UP 6: Methoden - Fernerkundung

Zeit: Mittwoch 8:30–11:00 Raum: GW2 B3009

Hauptvortrag UP 6.1 Mi 8:30 GW2 B3009

Tandem-L: Highly Innovative Interferometric Radar Satellite Mission for Climate Research and Environmental Monitoring — •Alberto Moreira — German Aerospace Center (DLR), Microwaves and Radar Institute, Wessling/Oberpfaffenhofen, Germany

Tandem-L is a proposal for a highly innovative L-band SAR satellite mission for the global observation of dynamic processes on the Earth's surface with hitherto unparalleled quality and resolution. Thanks to the novel imaging techniques and the vast recording capacity with up to 8 Terabytes/day, it will provide vital information for solving pressing scientific questions in the biosphere, geosphere, cryosphere, and hydrosphere. The Tandem-L mission concept is based on the use of two SAR satellites with variable formation flight configurations and is distinguished by its high degree of innovation with respect to the methodology and technology. Examples are the polarimetric SAR interferometry for measuring forest height, multi-pass coherence tomography for determining the vertical structure of vegetation and ice, the utilization of the latest digital beamforming techniques in combination with a large deployable reflector for increasing the swath width and imaging resolution, as well as the formation flying of two cooperative radar satellites with adjustable spacing for single-pass interferometry. Hence, in a time of intensive scientific and public debate on the extent and influence of climate change, Tandem-L will deliver vital missing information for improved scientific predictions upon which socio-political decisions can be based.

UP 6.2 Mi 9:00 GW2 B3009

Automatic detection of polar mesocyclones using satellite microwave humidity sounders — •Christian Melsheimer — nstitute of Environmental Physics, University of Bremen, Germany

Polar mesocyclones are small intense cyclones in polar and subpolar areas. They are challenging to observe, model and predict because of their small size, rapid development and short lifetime. Therefore polar mesocyclones and polar lows (PLs i.e., particularly strong PMCs over the sea) are poorly monitored – yet they have significant influence on atmosphere, ocean and sea ice. Here we present first results of an automatic detection algorithm, based on a simple threshold-based method using data from microwave humidity sounders (AMSU-B and MHS) on several operational meteorological satellites: On maps of the difference between the channels at 183±1 GHz and 183±7 GHz, PMCs over open ocean are visible as small patches of reversed sign. Such PMC signatures can be found by a classification algorithm that determines the size and shape of the patches and joins clusters of them if they are close enough to be considered belonging to the same cyclone. Such an algorithm must be trained, i.e., the distinguishing features of a PMC signature (size, shape, distance to similar signatures) have to be determined. This algorithm training is done by analysing signatures of about 100 known PMCs and PLs cases over the Norwegian Sea between 2000 and 2010. An automatic PMC and PL detection algorithm will allow to compile inventories of PMCs during the whole period of AMSU-B/MHS data (1999 to date). Until now, all such inventories had to be compiled by manual interpretation of satellite data.

UP 6.3 Mi 9:15 GW2 B3009

Experiences with an optimal estimation algorithm for surface and atmospheric parameter retrieval from passive microwave data in the Arctic — •Raul Scarlat and Georg Heygster — University of Bremen - Institute of Environmental Physics Otto-Hahn-Allee 1, 28359 Bremen, Germany

In this study we present experiences in using an integrated retrieval method for atmospheric and surface parameters in the Arctic using passive microwave data from the AMSR-E radiometer.

The core of the method is a forward model which can ingest bulk data for seven geophysical parameters to reproduce the brightness temperatures observed by a passive microwave radiometer. The retrieval method inverts the forward model and produces ensembles of the seven parameters. These are wind speed, integrated water vapor, liquid water path, sea and ice surface temperature, sea ice concentration and multi-year ice fraction. The forward model uses empirically determined sea ice surface emissivities for simulating brightness temperatures in ice covered areas. Three distinct versions of the retrieval method were implemented using the lower eight, ten and all twelve channels respectively.

This study provides an overview of the results for atmospheric and surface parameter retrieval as well as suggestions for future improvements.

UP 6.4 Mi 9:30 GW2 B3009

Impact of ambient conditions on the DOAS retrival of NOVAC data — •Elsa Wilken[1], Florian Dinger[1,2], Simon Warnach[1,2], Nicole Bobrowski[1,3], and Ulrich Platt[1] — [1]IUP, University of Heidelberg — [2]MPI Chemistry, Mainz — [3]University of Mainz

The measurement of magnitude and composition of volcanic gas emissions allow insights in magmatic processes as well as the impact of volcanoes on the atmospheric chemistry. Therefore the Network for Observation of Volcanic and Atmospheric Change (NOVAC) has been installed for monitoring the SO2 and BrO emissions of 30 volcanoes using scanning UV-spectrometers. The volcanic gas emissions are retrieved from the recorded spectra by applying Differential Optical Absorption Spectroscopy (DOAS). While NOVAC records an outstanding amount of gas emission data, the drawback of this automatically operating network is a limited accuracy and precision compared to manual measurements. For accurate retrievals, it is mandatory to find a Fraunhofer reference spectrum (FRS) which is free of volcanic gas and was recorded under similar conditions (e.g., instrument temperature, atmospheric conditions). We present an analysis of the impact of different external parameters on the DOAS fit quality when evaluating spectra using a FRS recorded, for example, on a different day. Based on our findings, an algorithm is introduced which automatically recommends for each plume spectrum a recorded FRS which optimises the accuracy. We show previous data from Tungurahua (Ecuador) and compare them to data created with the FRS with optimised accuracy.

