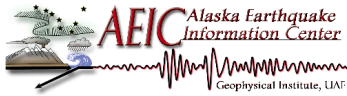


UNDERSEA GEOPHYSICAL OBSERVATORY ALONG THE ALEUTIAN ISLANDS



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NEEDS - COOPERATIVE MONITORING FOR EARTHQUAKES AND TSUNAMIS

ALASKA IS THE ONLY PLACE IN THE UNITED STATES WITH MAGNITUDE 9+ EARTHQUAKES ASSOCIATED WITH "MEGATHRUST" TECTONICS. A RESULT OF SUCH LARGE EARTHQUAKES, IN ADDITION TO STRONG SHAKING, IS THE GENERATION OF LARGE TSUNAMI WAVES. AN OUTSTANDING OPPORTUNITY EXISTS FOR THE DUAL USE OF THE NATIONAL MISSILE DEFENSE SYSTEM'S DEEP-SEA FIBER OPTIC CABLE. PLACING OCEAN BOTTOM SEISMOGRAPHS (OBS) AND BOTTOM PRESSURE RECORDERS (BPR) AT THE RELAY JUNCTION BOXES IN THE PROPOSED UNDERSEA FIBER OPTIC CABLE, PRESENTS AN UNPRECEDENTED CAPABILITY FOR OBSERVING THE COMPLEX MOTIONS OF A PLATE BOUNDARY ACTIVELY COLLIDING AND DEFORMING.

SEISMIC AND TSUNAMI HAZARDS IN ALASKA

SEISMIC HAZARDS IN ALASKA COME FROM SEVERAL SOURCES. BY FAR THE LARGEST EARTHQUAKES IN THE STATE OCCUR ON THE MEGATHRUST ZONE EXTENDING WESTWARD FROM PRINCE WILLIAM SOUND ALONG THE ALEUTIAN ISLANDS AND ARE CAUSED BY SUBDUCTION OF THE PACIFIC PLATE BENEATH ALASKA. (FIGURE 1.) THREE OF THE SEVEN LARGEST EARTHQUAKES OF THIS PAST CENTURY HAVE OCCURRED IN ALASKA (1957 ALEUTIAN M8.6, 1964 PRINCE WILLIAM SOUND M9.2, AND 1965 RAT ISLANDS M8.7). THE HAZARDS ASSOCIATED WITH THESE EVENTS ARE ENORMOUS AND AREAS AS LARGE AS THE ENTIRE STATE OF CALIFORNIA ARE AFFECTED. ALTHOUGH IT IS GENERALLY BELIEVED THAT THESE GREAT EARTHQUAKES ARE RARE, WITH RECURRENCE TIMES ON THE ORDER OF A FEW DECADES TO HUNDREDS OF YEARS FOR AN INDIVIDUAL SEGMENT, FIVE GREAT UNDERTHRUSTING EVENTS HAVE OCCURRED IN ALASKA SINCE 1938.

THE ENTIRETY OF THE ALEUTIAN ISLANDS IS COMPOSED OF COMPLEX TECTONIC COLLISIONS, AND RECTANGULAR BLOCKS CONTAINED WITHIN SHEAR ZONES AND DEFORMING CANYONS. HOWEVER, THIS TECTONIC PICTURE IS STILL POORLY DEFINED DUE TO THE LACK OF MONITORING CAPABILITIES WITHIN THE MOST ACTIVE OF THE UNITED STATES TECTONIC PLATE BOUNDARIES. IT IS IN THIS ENVIRONMENT THAT THE LARGEST EARTHQUAKES OCCUR, SPAWNING SOME OF THE MOST DESTRUCTIVE TSUNAMIS.

