



WC/ATWC Operations

December 5, 2006

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NOAA/NWS/West Coast-Alaska Tsunami Warning Center
Presented to the Alaska Seismic Hazards Safety Commission





WC/ATWC Mission



- Protect life and property from tsunami hazard by providing tsunami information and warning bulletins to the AOR.
 - Operational objectives to carry out mission:
 - Analyze seismic events potentially dangerous to the AOR.
 - Determine their tsunami potential.
 - Predict tsunami arrival times.
 - Predict impact on coast when possible.
 - Provide timely and effective information and warning bulletins to the AOR through multiple communication paths.
 - Increase community preparedness and public tsunami education through TsunamiReady program and outreach.
 - Develop new processes and techniques to improve response.



WC/ATWC Quick History



- Built in 1967 in response to the 1964 “good Friday” earthquake / tsunami
- The Alaska TWS originally housed at three centers in Adak, Sitka, and Palmer
- By late-70’s, operations had condensed to Palmer
- 1981 Area-of-Responsibility (AOR) increased to include west coast and BC
- 2003 new facility constructed
- 2005 AOR increased to include east, Gulf, and Canadian Atlantic coasts
- 2005 staff increased to allow 24/7 in-house coverage



WC/ATWC Area-of-Responsibility



- WC/ATWC AOR
 - Western:
 - California
 - Oregon
 - Washington
 - British Columbia
 - Alaska
 - Eastern
 - U.S. Gulf of Mexico coast
 - U.S. Atlantic coast
 - Eastern Canada
- PTWC AOR:
 - Hawaii
 - Pacific outside WCATWC AOR
 - Interim Puerto Rico/VI/Caribbean
 - Interim Indian O.





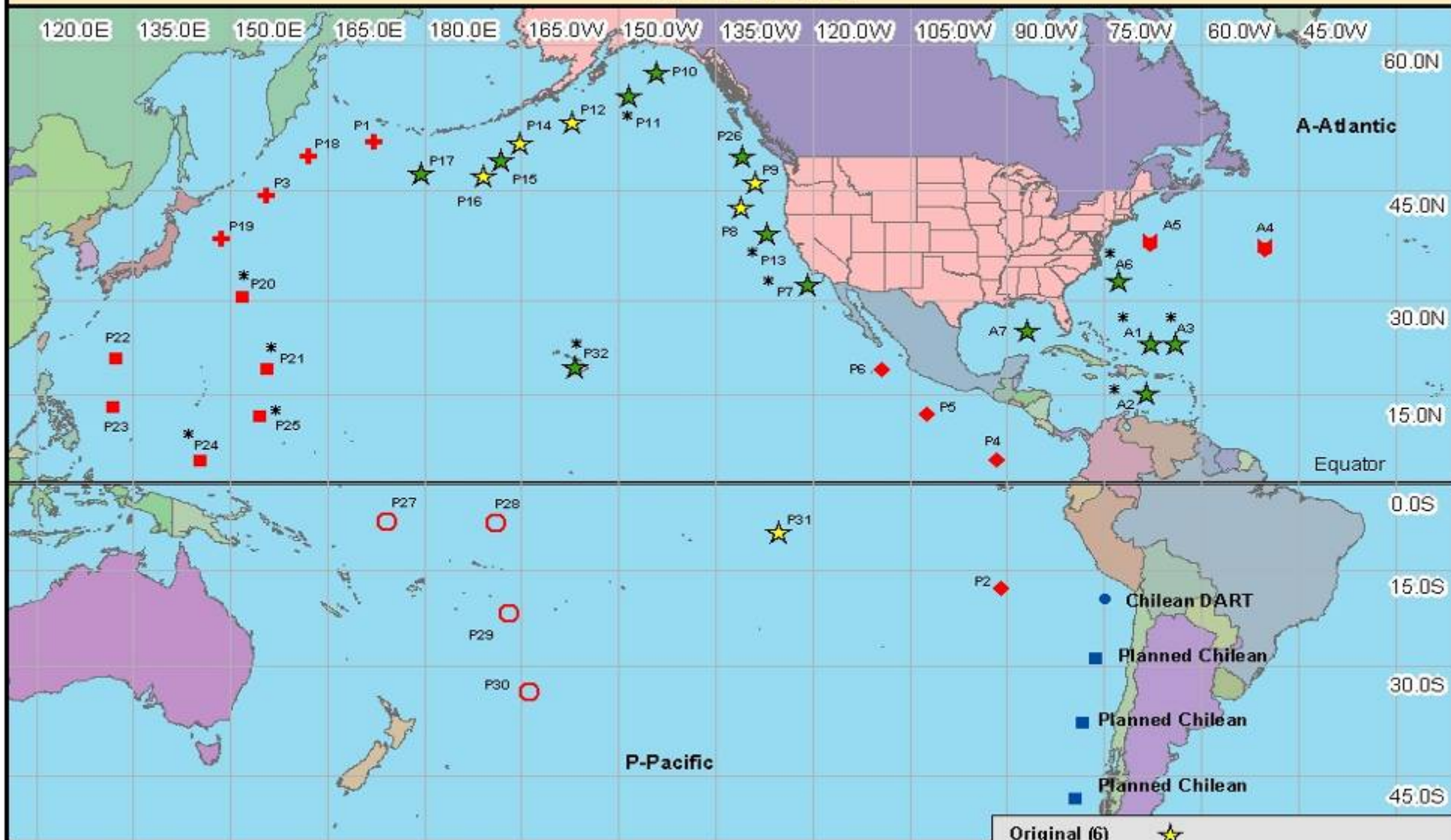
Tsunami Strengthening Planned Observational Network Improvements



