Name and surname:	**Witold Rohm**
Academic Degree	dr hab. inż. (DSc.)
Institute/Department	Institute of Geodesy and Geoinformatics
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UPWr Base of Knowledge - link	https://bazawiedzy.upwr.edu.pl/info.seam?affil=&id=UPWr4d682756bd1243c58f310f8e07f263af&lang=en&cid=1061108
Researchgate:	https://www.researchgate.net/profile/Witold-Rohm
Personal website / Working group website:	https://spaceos.igig.upwr.edu.pl
Projects in last 5 years (chronological; with distinction into PI (kierownik) and RF (wykonawca)):	2021 - 2025 NCN-OPUS Three-dimensional integrated observations of the troposphere using ground and satellite GNSS observations - PI 2020 - 2024 NCN-Preludium BIS Beyond machine learning in mobility prediction - PI 2019 - 2022 H2020, GATHERS - Integration of Geodetic and imAging TecHniques for monitoring and modelling the Earth's surface defoRmations and Seismic risk - Innovation and data manager 2017 - 2022 OPI - POIR, EPOS - European Plate Observing System - PI 2015 - 2019 NCBiR TANGO, GNSS tomography as an important meteorological data source - results comercialisation, PI
Research topic and funding	
1) PhD topic:	GNSS troposphere observation utilization in weather forecasting - PhD in GNSS for future mega-cities
2) Research discipline in Doctoral School	Civil Engineering and Transport
3) Short description of the research problem to be solved in the PhD:	Today, to resolve global transportation challenges, all moving objects are equipped with GNSS sensors: buses, trams, trains, taxis, bikes and almost all people are wearing smart watch or carry smartphone. Until just recently the GNSS chips were built with only handful of channels, one available system and a positioning based on the coarse code positioning. But things have changed, new chips are handling two or more frequencies from multiple constellations and are able to track the signal phase, just like the high-end precise receivers. Another, global challenge is the rapid climate change. The Earth System is pushed from the balance turning our weather system into less predictable, more changeable, with more serious severe weather events. With continuing development of mega-cities and growing density of urban areas, our weather forecast and rapid response systems are going to need significant reinforcement. One of the climate change mitigation practice is to improve the quality, availability and reliability of information concerning state of the troposphere i.e.: convection, moisture dynamics, location and intensity of severe event information. The inevitable response to the future challenges is to further invest in weather observation infrastructure. However, these cost could be partially reduced if we use signals of opportunity like GNSS to sense the troposphere parameters. The GNSS signals are transmitted towards Earth in uniform, continuous way and devices that are able to track the signal can act as a weather sensors. If we want to fully harness the power of GNSS signals we need to develop break-through technologies to process GNSS data from moving objects to retrieve variable troposphere conditions. GNSS mounted in the mobile devices could provide a troposphere estimates, with high spatial and temporal resolution. The number of devices, is proportional to the congestion, and the locations of observations resemble the circadian rhythm of a city, each governed by scalable people's movement laws, and thus predictable. Another dimension to the ground-based reference network is growing number of flying objects, from drones, through planes up to High-altitude Platform System and low earth orbiting satellites, each of these device is equipped with GNSS receiver with potential to observe troposphere using, direct, occulted or reflected signal. The number quality and availability of data retrieved from flying objects is potentially simulated using future forecasts. The GNSS data: from moving objects, reference networks, flying and orbiting objects could provide, high spatial density, high time resolution troposphere observations – water vapor content, hail and rain location, convection intensity. However, these data without a rigorous observation operator to assimilate them into numerical weather models is only half-way through. Therefore a new operator that uses GNSS derived observations have to be developed tested and implemented in the most popular weather model to stimulate growth in this field. Therefore two PhD topics are proposed in this project: PhD in GNSS troposphere processing flying or orbiting platforms Within this PhD project, successful candidate will, using simulated and real data develop innovative GNSS signal processing techniques for flying and/or orbiting platforms. Direct, occulted and reflected signals are to be investigated in a search for reliable troposphere information.
4) Professional skills for PhD candidate (e.g. master program, specializations, softwares, language, analytical techniques):	•MSc in geodesy, geomatics, physics, computer science or mathematics, •GNSS processing skills in one of the following software: Bernese GPS Software, GIPSY-OASIS, GNSS WARP, RTK LIB, goGPS •Understanding of atmosphere physics is essential •Good command in English •Tank full of enthusiasm for 4 years of research •Programming skills in one of the following: Matlab, Python, Fortran •Willing to undertake long-term (3 months+) internships in foreign research institutions
5) Details of the project to support PhD research	
a) Project title:	none
b) Agreement number:	none
c) Number of months in the project to support PhD (in months; starting from 1st of October 2021):	0
6) Project webside:	