

Global Navigation Satellite System in Thailand

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Abstract

GNSS has play an important role for navigation system also monitoring environmental for many years. The GNSS network around the world has about 500 stations. Thailand has 3 stations across the country from North to South. However, other stations that operate by Thai government (Thai Meteorological Department-TMD, Royal Thai Survey Department-RTSD, Department of Lands-DOL, and Department of Public Works and Town & Country Planning-DPT) are almost 30 stations. The use of GNSS in Thailand currently tends to be increased particularly in transportation navigator and in the business for find the solution to the customer.

Introduction

Global Navigation Satellite System (GNSS) is the data of positioning and timing. It collects ground control points for aerial triangulation and obtain the direct observation of the exterior orientation. Currently, almost 500 stations have been installed around the world but only few stations in some country such as Thailand, India have 3 stations, while Cambodia, Myanmar, Egypt or Laos have no any station (Figure 1)



Figure 1. Stations location around the world.

Source: International GNSS Service (2016)

The International GNSS Service (IGS) is the international organization that has different type of data such as parameter of earth's rotation, global ionosphere maps, information of satellite and tracking station clock, GNSS satellite ephemerides. Therefore, researcher around the world could download and use these data as Awange (2012) has reviewed the applications of GNSS i.e. for environmental monitoring,

environmental impact assessment or environmental pollution or Khodabandeh and Teunissen (2016) used to determine total electron content (TEC), and Nadarajah et al. (2014) and Giorgi et al. (2012) used for attitude determination and positioning for direct geo-referencing. The software to operate these data is RTKLIB that is an open source program package for GNSS positioning. The first version (0.2.0) was launched on 16 December 2006 and now the newest version (2.4.3) was released on 31 March 2015 (Takasu, 2015).

GNSS in Thailand

According to IGS (2016), there are 3 stations that were installed in Thailand; North, Central and South (Figure 2). Station CMUM is located in the North, Chiang Mai Province, CUUT is in Bangkok, Central and the south has CPNM station at Chumphon Province (Table 1). For each station photo and details can be seen in Figure 3 and Table 1.



Figure 2. Three stations that operation by JAXA

Edit from International GNSS Service (2016)



Figure 3. Photo of three stations in Thailand (left: CMUM, middle: CUUT, right: CPNM)

Source: International GNSS Service (2016)

Table 1. Details of all three stations in Thailand

Station	Latitude	Longitude	Elevation (meter ellips)	Install date	Province	Site name
CMUM	184539.15N	0985556.56E	308.962	18 Feb 2014	Chiang Mai	Chiang Mai
CUUT	134409.56N	1003202.16E	74.296	13 Jan 2015	Bangkok	Chulalongkorn University
CPNM	104328.74N	0992227.76E	9.143	4 Apr 2013	Chumphon	Chumphon

Source: International GNSS Service (2016)

Several of Thai government departments have involved with GNSS data such as Department of Public Works and Town & Country Planning (DPT), Thai Meteorological Department (TMD), Royal Thai Survey Department (RTSD), Department of Lands (DOL), for the first who has the Real Time Kinematic in Thailand is DOL (Rizos and Satirapod, 2011).

The Ionospheric and GNSS data center which is operated by King Mongkut’s Institute of Technology Ladkrabang (KMITL), is set to monitor Ionospheric and the efforts to create a GNSS and Ionospheric database in Thailand. Therefore, there are approximately 30 stations around Thailand that some stations collect only Ionospheric data such as PTC station (Phuket) or some stations collect GNSS data such as KMIT (Bangkok), CIMU (Chiang Mai University) or PTAC (Phuket) (Ionospheric and GNSS Data Center, 2016).

As it can be seen in Figure 4, there are about 30 stations over Thailand with different department of operation, as DPT has 11 stations across country, while DOL mainly has station around middle of Thailand or TMD has no station in the south of Thailand.

The examples of application of GNSS in Thailand are Narupiti (2011) delivery his talk in the United Nations meeting in Japan, about the using GNSS for vehicle tracking, probe vehicle, road management that are operated by ITS Thailand (Transport Systems in Thailand), Arunpold et al.(2012) study the effect of Ionospheric in positioning by using GNSS data in Thailand

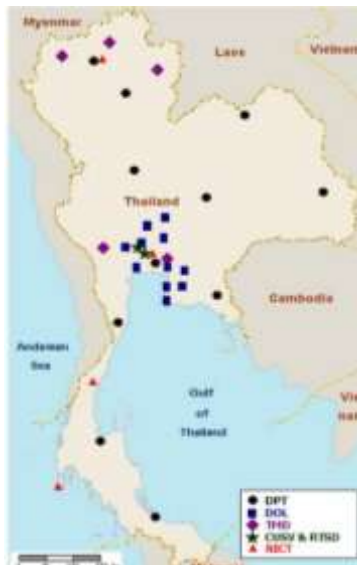


Figure 4. All stations network in Thailand

Source: Rizos and Satirapod (2011)

The recent event that related with GNSS in Thailand is the Startup Thailand on 28 April to 1 May 2016 at Queen Sirikit National Convention Center, Bangkok. The startup Thailand is the event that has a goal to integrate all organizations (government and non-government) for movement, development and ecosystem support in Thailand. In addition, one of the topic to discuss is “GNSS Technology Opportunity for Thai Startup” and the key note speech are Mr. Deok Jae Choi (Korea Aerospace Industries), Mr. Rod MacLeod (NovAtel, Canada), Mr. Dave Durey (Lockheed Martin, USA), Mr. Hugh Vanijrabha (Rolls-Royce, Thailand), Mr. Shan Kuo Yang (National Space Organization, Taiwan), Mr. Thierry Gardet (Airbus, France). The key of this discussion is the use of GNSS for transportation navigator especially for aircraft, also in the navigation business in term of find the answer and solution to the customer.

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