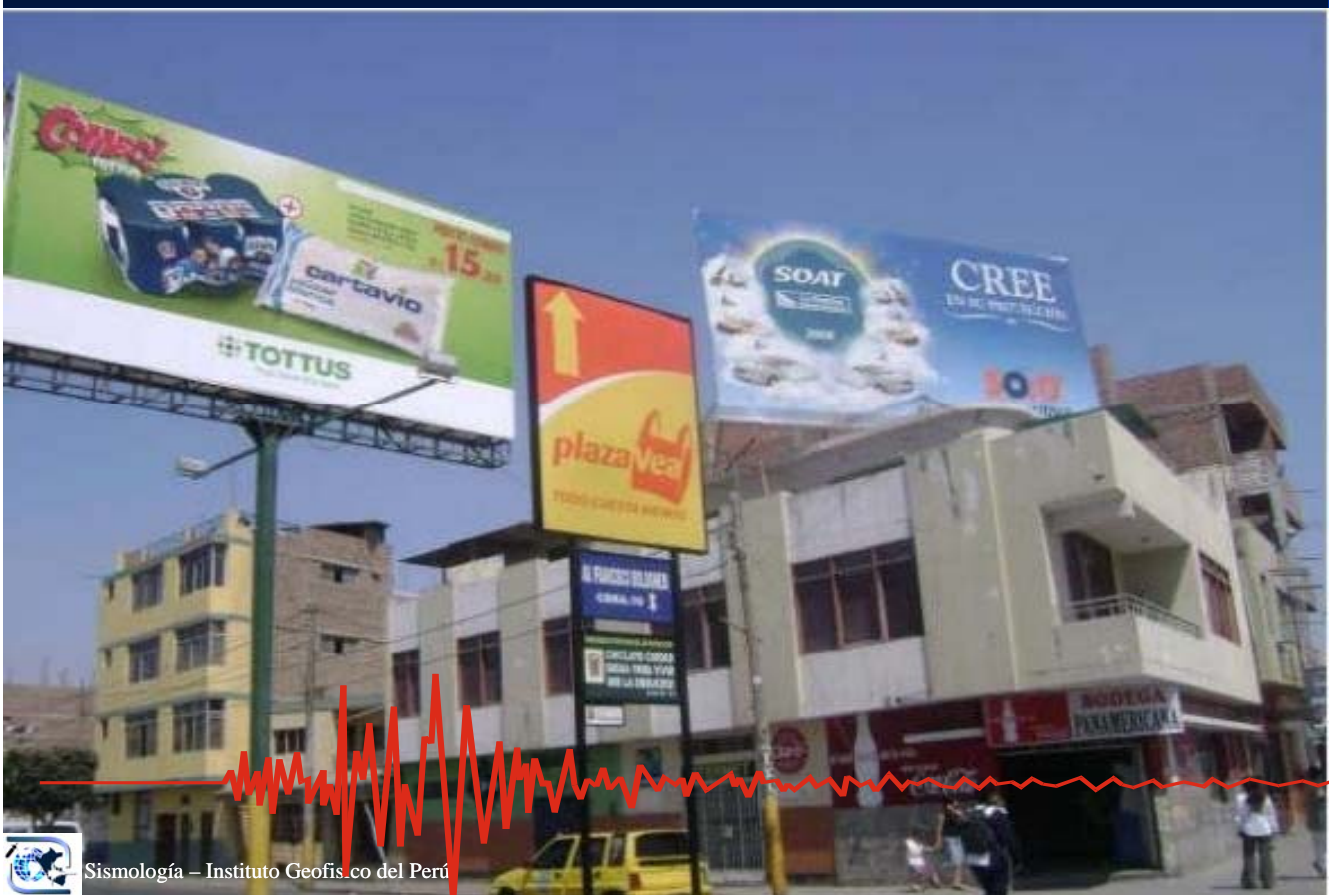




## News Risk in Lima City.....



## The invasion of commercial panels





PERÚ

Ministerio del Ambiente

Instituto Geofísico del Perú

Dirección de Sismología



## The Cathedral of AREQUIPA city in 1865



3 years before...



