СІЛЬСЬКОГОСПОДАРСЬКІ НАУКИ

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GLOBAL NAVIGATION SATELLITE SYSTEM

Global Navigation Satellite System (GNSS) receivers, using the GPS, GLONASS, Galileo or BeiDou system, are used in many applications. The first systems were developed in the 20th century, mainly to help military personnel find their way, but civilian applications soon became numerous. Global Navigation Satellite System (GNSS) refers to a constellation of satellites providing signals from space that transmit positioning and timing data to GNSS receivers. The receivers then use this data to determine location. By definition, GNSS provides global coverage. Examples of GNSS include Europe's Galileo, the USA's NAVSTAR Global Positioning System (GPS), Russia's Global Navigation Satellite System (GLONASS) and China's BeiDou Navigation Satellite System.

GPS (Global Positioning System, United States)

GPS was the first GNSS system. GPS (or NAVSTAR, as it is officially called) satellites were first launched in the late 1970sand early 1980s for the US Department of Defense. Since that time, several generations (referred to as «Blocks») of GPS satellites have been launched. Initially, GPS was available only for military use but in 1983, a decision was made to extend GPS to civilian use [1, p. 67-68].

GLONASS (Global Navigation Satellite System, Russia)

GLONASS was developed by the Soviet Union as an experimental military communications system during the 1970s. When the Cold War ended, the Soviet Union recognized that GLONASS had commercial applications, through the system's ability to transmit weather broadcasts, communications, navigation and reconnaissance data. The first GLONASS satellite was launched in 1982 and the system was declared fully operational in 1993. After a period where GLONASS performance declined, Russia committed to bringing the system up to the required minimum of 18 active satellites. Currently, GLONASS has a full deployment of 24 satellites in the constellation. GLONASS satellites have evolved since the first ones were launched [3].

BeiDou Navigation Satellite System (China)

China has started the implementation of a GNSS system known as BeiDou Navigation Satellite System (BDS). The system is being implemented in two phases: the initial phase provides regional coverage, while the second phase will provide global coverage. The initial phase of the BeiDou system officially became operational in

December 2012, providing coverage for the Asia Pacific region. The regional BeiDou space segment has five Geostationary Earth Orbit (GEO) satellites, five Inclined Geosynchronous Orbit (IGSO) satellites and four Medium Earth Orbit (MEO) satellites. The second phase of the BeiDou system is planned to be completed by the end of 2020 and will provide global coverage with enhanced regional coverage [4].

Galileo

In May 1999, a mountaineering expedition carried a GPS receiver to the summit of Mount Everest, allowing them to accurately measure its elevation at 8,850 m (29,035 ft). We think Galileo would have been happy. Galileo, Europe's planned global navigation satellite system, will provide a highly accurate and guaranteed global positioning service under civilian control. The United States and European Union have been cooperating since 2004 to ensure that GPS and Galileo are compatible and interoperable at the user level. By offering dual-frequencies as standard, Galileo will deliver real-time positioning accuracy down to the metre range, previously not achievable by a publicly available system. Galileo will guarantee availability of service under all but the most extreme circumstances and it will inform users, within seconds, of a failure of any satellite. This makes it suitable for applications where safety is crucial, such as in air and ground transportation. The first experimental Galileo satellite, part of the Galileo System Test Bed (GSTB) was launched in December 2005. The purpose of this experimental satellite was to characterize critical Galileo technologies, which were already in development under European Space Agency (ESA) contracts. Four operational satellites were launched, two in October 2011 and two in October 2012, to validate the basic Galileo space and ground segment. In coming years, the remaining satellites will be launched, with plans to reach FOC likely sometime after 2020 [2].

IRNSS (Indian Regional Navigation Satellite System, India)

India is in the process of launching its own regional navigation satellite system to provide coverage for India and the surrounding regions. The IRNSS system will consist of seven satellites, three of them in geostationary orbits and four in inclined geosynchronous orbits.3 The system will provide a position accuracy of better than 10 metres throughout India and better than 20 metres for the area surrounding India by 1500 km. IRNSS will provide two services. A Standard Positioning Service (SPS) available to all users and a Restricted Service (RS) available to authorized users only.

QZSS (Quasi-Zenith Satellite System, Japan)

QZSS is a four satellite system that will provide regional communication services and positioning information for the mobile environment. One of the four satellites was launched in 2010. The focus of this system is for the Japan region, but it will provide service to the Asia-Oceania region. QZSS will provide limited accuracy in standalone mode, so it is viewed as a GPS augmentation service. The QZSS satellites use the same frequencies as GPS and have clocks that are synchronized with GPS time. This allows the QZSS satellites to be used as if they were additional GPS satellites. QZSS satellites also broadcast an SBAS compatible signal and a high-precision signal at E6. Three of the QZSS satellites will be placed in a periodic Quasi-Zenith Orbit (QSO). These orbits will allow the satellites to «dwell» over Japan for more than 12 hours a day, at an elevation above 70° (meaning

they appear almost overhead most of the time). In the future, Japan intends to expand the QZSS system to a seven satellite system [4].

CONCLUSION

Global Navigation Satellite Systems (GNSS) technology has become vital to many applications that range from city planning engineering and zoning to military applications. It has been widely accepted globally by governments and organizations. That is why we expect to have very soon at least three GNSS systems: the USA GPS, European Galileo, and the Russian GLONASS systems.

References:

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ДОСВІД ВПРОВАДЖЕННЯ ЄВРОПЕЙСЬКИХ БІОТЕХНОЛОГІЙ АКВАКУЛЬТУРИ В ПРИДНІПРОВСЬКОМУ РЕГІОНІ

Безумовно, аграрна Дніпропетровщина має значний водний фонд, представлений водосховищами: Дніпровське, Дніпродзержинське, Каховське, річками, озерами. На сьогоднішній день в Україні Держрибагентство у рибній галузі України проводить багаточисельні реформи. Серед різнопланових заходів можна відмітити і запуск рибного патруля, і дерегуляція та стимулювання розвитку різних форм аквакультури, адаптованих до індустріальних умов кожного регіону.

Одним з пріоритетних напрямків у тваринництві (секторі рибництво) є отримання якісної продукції, що зможе задовольнити споживача біологічною повноцінністю, ціновою доступністю. Тому удосконалення біотехнологій культивування гідробіонтів, вибір оптимальних моделей та об'єктів вирощування займає чи не перше місце [1; 3]. Візит французької делегації до Дніпропетровського державного аграрно-економічного університету дозволив обмінятися досвідом використання європейських технологій у рибництві, перейняти деякі моделі вирощування риби та запустити пілотний експеримент з зацікавлених напрямків. Слід зауважити, що провідним завданням у програмі гостей – президента асоціації рибництва, члену федерації обмінів Франція-