- Seismic network upgrade
 - 9 Caribbean Global Seismic Network Quality Stations
 - PTWC Hawaii network
 - WCATWC network upgrade (NWS/TWEAK)
- Tide Gage network
 - 16 new NOS tide gages
 - Upgrade data transmission for NOS network
 - Four new Alaska tide gages installed (TWEAK supported)
 - Tsunami Mobile Alert Real Time (TWEAK supported)
- DART network
 - 32 new DARTs
 - Forecast model development
- 24/7 Tsunami Warning Centers

DART LOCATIONS - CONCEPTUAL PLAN

AUGUST 2006

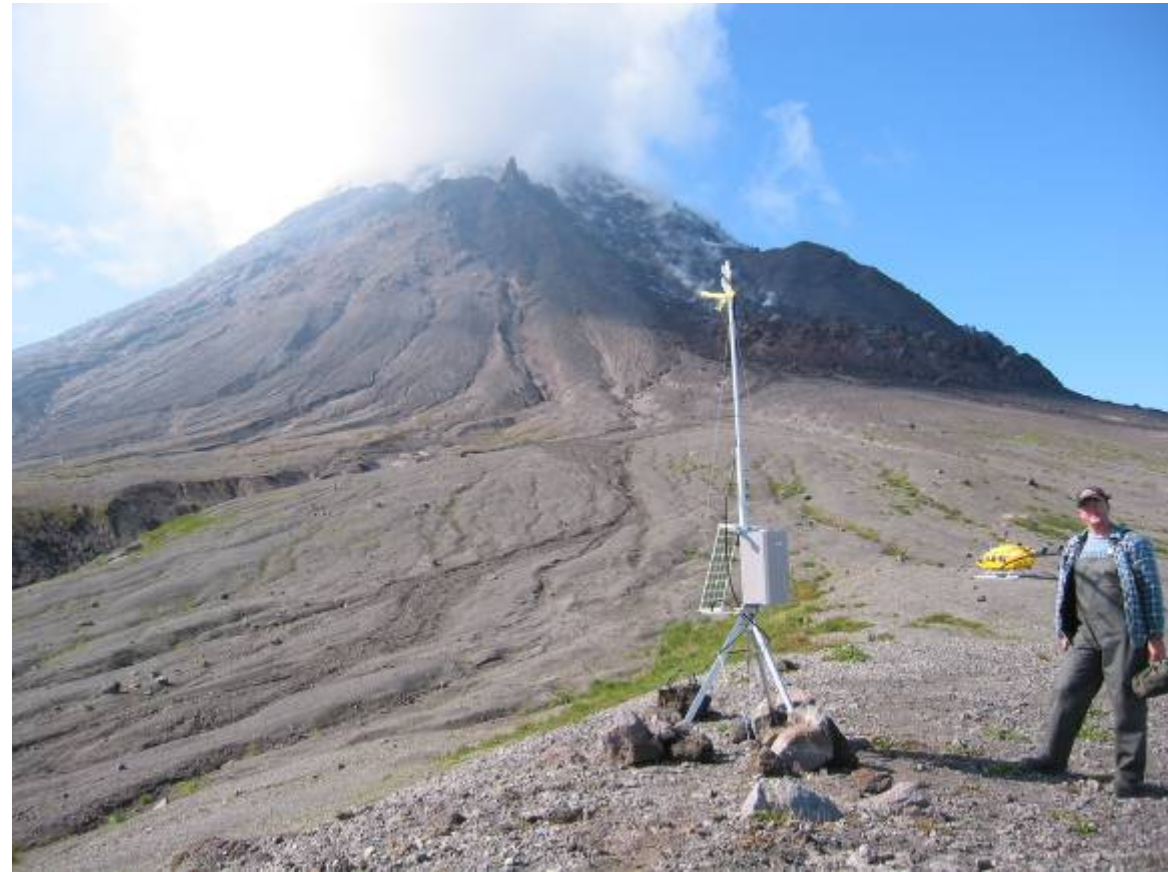


NOTE: Installation locations and priorities subject to change based on ongoing DART network analyses and ship scheduling.

- | | | |
|--------------------|-----|-------------------------|
| Original (6) | ★ | Installation Priorities |
| Completed (13) | ★ | 1 - ▲ 3 - ● 5 - ◆ 7 - ▽ |
| Planned (20) | Red | 2 - ■ 4 - + 6 - ◆ 8 - ○ |
| *IOC Installs (12) | | |



Tsunami Mobile Alert Real-Time





WC/ATWC Staff



- 15 staff
 - Director
 - TWSO
 - 5 Sr. Watchstanders
 - 4 Watchstanders
 - Oceanography
 - Geophysics
 - Physical Science
 - 1 ITO
 - 1 Senior ET
 - 1 ET
 - Secretary
- Center staffed 24x7 with 2 staff.





