

POPULAR SCIENCE SUMMARY

The concept of reference is a natural matter for humans. In every environment (especially in a new one) we look for a reference to orient ourselves in space. Presently, for precise navigation we commonly use Global Navigation Satellite Systems (GNSSs) and maps developed mainly on the basis of satellite images. As modern smartphones are available on a mass scale, the number of their users is estimated in billions and almost each of them is equipped with navigation satellite systems' receivers as a standard, so the scale of their application is also worldwide. However, few people realize that these systems also need a reference to work properly, more precisely, a 4-dimensional geocentric system in which first the coordinates of satellites, and consequently of points on the Earth's surface, are expressed. This system is called ITRF (International Terrestrial Reference Frame) and its construction is one of the main tasks of the International Association of Geodesy (IAG). This implementation takes place every few years, the latest system ITRF2020 will be officially introduced in 2022, but already published are the time series of changes in the position of selected points on the surface of the Earth, which are constantly monitored by satellites of various systems, among others in order to control their correctness. The analysis of such series is crucial to the correct construction of the mentioned frame, and what is (perhaps) more important – to determine its reliability, which in a simple way is transitioned into the accuracy of position determination e.g. using smartphones. Therefore, the aim of this project is to investigate the nature of both the deterministic and the stochastic part of the time series of position changes of permanent stations of two satellite techniques: GNSS (by means of GPS+GLONASS+Galileo) and DORIS (Doppler Orbitography and Radiopositioning Integrated by Satellite), which will have a bearing not only on determining the reliability of the current terrestrial reference frame, but will also influence the construction of future frames, which in turn will have a positive social impact due to the recent mass availability of positioning by navigation satellite systems.