PERÚ

Ministerio del Ambiente

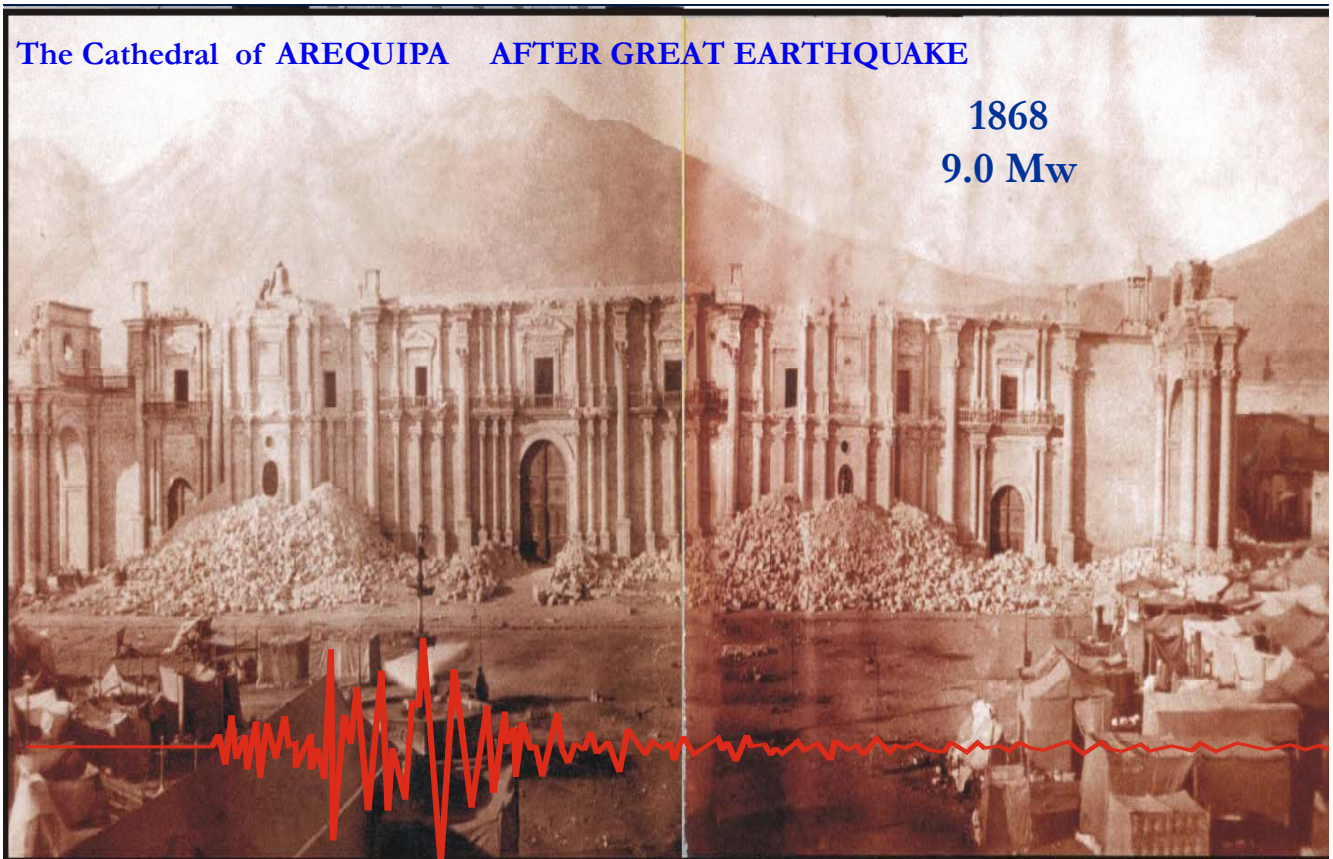
Instituto Geofísico del Perú

Dirección de Sismología



## The Cathedral of AREQUIPA AFTER GREAT EARTHQUAKE

1868  
9.0 Mw





PERÚ

Ministerio  
del Ambiente

Instituto  
Geofísico del Perú

Dirección  
de Sismología



PERÚ

Ministerio  
del Ambiente

Instituto  
Geofísico del Perú

Dirección  
de Sismología







PERÚ

Ministerio del Ambiente

Instituto Geofísico del Perú

Dirección de Sismología



# The CATHEDRAL of AREQUIPA destroyed by an new EARTHQUAKE

2001  
8.0 Mw



PERÚ

Ministerio del Ambiente

Instituto Geofísico del Perú

Dirección de Sismología



After an year .....

2002



¿The NEW Cathedral waits the NEXT Earthquake....!!



**GRACIAS...!!!!**