

Roberto Nebuloni



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Italiano

Ricercatore presso l'Istituto di Elettronica e di Ingegneria dell'Informazione e delle Telecomunicazioni (IEIIT) del Consiglio Nazionale delle Ricerche (CNR)

roberto.nebuloni@ieiit.cnr.it

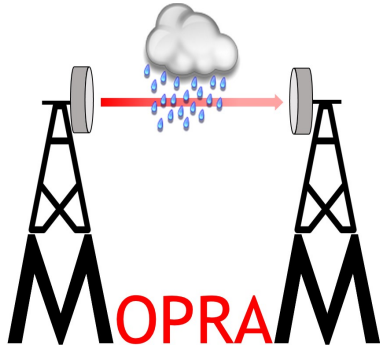
Roberto Nebuloni si è laureato in Ingegneria Elettronica e ha conseguito il Dottorato di Ricerca in Ingegneria dell'Informazione presso il Politecnico di Milano, nel 1997 e 2004, rispettivamente. Nel 2005, è entrato nel Consiglio Nazionale delle Ricerche (CNR), dove è tuttora ricercatore presso l'Istituto di Elettronica e di Ingegneria dell'Informazione e delle Telecomunicazioni (IEIIT), a Milano. I suoi interessi di ricerca includono aspetti teorici e sperimentali della propagazione delle onde radio e ottiche in atmosfera per applicazioni nell'area delle telecomunicazioni, meteorologia e monitoraggio ambientale. E' autore di circa 60 articoli sui temi sopra citati. Ha partecipato a progetti europei Cooperation in Science and Technology (COST) e alla rete di eccellenza Satellite Communications Network of Excellence (SatNEx). E' stato coinvolto in progetti finanziati dall'Agenzia Spaziale Europea (ESA) per lo studio delle tecniche di mitigazione dell'attenuazione per sistemi avanzati satellitari.

Publicazioni

- R. Nebuloni, C. Capsoni, M. Luccini, "Advanced time series synthesizer for simulation of joint rain attenuation conditions", *Radio Science*, Vol. 49, No. 9, pp. 699-708, 2014
- R. Nebuloni, C. Capsoni, V. Vigorita, "Quantifying Bird Migration by a High-Resolution Weather Radar", *IEEE Transactions on Geoscience and Remote Sensing*, Vol. 46, No. 6, pp. 1867-1875, 2008.
- R. Nebuloni and C. Capsoni, "Effects of Adverse Weather on Free Space Optics", in *Optical Wireless Communications*, Springer-Verlag Publishing, Berlin (Germany), 2016 (this book can be purchased at <http://www.springer.com/gp/book/9783319302003>)

ricerche

MOPRAM



Roberto Nebuloni is the principal Investigator and responsible of the activities carried out by IEIT in the frame of the national project “MONitoring of PRecipitation through A network of Microwave radio links” (MOPRAM), funded by Fondazione CARIPLO. MOPRAM is a multidisciplinary project that intends to use measurements carried out by a commercial network of microwave radio links to improve the characterization of the space-time variability of rainfall. MOPRAM is expected to contribute significantly beyond the state of the art in the area of hydrometeorology, in particular in river discharge prediction. The results of the project can help to address other problems as well, e.g. the triggering of shallow landslides, or the soil erosion that is important for agricultural purposes.

Project start: April 2017, duration: 36 months

Partners:

- Istituto di Elettronica e di Ingegneria dell'Informazione e delle Telecomunicazioni (IEIT), Consiglio Nazionale delle Ricerche (leaders)
- Dipartimento di Elettronica, Informazione e Bioingegneria (DEIB), Politecnico di Milano, Italy
- Dipartimento di Ingegneria Civile e Ambientale (DICA), Politecnico di Milano, Italy

attrezzature

> strumenti

A “METEK USA-1” sonic anemometer is installed on the rooftop of Building 20 of DEIB, within the campus of Politecnico di Milano. It carries out measurements of the 3D wind components (x , y , z) and of the sonic temperature of the air based on the propagation time of ultrasound waves between three pairs of transducers. This sensor provides accurate measurements of wind and turbulence parameters. Data are sampled every 1-s and stored on daily .txt files. The sensor is not operated continuously, however historical data or on-demand measurements can be requested by contacting ClimateLab staff.



The RPG (Radiometer Physics GmbH) HATPRO radiometer, installed on the rooftop of Building 20 of DEIB, collects brightness temperature measurements at 4 channels in the Ka (23.8 and 31.6 GHz) and V band (72.5 and 82.5 GHz) with 1-second sampling time. Such data allow inferring the liquid water content in clouds and the water vapor content in the troposphere. The instrument is also useful to quantify the attenuation induced by the troposphere (in nonrainy conditions) on EM waves. The HATPRO radiometer also features meteorological sensors monitoring pressure, temperature and relative humidity



The tipping bucket rain gauge, installed on the rooftop of Building 20 of DEIB, monitors precipitation events. The instrument provides as output the number of tips occurred every minute, from which rain rate time series can be derived (1-minute integration time). The tip resolution is 0.1 mm.



The Thies CLIMA laser disdrometer, installed on the rooftop of Building 20 of DEIB, provides detailed information on hydrometeors by measuring their particles size, their falling velocity and their state (liquid drops, snow flakes, hail particles, ...). Results are output with 1-minute integration time and they are of key importance for the in-depth investigation of the effects of precipitation on EM waves.



The beacon receivers installed on the rooftop of Building 20 of DEIB monitor the oscillations of the signal emitted by the Alphasat satellite (geosynchronous with orbital position at 25° E) at two frequencies: 19.7 GHz and 39.4 GHz. The measurements (the sampling frequency is 8 Hz) allow the deep analysis of the effects of the troposphere on EM waves, including: absorption by water vapor and oxygen, attenuation induced by clouds and hydrometeors, depolarization effects due to cloud ice crystals and signal rapid fluctuations (scintillation) due to atmospheric turbulence.

