Meteorological observations and instruments at Trafelberg site

Part of the meteorological activities by the Department of Meteorology and Geophysics of the University of Vienna (IMGW) are dedicated to examine the extreme climatological conditions in the depression in front of the Conrad Observatory (COBS) and to investigate the effects of atmospheric parameters, e.g., heavy rain or deep snow pack on temporal gravity variations. Starting in 2010 novel and partly self-developed measurement systems have been set-up. Among these are a micro rain radar, a snow balance system, a snow pack analyser and the METLIFT.

An intense observing period has been performed from November 26th, 2010 to March 26th, 2011 to study the life cycle of the cold air pool in the depression in front of the COBS during winter time. Additionally to the permanent measurements taken by METLIFT, and two weather stations - one located in front of the COBS and the other one located at the top of the Trafelberg - three weather stations have been operated on the lowest saddles of the depression. METLIFT (Fig. 1) has been developed by IMGW and allows for an automatic adaptation of the sensor height according to the snow depth. This guarantees that the sensors are always placed at the optimal height above snow surface. A novel snow pack analyser (Fig. 1) provided information about the snow depth, snow density, water equivalent and other snow parameters continuously. Data analysis is still under way but it was found that the cold air pool is removed every undisturbed night at least once. This is different to other, deeper, sinkholes in the Alpine Region (for a full description of night-time temperature series in sinkholes see Dorninger et al., 2011).

The short term gravity variations measured by the superconducting gravimeter inside of the COBS are partly affected by atmospheric effects. To account for these unwanted influences several meteorological instruments have been put in place. A vertical pointing micro rain radar mounted at the roof of the COBS measures the rain drop size distribution up to 3000 m above ground. From this rain rates, liquid water content and falling velocity can be derived resolved in 30 range gates. These are important data to study the effect of heavy rain in the lower atmosphere on short term gravity variations. For the same reason a snow balance system has been put in operation. It measures the weight of the snow pack which also influences the gravity measurements. Further, air pressure measurements of high temporal resolution are taken in the area around the observatory and correlated with the very fine scale gravity variations.

Figure 1. METLIFT (upper figure) and Snow Pack Analyser (lower figure) on 16th Dec. 2010. Snow depth: 80 cm.

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