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Long open-path TDL based system for monitoring background concentration for deployment at Jungfraujoch High Altitude Research Station- Switzerland

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A new, long open-path instrument for monitoring of path-averaged methane and water vapor concentrations will be presented. The instrument is built on the monostatic scheme (transceiver – distant retroreflector). A VCSEL tunable diode laser (TDL) with a central wavelength of 1654 nm is used as a light source. A specially designed, single-cell, hollow-cube retroreflector with 150 mm aperture will be installed at 1200 m from the transceiver in the final deployment at Jungfraujjoch and 100 mm retroreflectors will be used in the other applications. The receiver is built around a 20 cm Newtonian telescope. To avoid distortions in the shape of a methane line, caused by atmospheric turbulences, the line is scanned within 1 μs. Fast InGaAs photodiodes and 200 MHz are used to achieve this scanning rate. The expected concentration resolution for the above mentioned path lengths is of the order of 2 ppb.
The instrument is developed at the Swiss Federal Institute of Technology – Lausanne (EPFL) Switzerland and will be used within the GAW+ CH program for long-term monitoring of background methane concentration in the Swiss Alps. After completing the initial tests at EPFL the instrument will be installed in 2012 at the High Altitude Research Station Jungfraujoch (HARSJ) located at 3580 m ASL. The HARSJ is one of the 24 global GAW stations and carries on continuous observations of a number of trace gasses, including methane. One of the goals of the project is to compare path-averaged to ongoing point measurements of methane in order to identify possible influence of the station. Future deployments of a copy of the instrument include the Colombian part of Amazonia and Siberian wetlands.