



**The 3rd ECO Geomatics Committee Training Course on
Global Navigation Network Systems (GNNS) and Data Processing**

24-26 May 2021
(ECO Secretariat, Tehran, Iran)

**The 3rd ECO Geomatics Committee Training Course on
Global Navigation Network Systems (GNNS) and Data Processing**
(24-26 May, 2021, Tehran)

1. The 3rd ECO Geomatics Committee Training Course on Global Navigation Satellite Systems (GNNS) and Data Processing was held virtually on 24-26 May, 2021. The delegates from the Islamic Republic of Afghanistan, Republic of Azerbaijan, Islamic Republic of Iran (host), Republic of Kazakhstan, Turkmenistan and Republic of Uzbekistan as well as officials of the ECO Secretariat attended the Training Course. The list of participants is attached *as Annex-I*.

Inauguration of the Meeting

2. The Meeting started its proceedings with remarks of Mr. Hamed Moradian, Head of International Relations Office of the National Cartographic Center of the Islamic Republic of Iran. He extended his warm gratitude to the participants on behalf of National Cartographic Center for accepting invitation and participation in the Training Course.

3. Professor, Dr. Ali Sultanpour, General Manager of the Hydrography Department, Secretary of ECO Geomatics Committee, mentioned with regard to special data, it will always be exposed to natural and unnatural hazards and damages and so crisis management will not be possible without special data. The necessity now its plan geometry is not provided and, therefore, sustainable development in various fields, such as agriculture, industry, trade and others will not be achieved. Therefore, the ECO Geomatics Committee has been established with the approval of Heads of Surveying Organization of the ECO Member States to strengthen cooperation between Member States in the field of special data gathering, processing, analysis and presentations. The outcome of the previous meetings of Heads of Surveying Organizations of ECO Member States as well as the ECO Geomatics Committee will be used in intra-region cooperation. The satellite takes a processing course provided by the National Cartographic Center (NCC) of the Islamic Republic of Iran is a third Training Course that supposes on pay side positioning and exchanging now in this field and also paving the way for cooperation between the Member States, the coordinate frameworks in the region.

4. Mr. Rovshan Mirzayev, Director (EME) of ECO Secretariat in his opening remarks acknowledged that this kind of events provide ample opportunities for opening up of new avenues for cooperation and strengthening intra-regional bonds via increasing knowledge and sharing best practices. In this rationale, he called for building and enhancing future closer collaboration among the Member States in the field of Geomatics Committee so that regional objectives as enshrined in the ECO Vision 2025 could be achieved in a holistic manner.

5. Dr. Abdolreza Saadat, General Manager of Geodesy and Land Surveying Department of National Cartographic Center (NCC) of Iran explained about Coordinate System and Reference Frame, Geodetic Datum, Iranian Permanent Geodynamic and GNSS Networks and Geodetic Datum. He mentioned that Reference Frame is realization of the coordinate system. A Reference Frame consists of the set of physical reference points that uniquely fix the

coordinate system and standardize measurements with that Frame. Reference Frame realizes the system by means of coordinates of definite points that are accessible directly by observation. A simple Reference Frame can be defined in 3D with a triad of orthogonal axes.

6. Dr. Hamidreza Nankali, Head of Geodesy and Geodynamics Office briefed the participants that Geodesy provides a foundation for all earth observations and mentioned that space geodesy is the use of precise measurements between space objects (e.g., orbiting satellites, quasars) to determine, positions of points on the earth, position of the Earth's pole, earth's gravity field and geode. He explained that GNSS Satellites (GPS-U.S., Russia-GLONASS, EU-Galileo) equipped with precise clocks transmitting messages such as ephemeris, clock offsets, etc. to ground (and space-based) receivers to measure station to satellite pseudo-range, phase delay. VLBI: Radio telescopes equipped with X/S wideband receivers record signals from quasars to measure difference in signal arrival times. SLR/LLR: Ground-based short-pulse laser transmitting to satellites (or planetary targets) equipped with corner cubes to measure round-trip pulse time-of-flight to satellite. DORIS: Satellites equipped with DORIS receiver and uplink hardware transmit signals to ground beacons to measure Doppler shift on radiofrequency signals. He explained that space geodetic networks (GNSS, SLR, VLBI, DORIS) provide the critical infrastructure necessary to develop and maintain the TRF.

2nd Day Proceedings of Training Course on 3rd Geomatics Committee

7. Mr. Hamid Reza Nankali, gave the briefing on GPS Concept and stated that the GPS system was deployed by the Department of Defense for improved navigation, positioning and timing purposes. There are 29 satellites circling earth twice every day. Dual-frequency satellites broadcast L1 (~1.6 GHz) and L2 (~1.2 GHz) signals that are received by GPS receivers and converted into position and time information. Furthermore, he shortly explained the PPP (Precise Point Positioning), PPP Procedure and Advantages. At the end, Mr. Nankali, concluded his statement with remarks that PPP is a new processing approach aimed at high positioning accuracy with the use of only a single dual frequency GPS receiver. The PPP traditional model uses the ionosphere-free code and phase combinations to mitigate the ionospheric effects. Keeping CPU-time with increasing number of sites/parameters using parallel processing in clusters.

