Fifty years of seismic studies in Davao

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History of the Observatory

Fig. 1 The old Manila Observatory in Ermita, Manila was established in 1865. This was completely destroyed during the Bombing of Manila in World War II.

The Manila Observatory (MO) (Fig. 1) is a private non-stock, non-profit, scientific research institution established in 1865 by the Jesuit mission in the Philippines. With Federico Faura at its inception, it was engaged in the systematic observation of Philippine weather and seismic activities. It began serving typhoon warnings in 1879, and embarked on earthquake observations in 1880.

Because of the need to inform the public about earthquakes, the Jesuits also made significant contribution to the development of seismology—then a relatively young science.

They installed the first Jesuit seismographic station in the Manila Observatory in 1868.

Fr. Juan Ricart, SJ of the Ateneo Municipal de Manila developed the first earthquake-detecting instrument in 1869 (Fig. 2). The first recorded earthquake on this pendulum instrument, known today as a seismoscope, was on October 1, 1869. Padre Faura used it to make daily reports of the great July 1880 earthquake in Manila.

Upon the official establishment of the Observatory's seismology section, Fr. Miguel Saderra Maso, SJ started setting up a network of seismic stations throughout the country and equipped the central station in Manila with the latest developments in seismographs.

In 1899, the US Coast and Geodetic Survey commissioned the Observatory to produce an atlas of thirty maps of the Philippines. The "Distribucion de Temblores" (Fig. 3) is the first map on ground tremors in the country, which indicates the frequency of movements of the ground.

Fig. 2 Fr. Ricart's 1869 design of a pendulum seismometer, now known as a seismoscope.

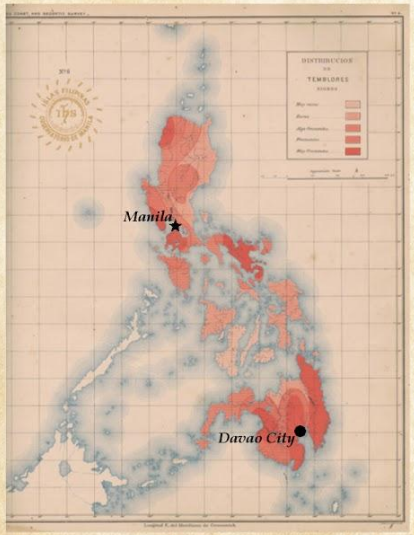

Fig. 3 Tremor Map of the Philippines published by the Manila Observatory in 1899. The MO - Davao Station, one of more than 300 weather & seismic stations operated by the pre-War Observatory, is located in a region with "very frequent" tremors.

Archival photos from MO Library and Archives
http://archives.observatory.ph

AMBER Network image from
http://magnetometers.bc.edu/index.php/amber2

MAGDAS Network image from
http://magdas.serc.kyushu-u.ac.jp/station/index.html

From Manila to Davao

In 1963 Frs. Jose Dacanay, SJ and Francisco Glover, SJ (Fig. 5) set out through the jungle to locate a spot proximate to the Dip Equator crossing, with availability of continuous electric power and logistically approachable by some existing municipality. A suitable site was located near Davao City and a permanent station then established equipped with a three-axis Askania recording magnetic variometer, NS, EW and Z seismometers from the U. S Coast & Geodetic Survey, and an air glow photometer from U.S. Air Force Research and Development Command.

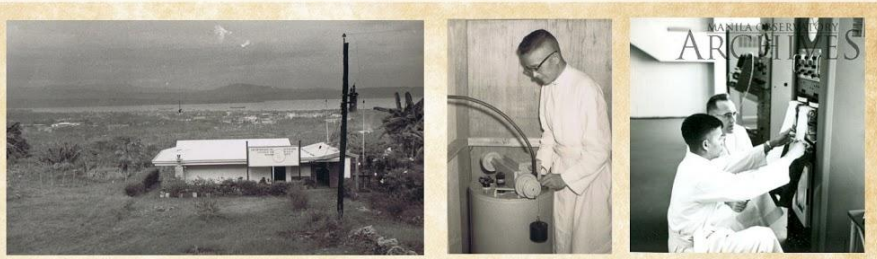

Fig. 5 Images of the site (left) selected by Fr. Jose Dacanay SJ, (middle) and Fr. Francisco Glover, SJ (right, background)

The Present-Day and the Future

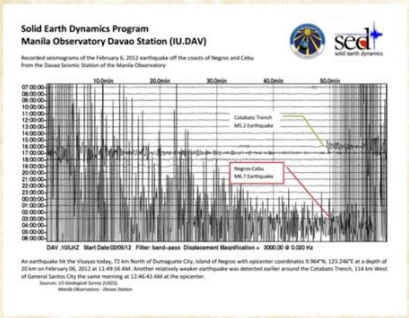

Fig. 6 Digital seismogram of some significant local earthquakes (left) recorded by IRIS/USGS broadband seismic sensors (right) at Davao Station are published in 'earthquake reports' by the Solid Earth Dynamics Program of the Observatory, headed by Fr. Sergio Su, SJ.