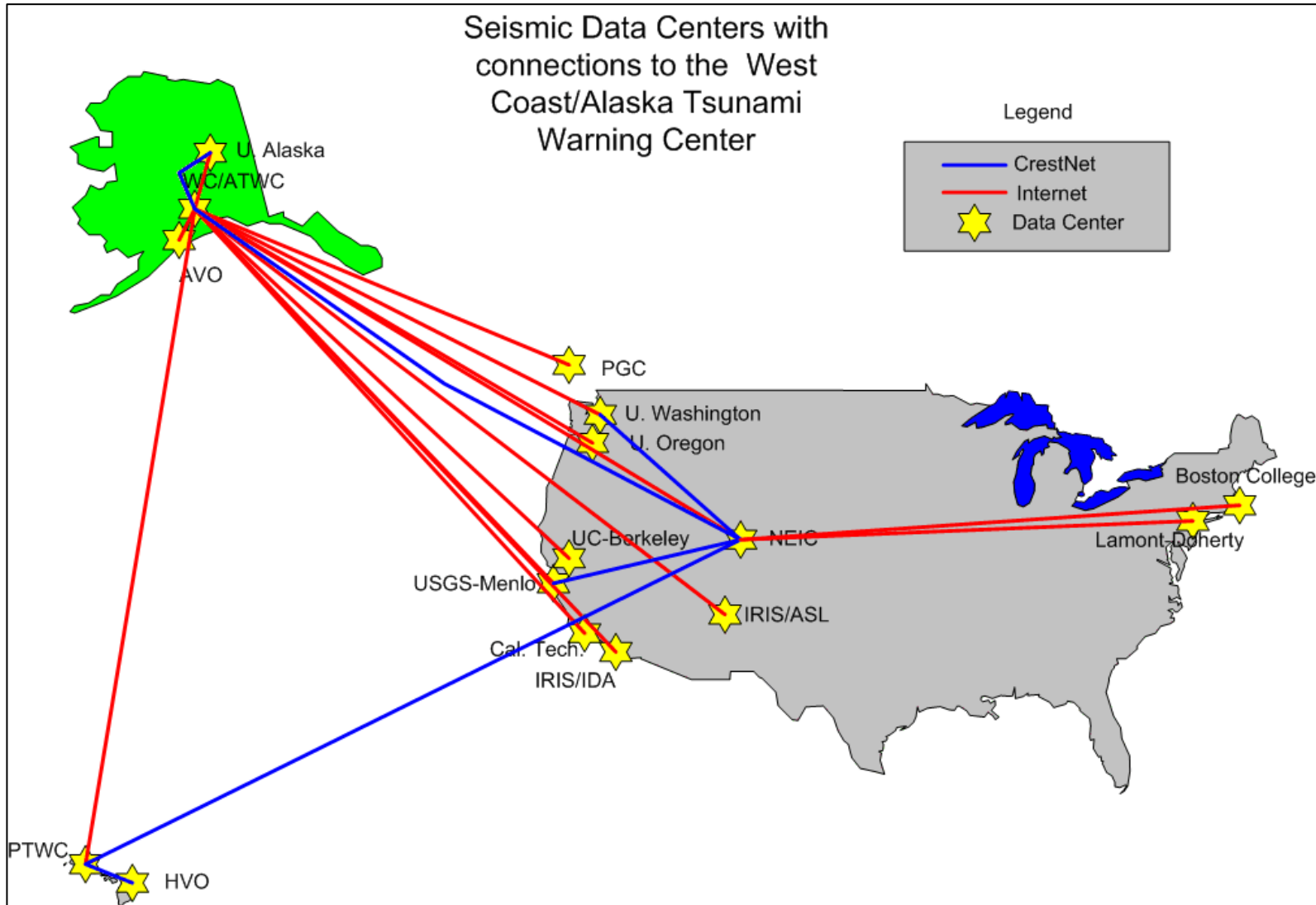
Tsunami Warning Center Core Functions



- Acquire raw data:
 - Seismic data
 - Sea level data
- Process and analyze data:
 - Initial processing on seismic data
 - Post-processing seismic data
 - Display sea level data
 - Analyze sea level data in conjunction with pre-event modeling
- Disseminate Information

