altitude of 4300 m. In spring and autumn, when local activity in the region is low, the location provides ideal conditions to measure background greenhouse gas concentrations representative for a geographically large area. During summer, touristic activity is prevalent, leading to increased traffic and related emissions. In winter, residential heating with coal or wood in the nearby villages can occasionally lead to elevated greenhouse gas and particulate matter concentrations.

Thus, the station serves three main purposes: (i) the observation of representative background signals, (ii) the assessment of health relevant air quality, and (iii) the determination of the impact of local activities on air quality and greenhouse gas emissions in the rural Kyrgyz Republic. These aspects are key elements for linking science, inventories and policy in this rapidly developing but sparsely observed area.

Quantification of materially utilized carbon in our society: the case of Japan

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To achieve the goals of Paris Agreement, global society is directing much effort in substantially reducing greenhouse gas (GHG) emissions. In addition to energy-related efforts, prevention of carbon release into the atmosphere with carbon capture and storage (CCS) and/or utilization of biomass resources is considered indispensable to achieving the global objective. In this study, considering carbon-containing goods as carbon reservoirs in our society similar to forests and reservoirs enabling CCS, the flow of materially utilized carbon was quantified by input-output-based material flow analysis (IO-MFA). IO-MFA with high-resolution IO table such as Japanese IO table having over 400 sectors provides carbon contents for products of each sector. Based on the carbon contents of products analyzed by IO-MFA, in-use carbon annually retained in an economy is quantified and its in-use condition is also identified. As a result, in 2011, 6.3 Mt-C of petroleum-derived carbon and 7.9 Mt-C of wood-derived carbon were introduced to the Japanese society as end-use products (e.g., automobiles and constructions) in various forms (e.g., plastics and synthetic rubbers). The total amount (14.2 Mt-C) corresponded to 4.1% (52.1 Mt-CO2) of annual CO2 emission in Japan in 2011. Subsequently, by referring to the technology that can treat carbon in the target forms in end-of-life products, the recoverability of carbon as a material has been discussed with respect to each form and end-use of carbon. By numerically showing the necessity and potential of implementing appropriate technologies, this study provides scientific direction for policymakers to establish a quality carbon cycle in our society.

Posters for Session 6: Regional efforts to constrain the global C cycle

Air-sea CO_2 fluxes from pCO_2 continuous measurements in a coastal area: the role of atmospheric forcing under different wintry seasons

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While confidence in estimating air–sea CO_2 fluxes in open sea environments is increasing, a large uncertainty remains in defining the role played by coastal ecosystems as CO_2 sinks or sources. This is due to their highly variable oceanographic and climatic characteristics and to the effects of continental inputs.

Within ICOS-OTC network, the PALOMA station, (Northern Adriatic Sea), is continuously collecting sea surface pCO_2 data since 2012. In the framework of JERICO-NEXT project, PALOMA is working together with several stations located in European coastal seas to explore the role of biological and atmospheric drivers in determining the observed pCO_2 variability.

In this work, we present and discuss the effects of meteorological conditions on CO_2 air-sea fluxes, using the data collected in four wintry seasons from 2012 to 2016.

In winter 2012-2013, the presence of lower temperatures and the occurrence of several events of Bora (wind speed > 15 ms^{-1}) produced a decrease of the SST down to 8.3 C leading to more favorable conditions for CO_2 absorption. The following winter was characterized by a higher air temperature, weaker winds, intense precipitation and river discharges larger than the average of the previous decade. These distinct hydrological and meteorological conditions significantly affected the sea surface pCO_2 that was lower in 2012-2013 (median pCO_2 = 324 ± 8.9 µatm) than in 2013-2014 (median pCO_2 = 343 ± 9.0 µatm). Sea always absorbed CO_2 from the atmosphere, but average daily fluxes were almost doubled during the colder winter 2012-2013 (F = -6.4 mmol–CO_2 m^2d^{-1}) than in the milder winter 2013-2014 (F = -3.7 mmol–CO_2 m^2d^{-1}).

Our results highlight the sensitivity of the CO_2 sink in the northern Adriatic to changes in the meteorological conditions and suggest that its capability of sequestering CO_2 could dramatically decrease in the next decades under a climate change scenario.

Local situations identification in GHG atmospheric hourly time series using statistical methods vs atmospheric approaches

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Tall tower atmospheric stations are used within ICOS to understand the atmospheric GHG budget variations and to assess the surface fluxes at the regional scales. High quality atmospheric concentrations gradients are used in inversion system to provide estimation of the surface fluxes estimation. Hourly time series of the atmospheric concentrations exhibit strong variability from days to years time scale. These variations may be related to meteorological and climate changes and to sources and sinks variations. While these drivers at regional scales play a significant role, local meteorology as well as local sources and sinks may also contribute to the observed GHG concentrations variability. Within ICOS one of our aims is to study the regional signatures at scales that can be aproached by the model inversion and assimilation framework and by the statistical inventories of sources. It is therefore necessary to filter out situations where the local influence is dominant enough to shadow the regional signature.. Background on top of what the regional signal is added.also needs to be defined accurately. Such local situations and background definitions may be extracted from signal processing/time series analysis procedures and / or by using physical based approached .

El Yazidi et al. (2018) assessed the efficiency and robusteness of 3 statistical spikes detection methods for CO2 and CH4 and concluded that the SD and REBS methods could be used after parameters specification. Local situations or strong local influence may also be identified by atmospheric based fingerprints such as calm wind, strong thermal inversion, large fast CO2 /CH4 or CO variations large CO or NO2 signal. However