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High resolution ground measurements

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FIELD EXPERIMENT

Ground measurement network

During COPS, the Universität Wien operated a ground measurement network with 100 HOBO weather stations (Fig.1) in an area of about 80km² (Fig.3), surrounding Supersite S. Data of precipitation, temperature, humidity, pressure, wind speed and wind direction were recorded with a temporal resolution of 1 minute. Additionally, 2 MAWS, 4 sonic anemometers, 1 micro rain radar, 1 disdrometer and 1 energy balance system were operated.

Fig.1: One of the Hobo weather stations operated with a 3m wind mast including the T/RH-sensor and pressure-sensor. The rain gauge is mounted on a separate pole.

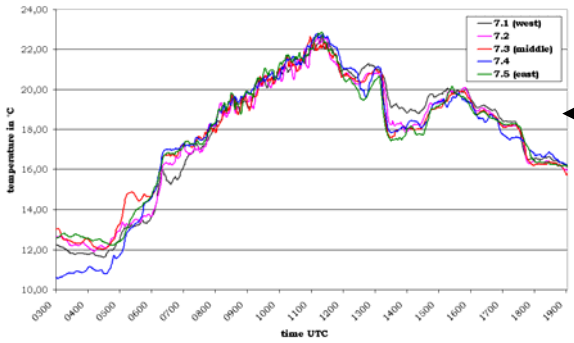


Fig.2: Temperature curves for July 8th, 2007 (IOP 7a) for the five HOBO stations marked in Fig. 3.
Due to the high temporal and spatial resolution of the data, even small differences like the varying cooling effect caused by a convective rain shower at about 13.00 UTC can be resolved.

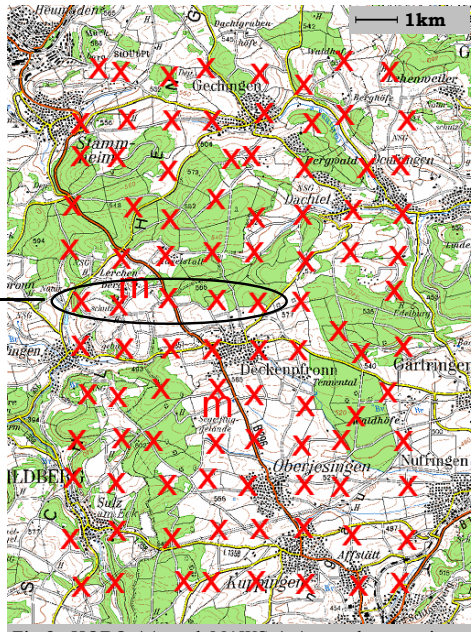
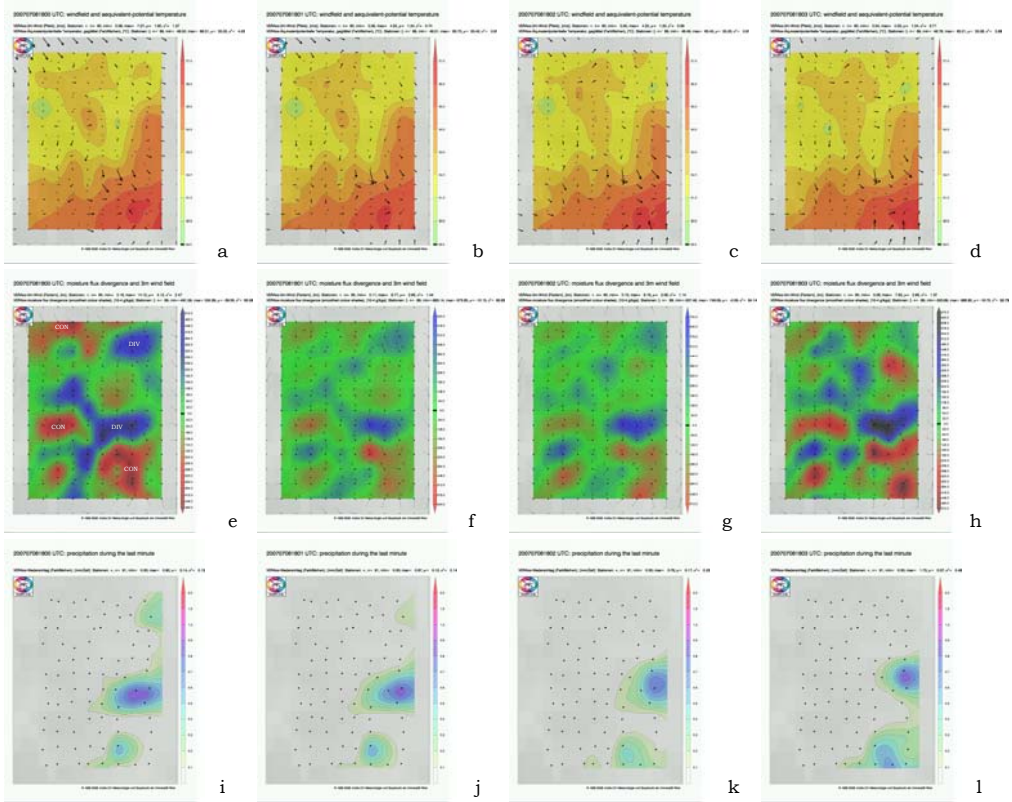


Fig.3: HOBO (x) and MAWS (m) weather stations surrounding Supersite S (SW of Deckenpfronn).

OFFICE EXPERIMENT

VERA analyses for IOP 7a (08.07.2007)



In a first step, data are quality checked using a new approach developed at the Universität Wien. Then analyses are calculated in one minute time steps for periods of interest, like the examples presented here for IOP 7a.
In ongoing studies, moisture flux divergence, which is a possible indicator for convective initiation will be investigated in more detail. Recurring spatial patterns due to orographic influence will be separated from the remaining signal, enlarging its significance.

Fig.4:
Analyses of equivalent-potential temperature and 3m wind field (a-d) and of moisture flux convergence (e-h). Reddish colours indicate convergence and bluish colours indicate divergence.
Analyses of accumulated 1 minute precipitation are displayed in i)-l).

One can see the advection of air with lower energy from the north west and convective shower cells in the south-east of the domain. Corresponding to the precipitation maximum, divergence in the moisture flux field can be detected due to the cold outflow.

Outlook: The dataset collected during COPS will be used for several applications at the Universität Wien. VERA (Steinacker et al., 2000) analyses as presented in Fig. 4 will be calculated for several IOPs to investigate small scale ground patterns of different parameters during convective events. These analysed data will be used for model comparisons (especially in the framework of MAP D-PHASE). Furthermore, this unique data set will be used to improve the VERA analysis scheme with regard to convective events. For example, it is planned to include radar data with the fingerprint technique (Steinacker et al., 2006) to downscale precipitation fields, whereas the COPS data set will be used for verification purposes. Another investigation will deal with the representativity of ground measurement stations. Last but not least, moisture flux convergence as an indicator for convective development will be tested on its reliability on a scale unprecedented before.

Steinacker R, Häberli C, Pöttschacher W (2000) A Transparent Method for the Analysis and Quality Evaluation of Irregularly Distributed and Noisy Observational Data. Mon Wea Rev 128: 2303-2316.
Steinacker R, Ratheiser M, Bica B, Chimani B, Dorninger M, Gepp W, Lotteraner C, Schneider S, Tschannett S (2006) A Mesoscale Data Analysis and Downscaling Method over Complex Terrain. Mon Wea Rev 134: 2758-2771.

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