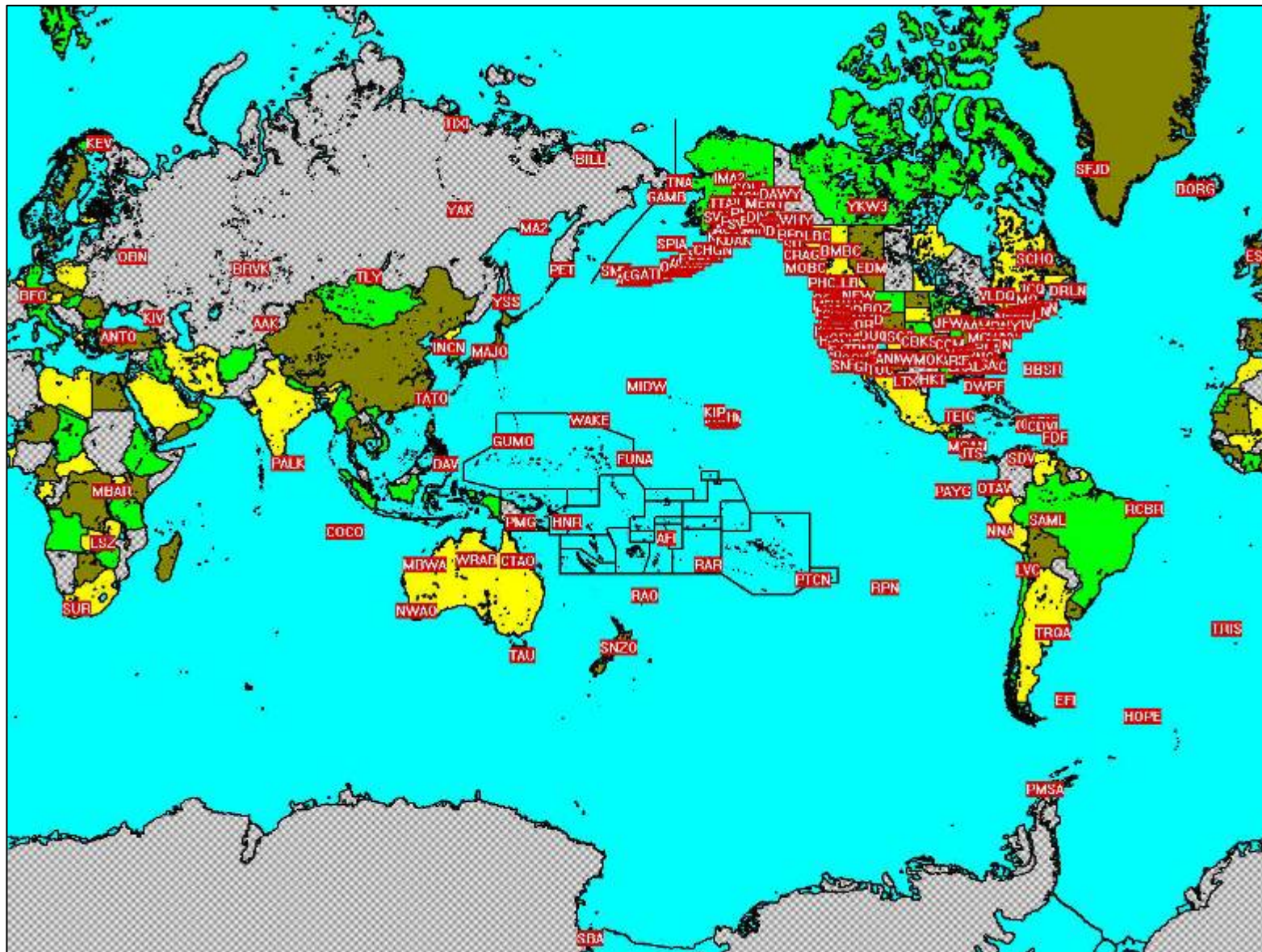


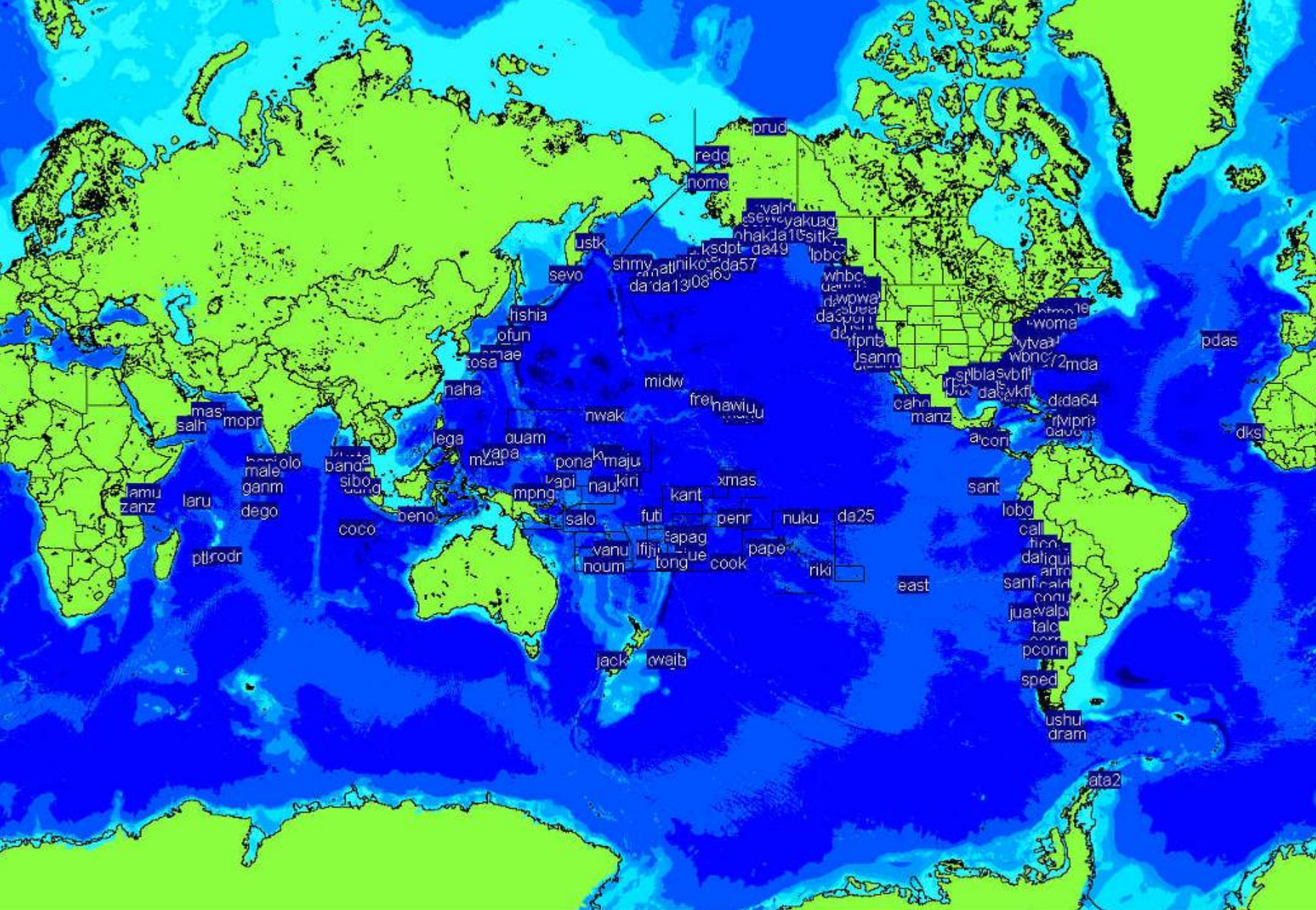
Seismic networks providing data to WC/ATWC