UP 6.5 Mi 9:45 GW2 B3009

Satellite Remote Sensing of Halogens in the Arctic Troposphere — •Ilias Bougoudis, Anne-Marlene Blechschmidt, Andreas Richter, Anja Schoenhardt, and John Burrows — University of Bremen

Halogens play a key role in the atmospheric composition of the Arctic atmosphere. They deplete the major greenhouse gas, Ozone which also is a precursor of OH and thereby potentially change radiative properties and temperature, as well as the oxidizing capacity of the Arctic atmosphere. Previous studies have shown that the recent temperature increase due to climate change is more pronounced in the Arctic compared to other parts of the globe, a phenomenon known as Arctic Amplification. Our primary goal is to investigate if Arctic Amplification affects tropospheric concentrations of halogens in the Arctic during recent years, and how these changes are related to changes of parameters regarded as crucial for release of halogens into the troposphere such as sea ice conditions, oceanic phytoplankton, temperature and wind speed. To assess this goal, satellite retrievals of halogens from different UV-VIS satellite sensors will be used. Preliminary results on intercomparing already existing satellite retrievals of BrO from GOME-2 and SCIAMACHY are presented, indicating a need to improve the retrievals in order to study the evolution of halogens in the Arctic in time under Arctic Amplification.

UP 6.6 Mi 10:00 GW2 B3009

Global phytoplankton functional type products derived from the Ozone Monitoring Instrument using PhytoDOAS — •Julia Oelker[1], Tilman Dinter[2], Vladimir R. Rozanov[1], Andreas Richter[1], John P. Burrows[1], and Astrid Bracher[2] — [1]Institut für Umweltphysik, Universität Bremen, 28359 Bremen — [2]Alfred-Wegener-Institut für Polar- und Meeresforschung, 27568 Bremerhaven

Ocean color sensors measure backscattered radiance in up to eight wavelength bands from which phytoplankton chlorophyll-a concentrations are derived. Various algorithms exist to additionally extract information on phytoplankton community from such multi-spectral sensors, e.g. size classes or phytoplankton functional types (PFT), however, it is generally agreed that hyper-spectral sensors, due to increased spectral information, are more suitable for phytoplankton community studies. So far, no ocean color sensors with hyper-spectral resolution

are available. It has been shown though for the hyper-spectral sensor SCIAMACHY, designed for the retrieval of atmospheric trace gases, that retrieval of oceanic paramaters is possible. Chlorophyll-a concentrations of up to four PFTs have been retrieved simultaneously from SCIAMACHY data using PhytoDOAS a method based on Differential Optical Absorption Spectroscopy (DOAS). Here we will present global PFT products from the still-operating Ozone Monitoring Instrument (OMI) in comparison to SCIAMACHY global PFT products. We will highlight the improved spatial resolution and coverage of the PFT data from OMI and give an outlook for upcoming Sentinel missions.

UP 6.7 Mi 10:15 GW2 B3009

Wasserdampfmessungen bis in die untere Stratosphäre: das Hochleistungs-Raman-Lidar am Schneefernerhaus — Lisa Klanner, •Thomas Trickl und Hannes Vogelmann — Karlsruher Institut für Technologie, IMK-IFU, Kreuzeckbahnstr. 19, 82467 Garmisch-Partenkirchen

Infolge des geringen Mischungsverhältnisses von 5 ppm stellen Messungen des stratosphärischen Wasserdampfs eine erhebliche Herausforderung dar. Wir setzen auf die Methode der Raman-Streuung, welche durch Steigerung der Laserleistung und der Größe des Empfangsteleskops im Prinzip des Wasserdampf-Rückstreusignals beliebig hochskaliert werden kann. Das Hochleistungs-Raman-Lidar am Schneefernerhaus (Zugspitze, 2675 m) beruht auf einem 180-W-XeCl-Lasersystem im Einzellinienbetrieb bei 307.93 nm Wellenlänge und separaten Empfangsteleskopen mit 1.5 m und 0.4 m Durchmesser betrieben. Wir präsentieren vertikal hochaufgelöste Messungen von Wasserdampf, akkumuliert innerhalb einer Stunde, welche bis zur Tagung bis in über 20 km Höhe ausgedehnt werden sollen. Die Kalibrierung erfolgt mit dem seit vielen Jahren im selben Labor betriebenen, sehr genauen differentiellen Absorptions-Lidar, wodurch die Probleme mit der hohen räumlichen Variabilität der Feuchte entfallen. Temperatur konnte aus den Rayleigh-Rückstreuprofilen für 308 nm bis in knapp 60 km Höhe ausgewertet werden, wobei das Streulicht noch um fast drei Größenordnungen abgeschwächt werden mußte. Nach Zurüstung eines Choppers, mit dem die ersten 10 km des Signals abgeschnitten werden sollen, werden Temperaturmessungen bis in die Mesosphäre erwartet.

Kaffeepause (30 min)