Today, the Davao Station continues to monitor earthquakes using its more modern equipment (Fig. 6) with the support of various international organizations such as the US Geological Survey and the Preparatory Commission on the Comprehensive Nuclear Test-Ban Treaty Organization (CTBTO). Manned by two full-time staff of the Observatory, Mr. Ruel Narisma and Mr. Efren Morales, the station continuously monitors seismic activity under their supervision.

The MO Davao Station is now also involved in other research areas related to the study of the Earth's magnetic field. This is mainly because of Davao's unique location. The Earth's magnetic line "crosses the Island of Mindanao, cutting the northern part of Davao Gulf and passing through the Balabac Strait, South of Palawan Island. The line of zero variation, where the earth's meridian coincides with the magnetic line—or with the direction of the magnetic needle—passes thru Cape Bojeador, with inclination from ESE to WNW." (Badillo and Hidalgo, 1980)

The Manila Observatory is now part of Boston College's African Meridian B-Field Education and Research (AMBER) Networks (Fig. 7) and Kyushu University's MAGnetic Data Acquisition System (MAGDAS) (Fig. 8). These international collaborations were established because of a common interest in understanding the link between electromagnetic phenomena in the atmosphere and ionosphere and those in the lithosphere that may be related to seismic activity. A sample magnetometer data from two MAGDAS Stations are shown in Fig. 9.

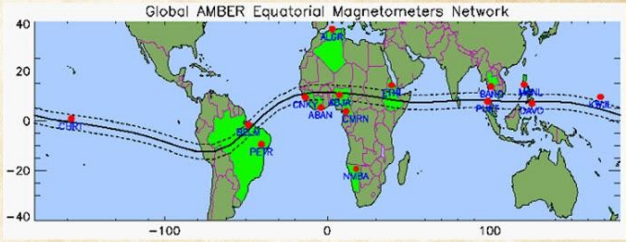

Fig. 7 The AMBER Magnetometer Network includes MO's Davao Station with the designated station code DAVO.

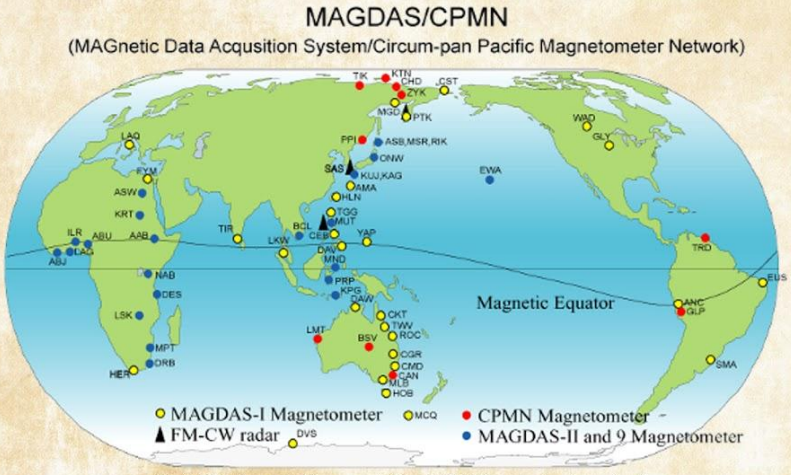

Fig. 8 MO's Davao Station as part of the MAGDAS magnetometer network.

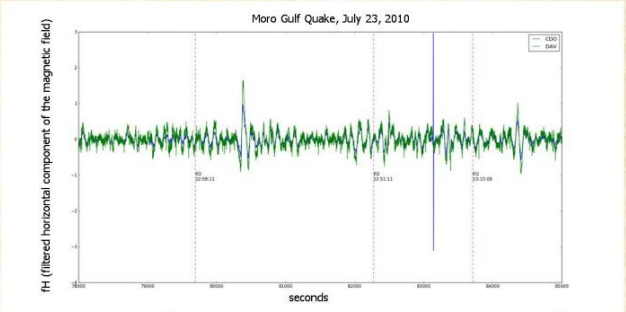

Fig. 9 Magnetometer data from MAGDAS Stations Cagayan de Oro (CDO) and Davao (DAV) from July 23, 2010. The filtered horizontal component of the magnetic field is shown with respect to earthquake events in the Moro Gulf in 2010.