UP 3: Remote Sensing

Time: Tuesday 11:00–12:00 Location: ELP 6: HS 4

UP 3.1 Tue 11:00 ELP 6: HS 4

Assessing the Impact of the 2023 Storm Daniel Flood in Pineios River Estuaries: An Analysis of Crop-Type and Inundation Mapping Using Sentinel-1/2 Imagery — •Rizos-Theodoros Chadoulis[1,2], Ioannis Manakos[1], and Constantine Kotropoulos[2] — [1]Centre for Research and Technology Hellas, Information Technologies Institute, 6th km Harilaou-Thermi Road, 57001 Thessaloniki, Greece — [2]Department of Informatics, Aristotle University of Thessaloniki, Box 451, Thessaloniki 54124, Greece

The 2023 Storm Daniel significantly affected the Pineios River estuaries, causing widespread flooding and impacting the agricultural landscape. This study aims to assess the impact of the floods on the area, utilizing Sentinel-1 and Sentinel-2 imagery for crop-type and inundation mapping. For the crop-type mapping, a time-series analysis was conducted over the 2022-2023 agricultural cycle, capturing the phenological changes of different crops, and a detailed crop-type map was produced using Machine Learning techniques and validated against in-situ observations conducted during the summer of 2023. The inundation mapping was achieved through a synergistic analysis of Sentinel-1 radar imagery and Sentinel-2 optical data, and the output was juxtaposed with the Copernicus EMS Rapid Mapping products. The proposed methodology provides accurate, evidence-based information to decision-makers, aiding in understanding the immediate effects of such events on agricultural regions but also providing valuable data for future flood mitigation and agricultural resilience planning in Thessaly.

UP 3.2 Tue 11:15 ELP 6: HS 4

Studying the global distribution of water vapour isotopologues with the Sentinel-5P mission — •Hartmut Bösch[1], Tim Trent[2], Matthias Schneider[3], Christopher Diekmann[3,4], Amelie Röhling[3], Farahnaz Khosrawi[3,5], Iris Thurnherr[6,7], and Harald Sodemann[6] — [1]Institut für Umweltphysik, Universität Bremen — [2]University of Leicester, UK — [3]Karlsruhe Institut of Technology — [4]Telespazio GmbH — [5]Forschungszentrum Jülich — [6]University of Bergen, Norwegen — [7]ETH Zuerich, Schweiz

Atmospheric moisture is a key factor for the redistribution of heat in the atmosphere and there is strong coupling between atmospheric circulation and moisture pathways which is responsible for most climate feedback mechanisms. Water isotopologues can make a unique contribution for better understanding this coupling. In recent years, global observations of water vapour isotopologues have become available from different satellite missions. With the launch of Sentinel 5P, water isotopologue total column retrievals with much improved spatial and temporal coverage compared to previous SWIR sensors thus representing a major advance for scientific and operational applications.

In this presentation, we describe the water isotopologues retrieval from Sentinel 5P, its assessment against ground-based reference data and against IR data from IASI which are mostly sensitive to the free troposphere. We will compare our water isotopologues dataset against isotope-enabled model calculations and discuss case studies to demonstrate how we can gain insights into hydrological regimes and processes. We will conclude with an outlook outlining future developments

UP 3.3 Tue 11:30 ELP 6: HS 4

Towards continuous, semi-automatic ship-borne measurements of columnar CO_2, CH_4, CO and NO_2 for regional-scale emission monitoring — •Vincent Enders[1], Ralph Kleinschek[1], Matthias Max Frey[3], Frank Hase[2], Isamu Morino[3], Astrid Müller[3], Hiroshi Tanimoto[3], Karolin Voss[1], and André Butz[1] — [1]Institute for Environmental Physics, Heidelberg University — [2]Karlsruhe Institute of Technology — [3]National Institute for Environmental Studies, Tsukuba, Japan

Previously, we successfully deployed an EM27/SUN Fourier transform spectrometer on research vessels to measure the column-averaged mixing ratios of CO_2, CH_4 and CO above the ocean. Here, we report on its first deployment on a commercial cargo vessel paving the way towards autonomous, ship-borne operations for the validation of satellite observations as well as monitoring and quantification of anthropogenic emission sources. For this purpose, we have supplemented the setup with a VIS spectrometer for simultaneous NO_2 measurements, a tracer of fossil combustion. The new spectrometer setup is particularly aimed at validating upcoming greenhouse gas monitoring satellites designed for measuring CO_2 together with NO_2.

Since mid-September 2023, the instrument is deployed on a commercial vessel, traveling back and forth along the East Coast of Japan. The current study focuses on testing the autonomous operations and on acquiring a dataset that allows us to evaluate the potential for identifying anthropogenic emission sources from Japan and the upwind Asian continent using the ratio between CO_2 and NO_2.

UP 3.4 Tue 11:45 ELP 6: HS 4

Portable ground-based scattered sunlight spectrometer for carbon dioxide and methane measurements — •Lukas Weis[1], Benedikt Löw[1], Ralph Kleinschek[1], Tobias Schmitt[1], Frank Hase[2], and André Butz[1] — [1]Institute of Environmental Physics, Heidelberg University, Germany — [2]Institute for Meteorology and Climate Research, Karlsruhe Institute of Technology, Germany

As atmospheric greenhouse gases continue to increase, there is a strong interest in understanding their sources and sinks. Quantifying urban emissions is vital to mitigating human-induced climate change. Our ground-based 'reflected sunlight' approach offers sensitivity to horizontal greenhouse gas distributions across kilometers, bridging the gap between localized in-situ and regional total column measurements.

We've adapted a portable EM27/SUN Fourier transform spectrometer (EM27/SCA) for carbon dioxide (CO_2) and methane (CH_4) retrieval from ground-scattered sunlight within the NIR spectral range. Deployed in an elevated position the EM27/SCA points into a source region along a multi-kilometer horizontal slant path. In 2022 the prototype demonstrated good agreement with CLARS-FTS during side-by-side measurements overlooking the Los Angeles Basin in California, USA.

We present results from this campaign and ongoing work on our second-generation instrument. The most notable improvement is a modular tracking system with optical fiber coupling, enhancing both flexibility and field of view homogenization to reduce the impact of target inhomogeneity on retrievals.