Seismic Data Network recorded at WC/ATWC – ~250 stations







Earthquake Data Processing



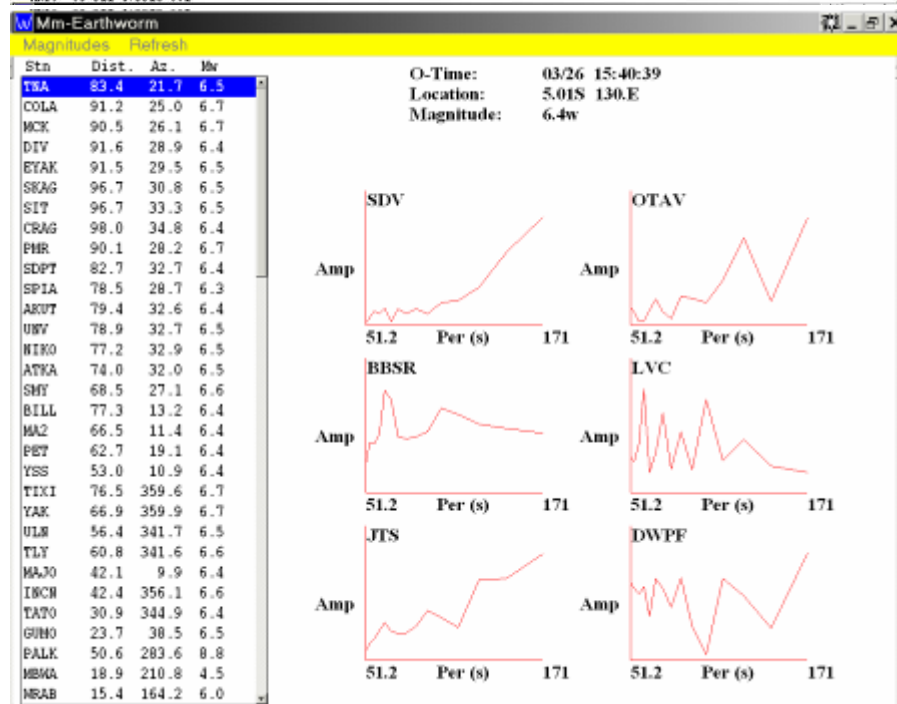
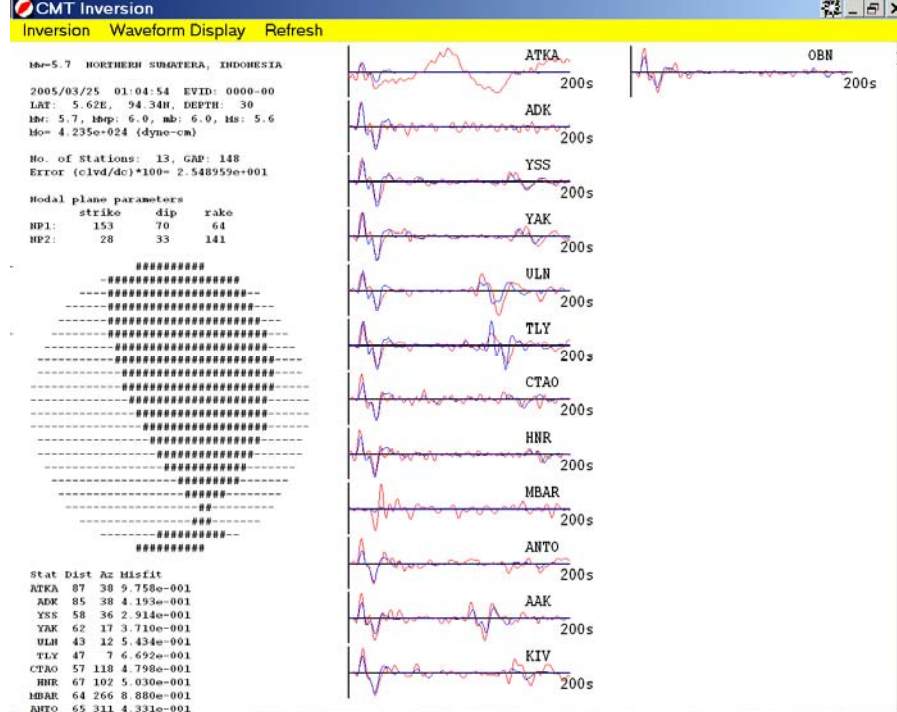
- WC/ATWC EarlyBird Seismic Processing System
- Developed for Fast evaluation of Big quakes
- Graphical interaction to refine automatic results
- Redundant backup operates concurrently (communications and hardware).