IMPROVED MONITORING IN THE ALEUTIAN ISLANDS

DISCUSSIONS ABOUT THE LAYING OF AN UNDERSEA FIBER OPTIC CABLE BETWEEN SHEMYA ISLAND AND MAINLAND ALASKA GIVE RISE TO AN INTERESTING AND RELEVANT COMPONENT TO THE COMMUNICATIONS PROJECT. THE UNDERSEA CABLE IS COMPRISED OF ~75 KM LONG SEGMENTS CONNECTED WITH RELAY BOXES. AT EACH OF THESE JUNCTIONS,

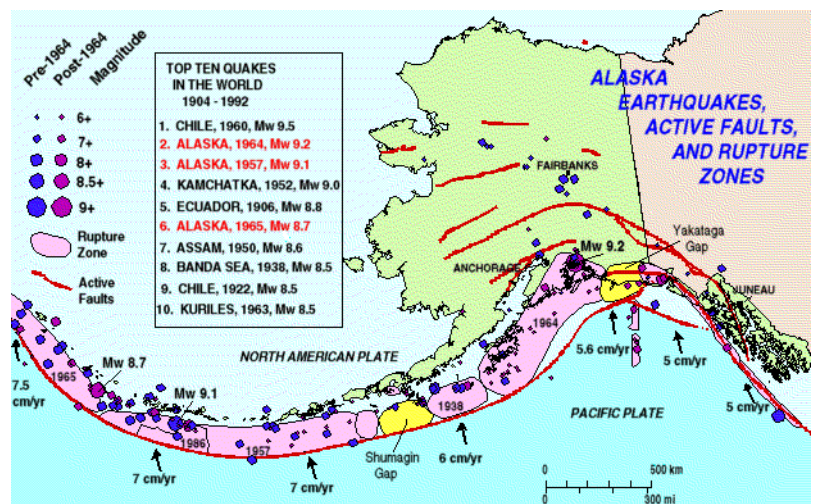
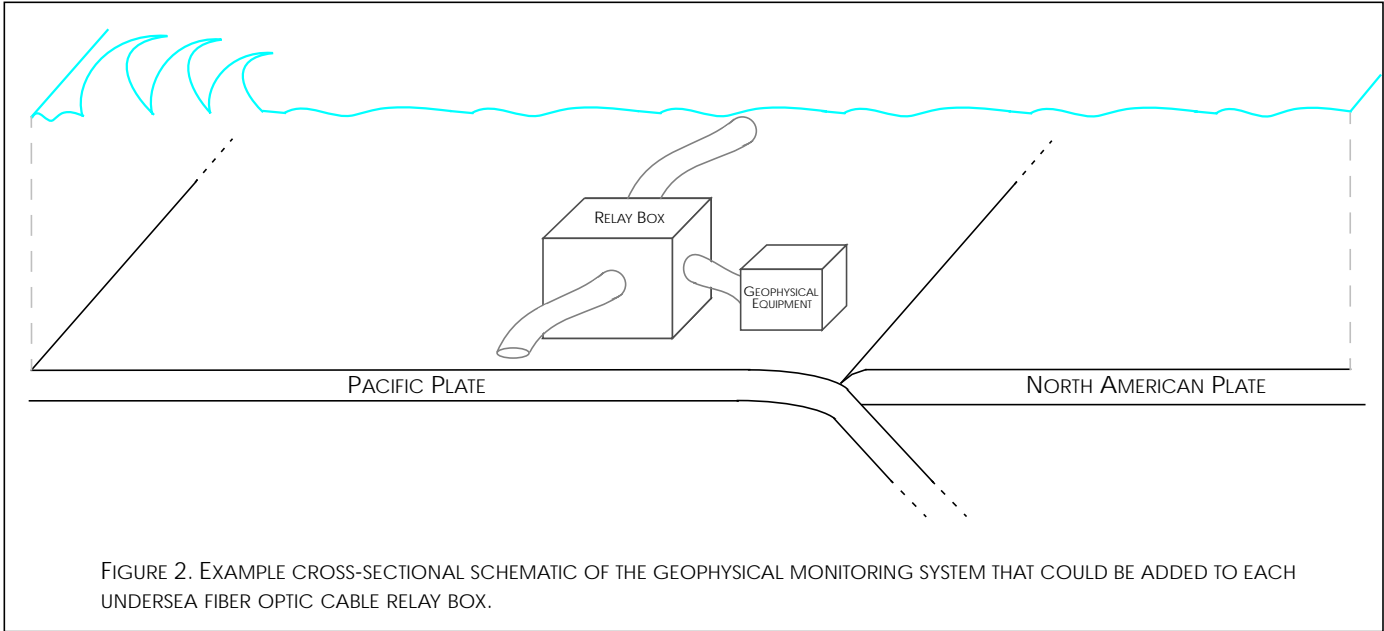


FIGURE 1. MAP SHOWING HISTORIC ALASKA EARTHQUAKES, ACTIVE FAULTS, AND RUPTURE ZONES. SHEMYA ISLAND, DENOTED BY RED STAR, IS LOCATED IN THE MIDDLE OF THE 1965 M8.7 RUPTURE ZONE.

