



SISGEO, DENSIFICATION OF THE SIRGAS-CON NETWORK IN CHILE



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NATIONAL SEISMOLOGICAL NETWORK AND THE VOLCANO WATCH NETWORK

CHILE IS SITUATED ON THE ACTIVE EDGE OF A CONTINENT WITH FREQUENT SEISMIC ACTIVITY. OVER THE LAST 450 YEARS CHILE HAS BEEN AFFECTED BY 45 DESTRUCTIVE EARTHQUAKES ($M > 7.5$), MOST OF WHICH HAVE CAUSED MODERATE OR DESTRUCTIVE TIDAL WAVES. ON AVERAGE, EVERY DECADE THERE ARE: 5 SEISMIC EVENTS OF MAGNITUDE OVER 7.0; 20 OF $M > 6.0$; 400 OF $M > 5.0$; ABOUT 5000 OF $M > 4.0$.

OBJECTIVE OF THE PROPOSAL

GIVEN THE ABOVE AND CONSIDERING THE MODEST EXTENT OF THE EXISTING MONITORING NETWORK, IT HAS BECOME NECESSARY TO IMPROVE THE QUALITY OF AND THE ACCESS TO THE SEISMIC INFORMATION OF CHILE. FOR THIS REASON THE GOVERNMENT OF CHILE HAS APPROVED THE PROPOSAL BY THE SEISMOLOGICAL SERVICE OF THE UNIVERSITY OF CHILE TO STRENGTHEN THIS BY OBTAINING A NATIONAL SEISMIC COVERAGE PROVIDING INFORMATION THAT IS CLOSE TO REAL-TIME TO CHILEAN INSTITUTIONS, ALSO CREATING FOR THE MEDIUM AND LONG TERM DATABASES OF HIGH QUALITY AND EASY ACCESS THAT CONTRIBUTE TO THE KNOWLEDGE OF THE DANGER AND TO REDUCING THE SEISMIC HAZARD TO THE COUNTRY.

THE PROPOSAL IS MADE UP OF THREE AREAS: THE SERVICES TO BE PROVIDED, THE INSTITUTIONAL SETUP AND THE INSTRUMENTATION NETWORK.

THE NEW INSTRUMENTATION NETWORK

IN ORDER TO CORRECTLY IDENTIFY THE DANGER AND HOW TO REDUCE AND MANAGE THE SEISMIC HAZARD, A NETWORK OF INSTRUMENTS WILL BE INSTALLED WITH A NATION-WIDE COVERAGE MADE UP OF THE FOLLOWING ELEMENTS:

SEISMOLOGICAL MONITORING

- 65 BROAD BAND SEISMOLOGICAL STATIONS
- 140 GLOBAL POSITIONING SYSTEM MONITORING STATIONS (GPS)
- 12 REGIONAL NETWORKS
- 2 PORTABLE NETWORKS FOR SUPPORT DURING SEISMIC CRISES (40 FULL SEISMOLOGICAL STATIONS AND 16 GPS)

INFRASTRUCTURE AND GROUND NETWORK

- 200 SURFACE ACCELEROGRAPHS
- 1 PORTABLE RAPID-RESPONSE NETWORK OF ACCELEROGRAPHS

THE COSTS OF INVESTMENT IN THIS REACHES UP TO US\$19.7 M.

SISGEO, CONTINUOUS GPS STATIONS NETWORK OF CHILE

THE MILITARY GEOGRAPHIC INSTITUTE OF CHILE, BEING INTERESTED IN IMPROVING AND MAKING MORE DENSE THE NATIONAL GEODESIC REFERENCE FRAMEWORK, CALLED RGN SIRGAS CHILE, HAS SIGNED AN AGREEMENT WITH THE UNIVERSITY OF CHILE TO TAKE ADVANTAGE OF THE INFRASTRUCTURE CONSTITUTED BY THE GPS STATIONS OF THE SEISMOLOGICAL NETWORK AND INCORPORATE THEM INTO THE NETWORK OF PERMANENT STATIONS OF CHILE, NAMED SISGEO. WITH THE EXISTING NETWORK AND THE ADDITION OF THESE NEW STATIONS, SISGEO WILL HAVE ABOUT 170 STATIONS DISTRIBUTED AROUND CHILEAN TERRITORY.

A KEY FEATURE OF THESE 140 NEW STATIONS IS THAT THEY WILL BE CONNECTED TO A CENTRAL SERVER OF DATA LOCATED IN THE SEISMOLOGICAL SERVICE OF THE UNIVERSITY OF CHILE, TRANSMITTING IN REAL TIME, WHICH WILL BE SHARED WITH THE MILITARY GEOGRAPHIC INSTITUTE AND THUS BE AVAILABLE IN A SHORT TIME TO ANY USER WHO NEEDS IT.