Earthquake Processing

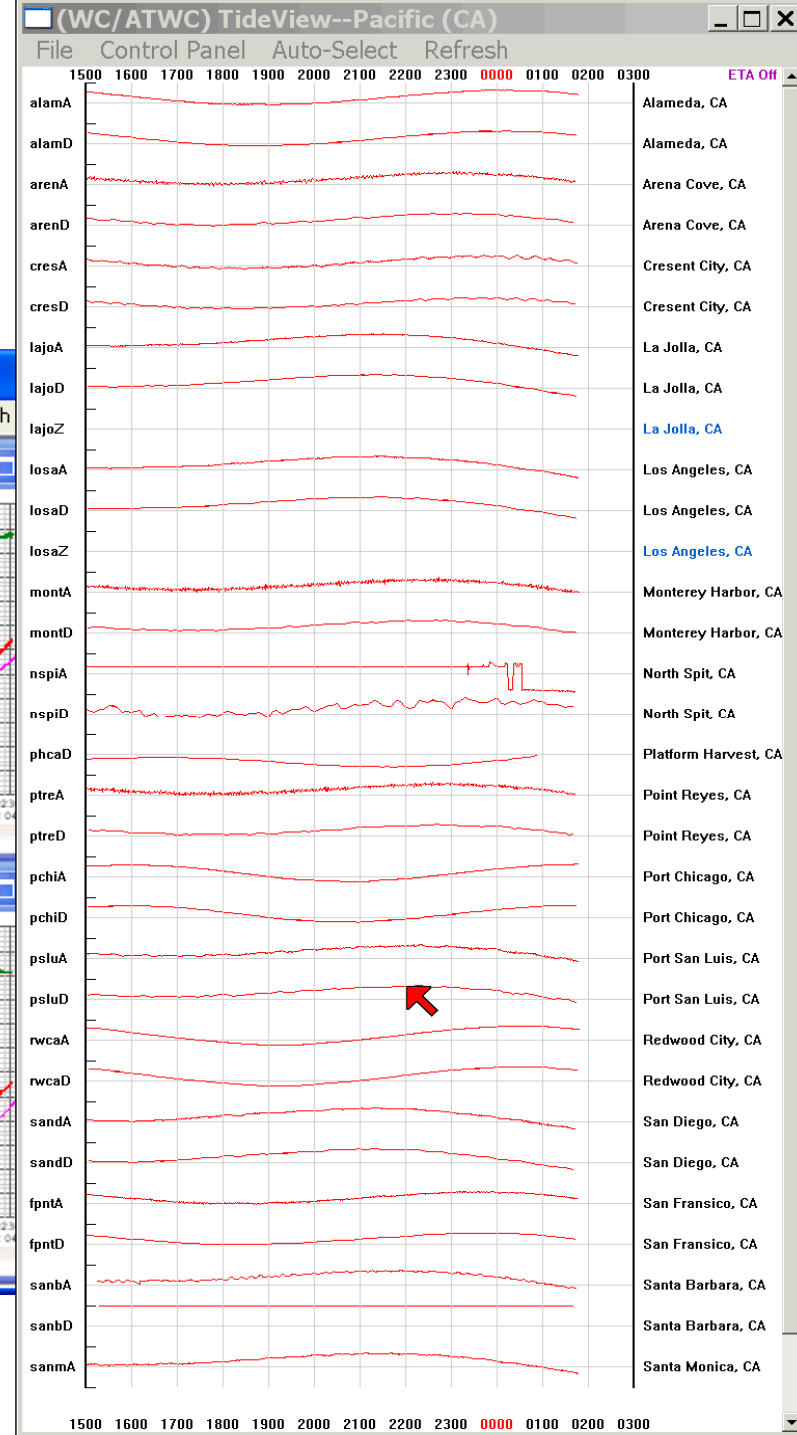
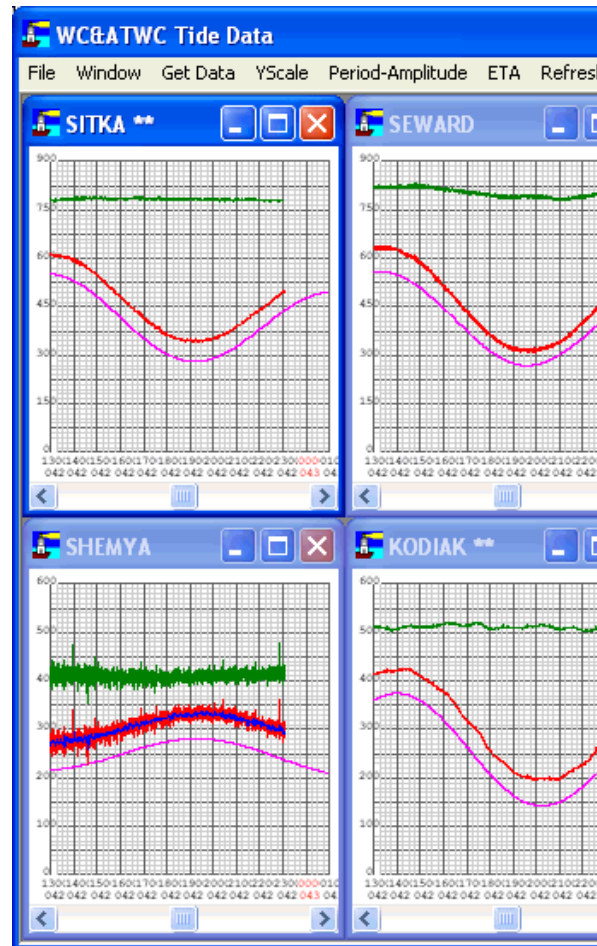
- Initial processing defines location, depth, moment magnitude
- After initial message; post-processing
 - refine Mwp (5-15 minutes)
 - Computing Centroid Moment Tensor solution (about 15-20 minutes – NEIC method)
 - Computing Mw based on surface waves (20-60 minutes - Tahiti/PTWC method)





Sea Level Data Display and Analysis

- Data acquired at WC/ATWC from NOS, PTWC, and other centers' sites
- 300+ tide gage signals
- 19 DART stations
- Data displayed with predicted tide and residuals
- Data real-time, triggered, or satellite delayed (hourly).
- Data merged with pre-computed forecasts to estimate impact.

