



MSc Thesis in Remote Sensing of the Atmosphere

Urban-specific clutter mitigation for weather radar

Background & Research question

Being reflected by surrounded rain drops, the microwave signal from ground-based weather radars may provide maps of rainfall rate. Compared to the granular measurement obtained by rain gauges, the radar covers a much larger spatial area which is paramount for many applications in meteorology, flood, and climate change monitoring.

However, such radar images can suffer from unwanted, non-atmospheric echoes called 'clutter' that hampers the quality of the retrieved rainfall information. This is particularly true in urban environment where heavy clutter is generated from multiple sources, such as large buildings, windmills, but also interferences from telecommunication systems.

The Rijnmond radar, an advanced weather X-band radar system, is soon going to be deployed in the very centre of a city, in Rotterdam. Thanks to its advanced capabilities, it will map rainfall at very high resolution in order to better manage urban water at street-level and improve our understanding of urban climatology. **The question is whether the clutter in the radar image can be mitigated without removing the information from the rainfall.**

Master topic

Research has been carried out at TU-Delft on clutter filtering using spectral (Doppler) and polarimetric radar measurements. The proposed methodology, spectral polarimetry, can be enhanced with image processing techniques at low radar elevation angles and in the case of radio frequency interference. It was applied on study cases. **The proposed master topic aims at investigating the impact of an urban environment on this promising enhanced methodology.** The master thesis topic is part of the EU funded program ATTRACT (2019-2020), under the project: Enhanced Urban Rain Surveillance Systems for Smart city Solutions (EU-RainS4).

Supervision

Organized at the TU Delft Department of Geoscience and Remote Sensing and co-supervised by SkyEcho, a young startup company working on rainfall estimation and smart city solutions.

Requirement and Experience gain

The work doesn't require any real-time processing. Matlab or Python coding is sufficient. The main gain is to apply weather radar signal processing research in real environment with a direct contact with a industrial sector for city climate adaptation applications. **If successful, the student will have the opportunity to present his work in an international conference with high network potential.**

Contact information

Christine Unal (c.m.h.unal@tudelft.nl, CITG HG2.18) – lead supervisor

Herman Russchenberg (h.w.j.russchenberg@tudelft.nl, CiTG HG2.10) - professor

Albert Oude Nijhuis (albertoudenijhuis@sky-echo.eu, SkyEcho, Rotterdam) – co-supervisor