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RUSALKA experiment to measure carbon dioxide and methane from ISS

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RUSALKA is an experiment aimed to demonstrate the method to monitor CO2 and CH4 with low cost and weight equipment. It was delivered to the Russian segment of the International Space Station (ISS) in the end of summer 2009. The novel instrument is a high-resolution near-IR spectrometer combining an echelle grating with an acousto-optic tunable [U+FB01]lter (AOTF) for separation of diffraction orders. A compact design with no moving parts within the mass budget of 2 kg allows to reach the resolving power of 20000 in the spectral range of 1580 nm (CO2), 1640 nm (CH4), in 49 and 47 echelle grating diffraction orders, and of reference O2 bands 760 and 1270 nm, in 101 and 61 diffraction orders. Only one diffraction order can be measured at a time, but thanks to [U+FB02]exibility of the AOTF tuning, any order can be measured randomly and rapidly within the spectral range. A spectrometer, based on this principle, SOIR (Solar Occultation InfraRed) is operational on Venus Express ESA mission since 2005. RUSALKA investigation targets precision measurements of CO2 and CH4 integral quantities, in nadir/oblique or observing solar glint over the water surfaces. Test measurements are also planned in solar occultation mode. Battery-powered RUSALKA package consists of the spectrometer itself, standard photographic camera for context imaging, and adapters. Measurements are performed by crew members pointing manually the target areas. Such measurements from ISS allow to verify methods used on different satellite platforms. The small size of the instrument makes it ideal for micro-satellites, capable to provide necessary pointing for glint or solar occultation observations. By the end of year 2009 all technical and organizing problems were solved and first datasets (high resolution spectra and exact ISS position data) where acquired for further processing.