SISGEO WILL BE A NETWORK OF PERMANENT GPS STATIONS INTENDED FOR THE GEODESY AND GEODYNAMICS FIELDS, ORIENTED TOWARDS :

- STUDYING THE COMPLEX DEFORMATION OF THIS TERRITORY AS A RESULT OF THE CONVERGENCE OF THE TECTONIC PLATES OF NAZCA AND SOUTH AMERICA, THIS BEING THE BASIC INFORMATION FOR THE DEFINITION OF THE VELOCITY MODEL FOR THE COUNTRY.
- ESTABLISH A GEODESIC REFERENCE FRAMEWORK OF HIGH ACCURACY FOR MULTIPLE PURPOSES, WHICH WILL BE PART OF THE NATIONAL GEODESIC NETWORK (RGN SIRGAS CHILE).
- PROVIDE INFORMATION TO OTHER RESEARCH INSTITUTIONS.
- CONTRIBUTE TO THE DEFINITION OF REGIONAL, CONTINENTAL AND GLOBAL REFERENCE SYSTEMS (SIRGAS-CON, ITRFXX AND OTHERS).
- PROVIDE, TO GPS USERS, DATA FOR APPLICATIONS INVOLVING CARTOGRAPHY, SURVEYING, GEODESY AND POSITIONING IN GENERAL.
- PROVIDE CONTINUOUS RECORDS OF GPS DATA FOR GEODYNAMIC DATA, STUDIES OF THE IONOSPHERE AND TROPOSPHERE AND OTHERS.

CONCERNING THE CONTRIBUTION TO THE SIRGAS-CON NETWORK, THE MILITARY GEOGRAPHIC INSTITUTE OF CHILE IS APPLYING TO BE THE SIRGAS EXPERIMENTAL PROCESSING CENTER. TOGETHER WITH SETTING UP THIS OFFICE, MORE STATIONS WILL BE SET UP IN CHILE TO BE INTEGRATED WITH THE SOUTH AMERICAN REFERENCE FRAMEWORK, SELECTING A NUMBER OF SISGEO STATIONS THAT HAVE AN EVEN, STANDARD DISTRIBUTION AND COVER THE WHOLE OF CHILEAN TERRITORY.

FUTURE PROJECTS ASSOCIATED WITH SISGEO.

- RTK, CHOOSING SOME STATIONS FOR TRANSMITTING DIFFERENTIAL CORRECTIONS.
- DGPS, PROCESSING OF GPS DATA ON-LINE THROUGH IGM WEB SITE.

GENERAL FEATURES OF PROCESSING.

THE INSTRUCTIONS FOR THE "LOCAL PROCESSING CENTERS" DEFINED BY SIRGAS WILL BE FOLLOWED IN ORDER TO COMPLY WITH THE PROTOCOLS REQUIRED BY THE PROJECT.

- BERNESE 5.0. SOFTWARE
- WEEKLY SOLUTIONS IN SINEX FORMAT.
- SAMPLING INTERVAL: 30 SECONDS.
- CUT-OFF: 3° .
- INTRODUCTION OF SATELLITE ORBITS, CORRECTIONS OF THE SATELLITE CLOCKS AND PARAMETERS FOR ORIENTATION OF THE EARTH CONTAINED IN THE FINAL SOLUTIONS OF IGS.
- USE OF THE ABSOLUTE VALUES OF THE CORRECTIONS TO THE VARIATIONS OF THE PHASE CENTERS FOR THE GNSS ANTENNAS PUBLISHED BY IGS.
- COMBINED SET OF ANTENNAS.
- LISTS OF EQUIPMENT (RECEIVER + ANTENNA) FOR IDENTIFYING THEM.
- ABILITY TO TAKE OCEAN LOADING INTO ACCOUNT (FES2004).
- ENTER VALUES FOR TROPOSPHERIC CORRECTION.
- CORRECTION OF AMBIGUITIES.
- ETC..

WORK PROGRAM

- 2009 - FIRST CAMPAIGN OF RECOGNITION, SELECTION OF THE LOCATION AND ACQUISITION OF EQUIPMENT.
- 2010 - SECOND CAMPAIGN OF RECOGNITION.
- 2010 - INSTALLATION OF 40 "SISGEO" STATIONS.
- 2011 - INSTALLATION OF 100 "SISGEO" STATIONS.
- 2012 - ALL "SISGEO" NETWORK IN OPERATION.

