Langley calibration of spectroradiometers at the high-altitude research station Jungfraujoch

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To study the Earth's climate the knowledge of the radiation budget is essential. Such an assessment relies on the measurement quality of the radiometers, which either orbit around the Earth or sit on the surface. Unfortunately, the two groups of instrumentation are rarely compared side-by-side to guarantee the consistency of the radiation measurements. In space, radiometers may use the sun as a calibration source. However, ground-based radiometers can also be calibrated with the extraterrestrial solar radiance by using the Langley-plot calibration method. From an infrastructural point of view it requires a narrow field-of-view collimator tube and an accurate solar tracker to guarantee that only the unscattered direct solar radiation is measured by the radiometer. The Langley calibration was applied to 3 different spectral radiometers, covering the spectral region between 350nm and 1700nm, with an average spectral resolution of 5nm. The experiment was conducted at the high-altitude research station Jungfraujoch at 3580 m.a.s. (Switzerland) during September and October 2009. First Langley-plots show a difference between the measurement points and the linear fit of less than 5ppm up to an airmass of 12. From May 2010 on the spectral radiometers will be deployed with a rotating shadowband for global and diffuse hemispheric spectral measurements at Leiden (The Netherlands), using the calibration values as determined with the Langley-plot method at the Jungfraujoch. Together with a set of well-calibrated broad-band radiometers, this will allow us to perform detailed radiative closure studies. Interestingly Langley calibrations are used mainly for filter-type radiometers but rarely for spectroradiometers. As the analysis so far shows a good quality of the Langley plots we would like to present more details and final results of this experiment.