THERE IS ACCESS TO A COMMUNICATIONS CHANNEL AND A POWER SOURCE. THIS MEANS THERE IS THE OPPORTUNITY TO PROVIDE AN UNPRECEDENTED CAPABILITY TO MONITOR AN UNDERSEA SUBDUCTION ZONE AT A PRECISION NEVER BEFORE AVAILABLE ANYWHERE IN THE WORLD.



AT EACH OF APPROXIMATELY 65 RELAY BOXES (FIGURE 2.), A MONITORING SYSTEM COMPRISED OF A SEISMOMETER AND UNDERSEA PRESSURE SENSOR CAN BE ADDED, AT A FRACTION OF THE COST OF THE FIBER CABLE INSTALLATION. NOT ONLY DOES THIS EXPANDED SYSTEM OF UNDERSEA SENSORS PROVIDE UNPRECEDENTED MONITORING, HAZARD MITIGATION FOR EARTHQUAKES AND TSUNAMIS, AND A WORLD CLASS RESEARCH TOOL, BUT IT ALSO PROVIDES ADDITIONAL CLOSE-IN MONITORING OF THE STATUS OF THE SEAFLOOR ON WHICH THIS VITAL COMMUNICATIONS CABLE IS RESTING. NEAR-REAL-TIME INFORMATION WILL BE AVAILABLE FOR DETERMINING TECTONIC MOTIONS NEAR THE CABLE, AS WELL AS FOR SENSING ANY CABLE DISTURBANCES THAT DO ARISE IN UNDERSEA APPLICATIONS. OF NOTE ARE POTENTIAL RESONANCE MOTIONS OF A TAUGHT CABLE THAT CAN FORECAST SOURCES OF POTENTIAL OUTAGES.

SOLUTION - ALEUTIAN UNDERSEA OBSERVATORY

THIS LEVEL OF UNDERSEA SCIENTIFIC OBSERVATION HAS NEVER BEEN ACCOMPLISHED BEFORE IN THE WORLD, INCLUDING THE ALEUTIANS. THE COMBINATION OF PERMANENT UNDERSEA SEISMOGRAPHS AND PRESSURE SENSORS PRESENT A LEAP FORWARD IN HAZARD MITIGATION WITH THE ABILITY TO QUICKLY IDENTIFY TSUNAMIGENIC EARTHQUAKES AND VERIFY THE EXISTENCE OF TSUNAMI WAVES IN THE DEEP OCEAN NEAR THE SOURCE. EARLY WARNING SYSTEMS WOULD THEN BE CAPABLE OF ALERTING THE RADAR SYSTEM OF LARGE REGIONAL EARTHQUAKES. FASTER WARNINGS, AND THE ELIMINATION OF EVACUATIONS PACIFIC-WIDE DUE TO FALSE TSUNAMI ALARMS, COULD BE REALIZED FOR EARTHQUAKES ORIGINATING IN ALASKA’S WATERS.

THIS UNDERSEA NETWORK, INTEGRATED TOGETHER WITH THE SHEMA NETWORK AND THE ADDITIONAL STATIONS ON-LAND IN THE ALEUTIANS, WOULD PROVIDE THE ALASKA EARTHQUAKE INFORMATION CENTER WITH THE CAPABILITY TO DEVELOP A REAL-TIME EARLY WARNING SYSTEM TO THE NATIONAL MISSILE DEFENSE SYSTEM FOR THE ARRIVAL OF STRONG GROUND SHAKING AND RESULTING TSUNAMIS FROM THE VERY LARGE EARTHQUAKES EXPECTED IN THE ALEUTIAN ISLAND REGION.