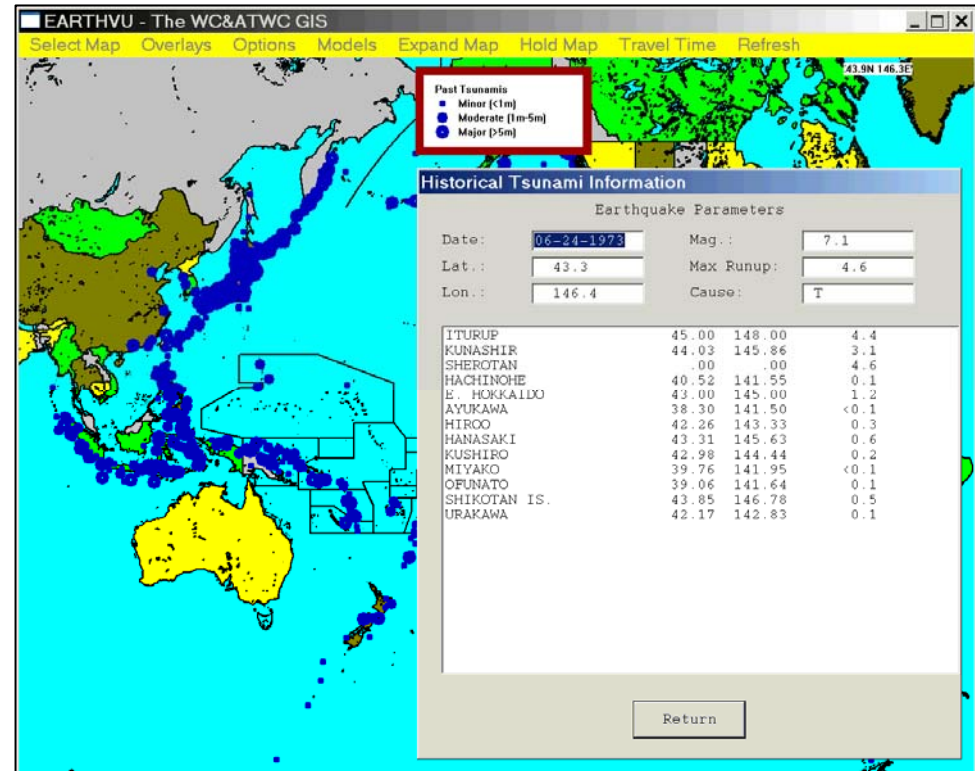




Historic Tsunami Data Base



- Historic tsunami data can also be used to predict impact during an event
- Compare earthquake size, observed and previous runups to estimate impact elsewhere.
- Valuable technique where historic data is plentiful (e.g. 9/25/2003 Japan event).
- NOAA/NGDC source of most data in tsunami warning center data bases.





Procedural Thresholds – Events Near the West coast, BC, and Alaska



Magnitude	Area	Product
4.0-5.0	Within 50km of coast	Tsunami Information Statement
5.0-6.0	Within 150km of coast	Tsunami Information Statement
6.0-6.5	Within 250km of coast	Tsunami Information Statement
6.5-7.0 6.5+	Offshore of near coast Inland	Tsunami Information Statement
7.1-7.5	Pacific coast	Fixed warning (350km)
7.6-7.8	Pacific coast	Fixed warning (1000km)
≥ 7.9	Pacific coast	3 hour watch/3hour warning
≥ 7.1	Bering Sea	Fixed warning for Bering Sea coast



Tsunami Product Codes - WMO and AWIPS

(effective April 20, 2005)

