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, energy balance stations, turbulence stations, distrometers, soil moisture and temperature sensors, and rain gauges;
- ground-based active remote sensing instruments: a K-Band cloud radar, a X-Band precipitation radar, a C-Band precipitation radar, 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.

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Afterwards KITcube will be participating in the High Definition Clouds and Precipitation for Climate Prediction HD(CP) 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. 1 KITcube set up in Hatzenbühl, Germany, during its extensive test period from autumn 2011 to spring 2012.

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

Fig. 3 Measurement example of a cumulus topped boundary layer

HyMeX

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.

Current Measurement Campaigns

4. Current Measurement Campaigns

Fig. 3 Measurement example of a cumulus topped boundary layer