8. A representative from NCC informed about functions of GNSS Observations, Modeling the observation and limits of GNSS accuracy. He stated that high-precision positioning uses the phase observations and explained about long session static that tracking of change in phase over time carries most of the information. The shorter the span the more important is ambiguity resolution. Moreover, he highlighted GPS Satellite and explained that limits to model are non-gravitational acceleration due to solar and earth radiation, unbalanced thrusts, and outgassing; and non-spherical antenna pattern. Modeling of these effects has improved, but for global analyses remain a problem. Parametric models are used in GAMIT and these evolve with time (and version).

9. Ms. Agha Mohammadi, Experts of Geology Department of the Islamic Republic of Iran introduced about GAMIT/GLOBK as well basic framework of GAMIT and GAMIT Structure. She mentioned that development started in late 1970s when MIT was building GPS receivers and code derived from 1960-1970 planetary ephemeris and VLBI software. Start of IGS was established in 1992 and prompted development of automatic processing schemes and fully automatic processing in mid-1990s including continuous stations and campaign GPS measures.

3rd Day Proceedings of the Training Course on Geomatics Committee

10. Ms. Fatemeh Khorrami, from National Cartographic Center (NCC) briefed about the GPS data processing with GAMIT/GLOBK and introduced that how it works during earthquake for recovering the data by using GAMIT/GLOBK software. She informed that any interested Member States can download it through the web link <http://geoweb.mit.edu/>. However, the interested Member States may send their email on (rwk@chandler.mit.edu) before downloading the software to get username and password from Robert W King. After that any representative will be able to download and use the software. She mentioned that there are different type of files i.e. Global files, control files, coordinate file, gambit command as well station information which can be used by using above weblink.

11. Mr. Fatemeh introduced that GLOBK is a Kalman filter whose primary use is to combine various geodetic solutions, local network and global networks. GLOBK combines together daily GPS processing (h-files), which are obtained from GAMIT to produce time series and positions and velocity in order to tie our regional network rigorously to large global reference frame. She stated that operation of GLOBK is executed from the project-level directory and run in solution dir/gsoln, which requires two file; i) binary h-file generated by "htoglb" and; ii) 2 command files: globk_comb.cmd,glorg_comb.cmd.

12. Mr. S.A. Saadat, General Manager of Geodesy and Land Surveying Department of National Cartographic Center (NCC) of Iran gave a short review, while briefing about Coordinate System and Reference Frame and Geodetic Datum. He explained about the deformation model and transformation parameters of Iranian Permanent Geodynamic and GNSS Networks which can be used to measure the point and surface of land as well as data of earthquake. Further, he informed that GNSS Iran will be at the disposal of ECO Member if they are willing and face the problem while downloading the software and requested the Member States to share their views/comments that are using GNSS Network in their countries.

Closing Ceremony

13. Mr. Hamed Moradian, Head of International Relations Office of the National Cartographic Center of the Islamic Republic of Iran informed the representatives of the Member States that the certificates will be sent to the participants formally after preparation and affixation signature of Secretary ECO Geomatic Committee. Meanwhile, he requested the ECO Secretariat to share the list of participants for forwarding the certificates to the participants.

List of Participants for the Virtual Training Course on “Reference Frames and Global Navigation Satellite System (GNSS) Data Processing”

(May 24-26 2021, ECO Secretariat, Tehran, Iran)

ECO SECRETARIAT

1. Mr. Rovshan Mirzayev, Director for Energy, Minerals and Environment
2. Mr. Nurlan Darimov, Program Officer for Energy, Minerals and Environment
3. Mr. Shahzado Lund Baloch, Steno-Secretary for Energy, Minerals & Environment

ECO MEMBER STATES

Islamic Republic of Afghanistan

4. Sayed Shah Mahmoud Sadat, Director of Ground Control Points Department, Ministry of Urban Development and Land.

Republic of Azerbaijan

5. Mr. Murad Jamalov, Specialist of the Earth Remote Observation Department of the Azercosmos Agency

Islamic Republic of Iran

6. Mr. Hamed Moradian, Head of International Relations Office
7. Dr. Abdolreza Saadat, General Manager of Geodesy and Land Surveying (Trainer)
8. Dr. Hamidreza Nankali, Head of Geodesy and Geodynamics Office (Trainer)
9. Ms. Fatemeh Khorrami, Expert of Geodesy
10. Ms. Sedighe Hossein, Expert of Geodesy

Turkmenistan

11. Mr. Sherzhanov Arslan, Head of the Department of Space Systems and Information Security of the Turkmenaragatnashyk Agency.

Republic of Uzbekistan

12. Mr. Tokhir Teshaboev, Leading Specialist of the Department of high-precision Navigation and Scientific and Technical Developments