UP 6: Remote sensing and data analysis methods

Zeit: Mittwoch 14:00–16:00 Raum: HS 22

Hauptvortrag UP 6.1 Mi 14:00 HS 22

Advanced Multi-Parametric Synthetic Aperture Radar Techniques for Environmental Applications — •Irena Hajnsek[1] and Kostas Papathanassiou[2] — [1]Institute of Environmental Engineering, ETH Zürich, Switzerland — [2]Microwaves and Radar Institute, German Aerospace Center, Germany

Recent advancement in the multi-parametric Synthetic Aperture Radar (SAR) techniques will be presented on the base of the German satellite mission TanDEM-X and airborne F-SAR campaigns acquiring unique data for the retrieval of environmental applications. The focus will be on the use of multiple techniques (polarimetric SAR, interferometric SAR, polarimetric SAR interferometry and tomography) in relation to their capability to derive specific information like for example 3D information content.

Hauptvortrag UP 6.2 Mi 14:30 HS 22

Aeolus - the first wind lidar in space: Challenges and first results — •Oliver Reitebuch[1], Christian Lemmerz[1], Oliver Lux[1], Uwe Marksteiner[1], Markus Meringer[1], Karsten Schmidt[1], Fabian Weiler[1], Benjamin Witschas[1], Dorit Huber[2], Ines Nikolaus[3], and Thomas Kanitz[4] — [1]DLR, Oberpfaffenhofen, Germany — [2]DoRIT, Fürstenfeldbruck, Germany — [3]University of Applied Sciences, Munich, Germany — [4]ESA, Noordwijk, The Netherlands

Soon after its successful launch in August 2018, the spaceborne wind lidar ALADIN (Atmospheric LAser Doppler INstrument) on-board ESA's Earth Explorer satellite Aeolus has demonstrated to provide atmospheric wind profiles on a global scale. Being the first ever Doppler wind lidar instrument in space, ALADIN contributes to the improvement in numerical weather prediction by measuring one component of the wind vector along the instrument's line-of-sight from ground throughout the troposphere up to the lower stratosphere.

The measurements are performed with the single payload ALADIN, which is a direct-detection Doppler wind lidar operating at an ultraviolet wavelength of 354.8 nm. ALADIN uses a frequency-tripled Nd:YAG laser, a large 1.5 m Cassegrain telescope, and 2 interferometers for detection of the Doppler frequency shift from molecules and particles.

Challenges during the development of the ALADIN instrument are highlighted and first results are discussed including validation with an airborne instrument demonstrator.

UP 6.3 Mi 15:00 HS 22

Impact of three-dimensional cloud-structures on atmospheric trace gas retrievals — •Claudia Emde[1], Arve Kylling[2], Huan Yu[3], Michel van Roozendael[3], Bernhard Mayer[1], and Kerstin Stebel[2] — [1]Meteorological Institute, LMU, Munich — [2]Norwegian Institute for Air Research (NILU), Oslo, Norway — [3]Royal Belgian Institute for Space Aeronomy (BIRA-IASB), Brussels, Belgium

Operational retrievals of tropospheric trase gases from space-borne spectrometers are based on one-dimensional radiative transfer models in combination with simplified cloud correction schemes, which do not consider effects like cloud scattering into neighboring pixels or cloud shadowing.

To study the impact of three-dimensional (3D) cloud structures, we have developed the Absorption Lines Importance Sampling (ALIS) method and implemented it into the Monte Carlo radiative transfer model MYSTIC. ALIS allows efficient simulations of radiances in high spectral resolution for 3D model atmospheres including realistic clouds. Furthermore we implemented 3D box-airmass-factor calculations.

Based on 3D cloud fields as model input we simulate spectral radiances for regions relevant for NO2 retrievals: The spectrum between 400 and 500nm includes characteristic NO2 absorption features, and the O2A absorption band between about 755 and 775nm is used for cloud correction. We apply a DOAS retrieval algorithm including a simple cloud correction scheme on the simulated data and by comparing the retrieved NO2 column with the model input, we estimate the error due to cloud scattering.

UP 6.4 Mi 15:15 HS 22

Uncertainties in the retrieval of shortwave broadband albedo from satellite, airborne and ground-based radiative measurements — •Christine Pohl, Larysa Istomina, Vladimir Rozanov, Gunnar Spreen, and Georg Heygster — Institut für Umweltphysik, Universität Bremen

Arctic surface shortwave broadband albedo, hereafter called as albedo, is a key quantity determining the Arctic surface radiation energy budget and is closely related to the Arctic climate. Consequently, climate models require an albedo accuracy of 0.02 - 0.05 to simulate the Arctic climate correctly.

Albedo is derived from reflectance measurements by various satellite (e.g. MODIS, AVHRR/3), airborne (e.g. SMART-Albedometer), or field instruments (eg. FIGIFIGO, ASD-spectroradiometer). However, these instruments have various fields of views (FOVs) and different spectral and spatial resolution, which introduces uncertainties in the derived albedo product.

We quantify these uncertainties for typical Arctic surface types under variable solar zenith angles (55°- 80°) using the radiative transfer model SCIATRAN. Spectrally and angularly sparse resolved satellite observations introduces the highest uncertainties in the albedo retrieval, which tend to increase with the solar zenith angle. Uncertainties due to different FOVs can be neglected.

UP 6.5 Mi 15:30 HS 22

Cosmic Ray Neutron Sensing with novel neutron detectors — •Markus Köhli[1,2], Jannis Weimar[1], Fabian Allmendinger[1], Fabian Schmidt[2], and Ulrich Schmidt[1] — [1]Physikalisches Institut, Universität Heidelberg, Heidelberg, Deutschland — [2]Physikalisches Institut, Universität Bonn, Bonn, Deutschland

The method of cosmic ray neutron sensing - measuring soil moisture non-invasively at the hectometer scale has turned out to be feasible by detecting the environmental albedo neutron density. The key feature of the method is that neutrons generated by cosmic rays show an exceptionally different behavior interacting with hydrogen. It slows down fast neutrons whereas any other heavier element, independent of the chemical composition, rather reflects them. In the recent years the understanding of neutron transport by Monte Carlo simulations led to major advancements in precision, which have been successfully targeted meanwhile by a manifold of experiments. We are now developing boron-lined neutron detectors using spin-off technologies from the upcoming European Spallation Source and instrument design experience from past experiments. These detectors shall also offer an alternative platform to current Helium-3 based systems. In order to reduce costs we recently have developed readout electronics and data acquistion systems based on Arduino microcontrollers.

UP 6.6 Mi 15:45 HS 22

digital filter design based on FPGA system for nuclear detection — •yuzhen ma — Institute of Semiconductor and Microsystems Technology, Technische Universität Dresden, Dresden 01069, Germany

Amplitude is an important parameter in the measurement system for the nuclear radiation, which is very critical for a nuclear instrumentation for it is proportional to the amount of charge. By using the traditional Fourier transform appears to be powerless for nuclear radiation signal. As a new signal measurement method, wavelet analysis decomposes various frequency components in the signal into non-overlapping frequency bands, which provides an effective way for signal filtering, The use of wavelet analysis for measuring signal is an important application in nuclear instrumentation, which provides a useful tool for the analysis for non-stationary signals. This work performs a comparison between different digital filters and presents a filter based on FPGA system to obtain precise amplitude value. A filter based on wavelet transform is designed to improve the performance of measuring system for radioactive detection. With specific scintillation detector, the energy resolution is improved by the designed measurement technique comparing to other filters.