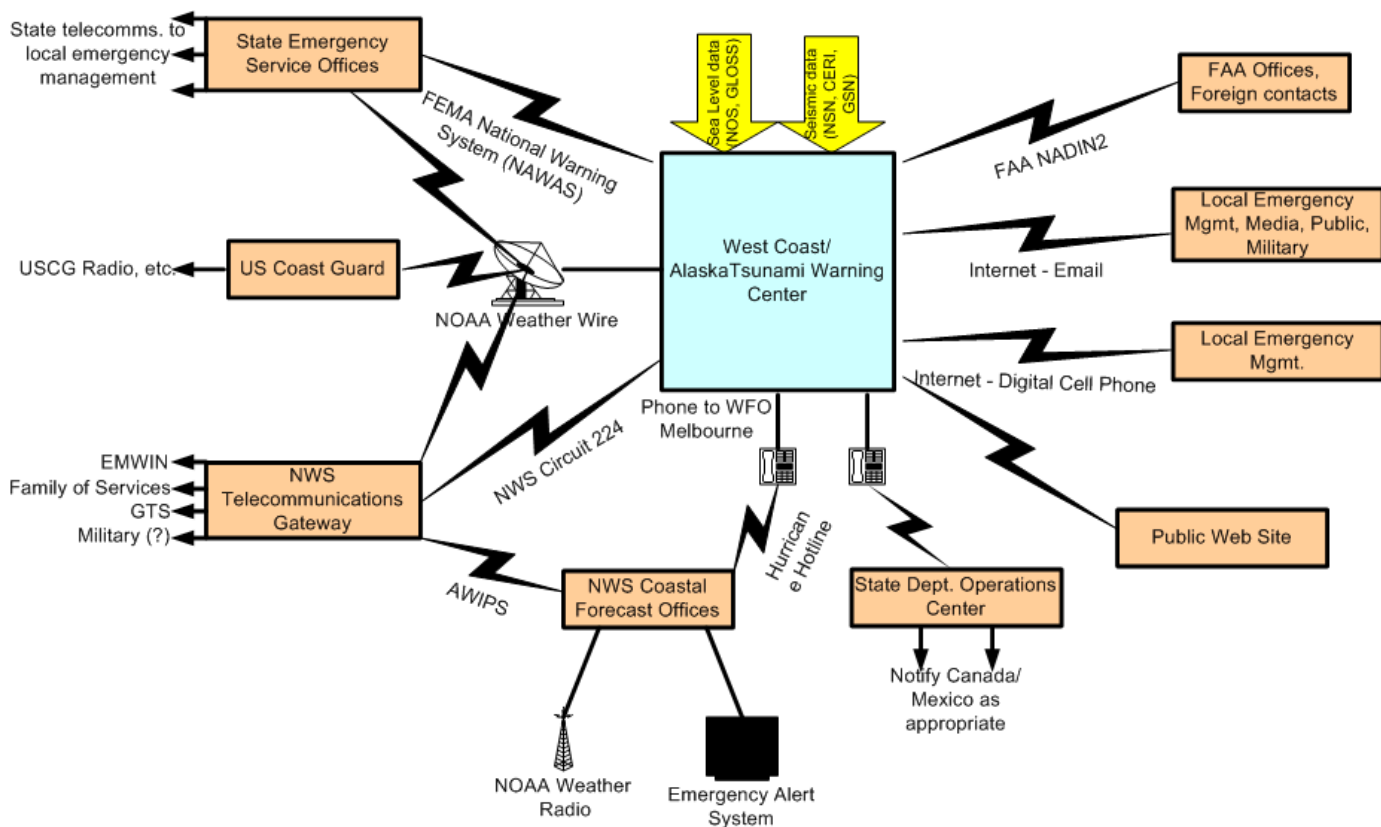


Tsunami Products

	WMO Headers	NWW PIL internal use only	AWIPS ID	Message Explanation	
Originated by WC/ATWC	WEPA41 PAAQ	ANCTSUWCA	TSUWCA	Tsunami Warnings [AK & West Coast > 7.0]	West Coast, BC, Alaska
	WEPA43 PAAQ	ANCTIBWCA	TIBWCA	Tsunami Information Bulletin [AK & West Coast 6.5 to 7.0]	
	SEAK71 PAAQ	ANCEQIAKX	EQIAKX	Information Message [Alaska < 6.5]	
	SEUS71 PAAQ	ANCEQIWOC	EQIWOC	Information Message [West Coast & BC < 6.5]	
	WEAK51 PAAQ	ANCTSUAK1	TSUAK1	Public Tsunami Warnings [AK & West Coast > 7.0]	
	WEAK53 PAAQ	ANCTIBAK1	TIBAK1	Public Tsunami Information Bulletin [Pacific 6.5 to 7.5]	
	WEXX20 PAAQ	ANCTSUAT1	TSUAT1	Tsunami Warnings U.S. East & Gulf Coast	Atlantic & Gulf Coast
	WEXX22 PAAQ	ANCTIBAT1	TIBAT1	Tsunami Information Bulletin U.S. East & Gulf Coast	
	WEXX30 PAAQ	ANCTSUATE	TSUATE	Public Tsunami Warnings U.S. East & Gulf Coast	
	WEXX32 PAAQ	ANCTIBATE	TIBATE	Public Tsunami Information Bulletin U.S. East & Gulf Coast	
	SEXX60 PAAQ	ANCEQIAT1	EQIAT1	Information Message [U.S. East and Gulf Coast]	
NTXX98 PAAQ	ANCTSTMSG	TSTMSG	Test Message		
	WMO Headers	NWW PIL internal use only	AWIPS ID	Message Explanation	
	WEPA40 PHEB	HFOTSUPAC	TSUPAC	Tsunami Warning [Pacific > 7.5]	



Tsunami Warning Dissemination



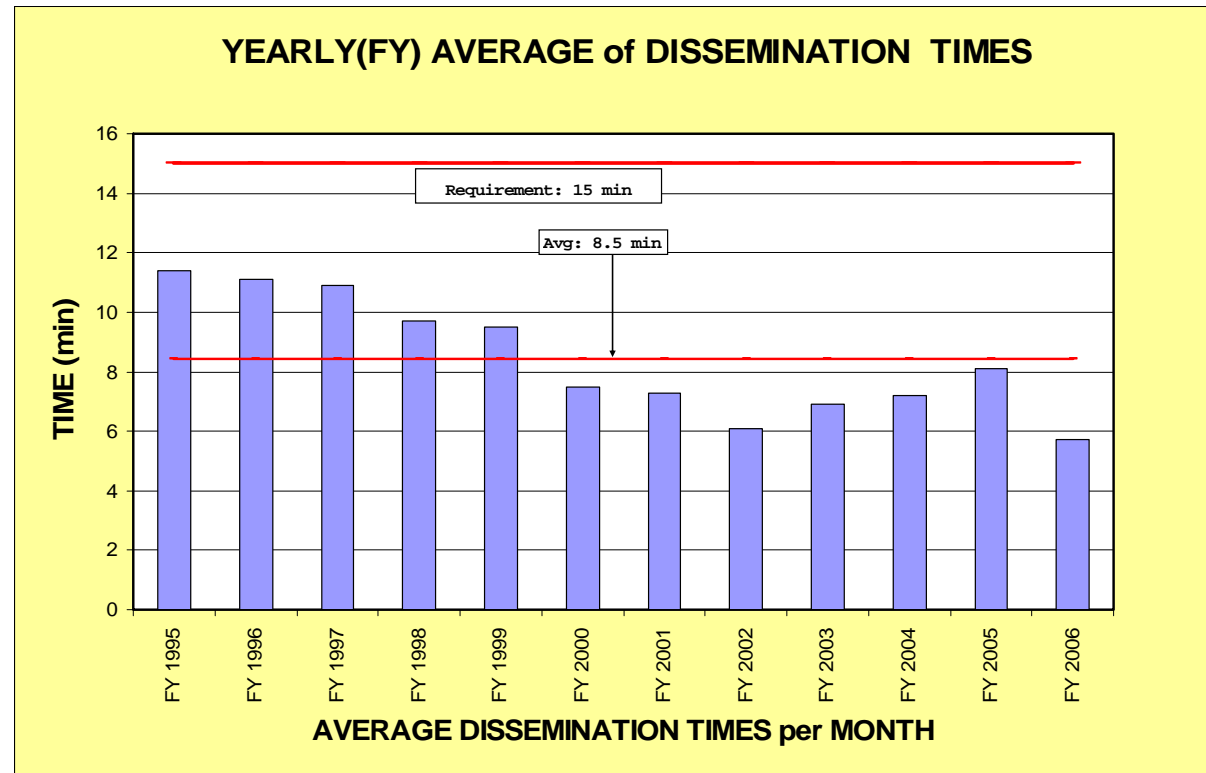
- Main dissemination paths
 - FEMA-NAWAS
 - NWWWS
 - FAA NADIN2
 - NWS Gateway/Line225
- Secondary paths
 - QDDS
 - Email
 - EM lists
 - TsunamiWatcher
 - Phone
 - Cell Phone Text Msg
 - RSS
 - Web



Performance Goals



- Response Time:
 - 5 minute in office
 - 10 minute after hours
- Location:
 - +/- 15km
- Magnitude:
 - +/- 0.2





Redundancy!



- Data Acquisition
 - Internet
 - Crestnet
- Processing
 - Two Independent Systems
- Message Communications
 - NWWS
 - NWS Circuits
 - FAA
 - NAWAS.....
- Facility
 - Backup Power, Comms., Internet
 - PTWC Backup Operational Center

Crescent City Tsunami Forecasts (cm)

Nov. 15, 2006

