Karlsruhe Institute of Technology

Institute for Meteorology and Climate Research (IMK-TRO)

KITcube - A complete observation system for the troposphere

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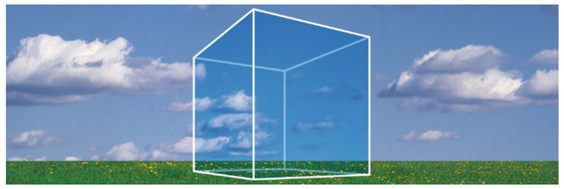

To understand atmospheric processes in the troposphere it is recommended to image the whole process chain in a real environment. To do so, a large set of different meteorological instruments is required, monitoring simultaneously the atmosphere. At the Institute for Meteorology and Climate Research (IMK) of the Karlsruhe Institute of Technology (KIT) such an overall monitoring system that merges a set of state-of-the-art instruments exists - **the KITcube**.

1. Research Areas

- Boundary layer topology and processes: continuous more-dimensional measurements of wind, temperature and humidity allow the evaluation of turbulence parameterizations.
- Moist convection: spatial variability of moisture and temperature, moisture and mass convergence and spatial variations in aerosol distribution are trigger mechanisms for convection. The KITcube can be used to study details of these processes.
- Clouds and precipitation: observations of the development of precipitation including the identification of different hydrometeors and the detection of mixing processes are directly possible.

2. Equipment

The KITcube equipment spans

- ground-based in-situ instruments: mobile towers (20 m, and 4 m), a 200 m tower[1], energy balance stations, turbulence stations, distrometers, soil moisture and temperature sensors, and rain gauches;
- ground-based active remote sensing instruments: a K-Band cloud radar, a X-Band precipitation radar, a C-Band precipitation radar[1], 3 Doppler lidars, a ceilometer, a scintillometer and a sodar;
- ground-based passive remote sensing instruments: a microwave profiler;

  as well as
- airborne in-situ measurements systems: radiosondes and dropsondes.

Two cloud cameras complement the instrumentation.

Fig. 1 KITcube set up in Hatzenbühl, Germany, during its extensive test period from autumn 2011 to spring 2012.

Overall measurements in a volume of about 10 km x 10 km x 10 km can be conducted. Being a mobile device, the KITcube can be operated at arbitrary measurement locations for time periods of several weeks to months.

[1] stationary at KIT Campus North

3. Data Flow

The special designed KITcube control unit (located in a separate control center) offers an intelligent instrument control. All data are collected and stored in a unique data format and real-time quick looks of the measurements are provided. The scanning remote sensing instruments will be jointly controlled to provide highly synchronized measurements in the near future.

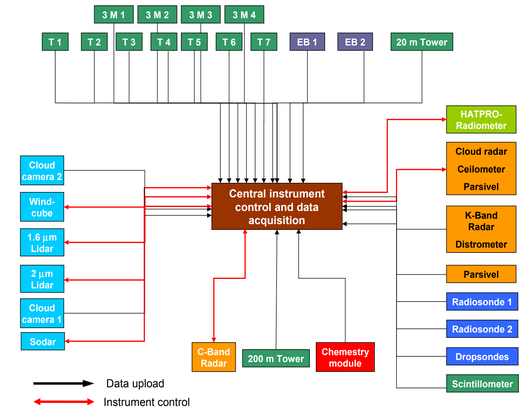

Fig. 2 KITcube data flow to and from the control center.

4. Current Measurement Campaigns

HyMeX
HYdrological cycle in Mediterranean EXperiment

From July to November 2012 the KITcube will contribute in the field campaign **HyMeX** (The Hydrological Cycle in the Mediterranean Experiment) on the hydrological cycle in the Mediterranean. Being located at the Corsican island the KITcube will be used (1) to monitor the conditions in the pre-convective environment in the upstream region (Ligurian Sea) of High Impact Weather; (2) to quantify the contribution of different scale dependent processes to the evolution of the pre-convective conditions and to deep convection; and (3) to investigate the impact of the island on the initiation and evolution of single MCSs, and on deep convection embedded in cyclones.

Afterwards KITcube will be participating in the High Definition Clouds and Precipitation for Climate Prediction **HD(CP)**[2] field experiment.

5. Measurement Example

The simultaneous and complementary use of the different instruments provide the possibility to gain a nearly complete picture of atmospheric activities.

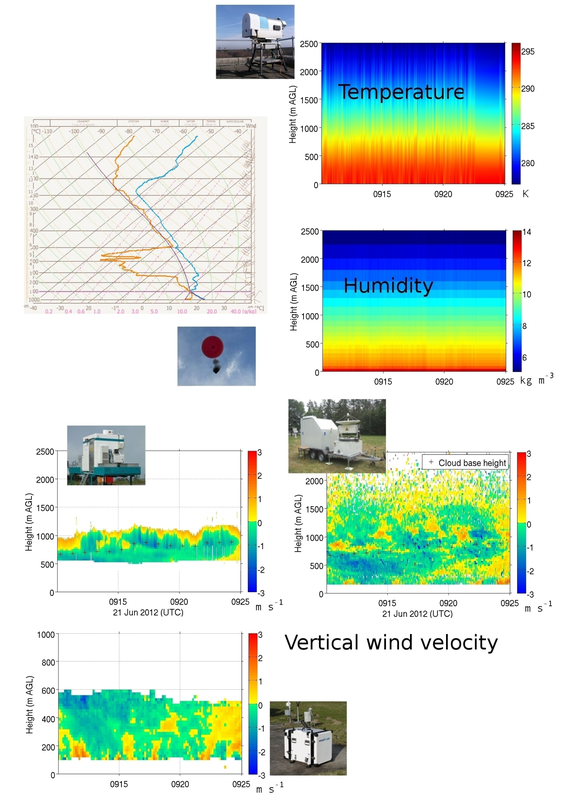

Fig. 3 Measurement example of a cumulus topped boundary layer