Meteodrones – Towards the perfect 24-hour forecast

May 23rd, ISARRA 2016, Toulouse

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Agenda

- Who are we? Why the drones?
- Technology
- Data of the flight campaign in Lannemezan
- Data assimilation into weather model
- On-going work & outlook
Meteomatics Company Profile

- Weather service provider
- Offices in Berlin & St. Gallen (Switzerland)
- Employees with strong backgrounds in physics, mathematics and computer sciences
- Customers in various sectors
- Specialized on industrial weather forecasts
- Focus on high-resolution local weather models and data distribution and accessibility
Improving PBL Data Situation

Only little data

- Satellites
- Aircraft
- Radar
- Balloons
- Weather station
- Laser
- Sound/Microwave

Fog
Trigger for Storms
Low stratus
PBL up to 1.5km
Adding Drone Data

Satellite

Aircraft

Radar

Balloons

PBL up to 1.5km

Meteodrone

Weather Station

Laser

Sound/Microwave
First private company that received the BVLOS approval for mini UAV.
Technology

Parachute Rescue System

Red/green position lights

Flashing LED (visibility 2km)
Rescue System at high wind speeds.
Flight Track in Google Earth
Flight Campaign in Lannemezan

- 59 flights in total
- 35 consecutive flights to 1000m above ground, covering 8 hours of continuous measurements
Pressure, May 18th, 2016, Lannemezan

Pressure in Toulouse.

7 am UTC  3 pm UTC

1600m ASL

1400

1200

1000

800

600 ASL

820 hPa

940 hPa
Rel. Humidity, May 18th, 2016, Lannemezan
Rel. Humidity, May 18th, 2016, Lannemezan

Tower data kindly provided by L6 2 22 % 7 6 m 9 32 6 50 o

Relative Humidity in Toulouse

Relative Humidity (%)

REL_HUM_2
REL_HUM_30
REL_HUM_45
REL_HUM_60

00:00 03:00 06:00 09:00 12:00 15:00 18:00 21:00

Instrumented 60m Tower: 2016-05-18
Temperature, May 18th, 2016, Lannemezan

Temperature in Toulouse.
Temperature, May 18th, 2016, Lannemezan

Tower data kindly provided by

Instrumented 60m Tower: 2016-05-18
Wind Speed & Dir., May 18th, 2016, Lannemezan

Wind Speed and Direction [m/s] in Toulouse

10 m/s
0 m/s
Wind Speed, May 18th, 2016, Lannemezan

Wind Speed and Direction [m/s] in Toulouse

Wind Speed (m/s)

Instrumented 60m Tower: 2016-05-18

Tower data kindly provided by 28 26 28
28 22 22 28 27 36 32 38 37 4 45 0 2 8 7 17
Wind Direction, May 18th, 2016, Lannemezan

Tower data kindly provided by

Instrumented 60m Tower: 2016-05-18
WRF Assimilation

First results from assimilation experiments with Meteodrone data.

**Model setup**
- WRF-ARW forecast model for Switzerland (1km x 1km)
- Initialization: ECMWF 00z and 12z runs
- Data assimilation: Four Dimensional Data Assimilation (FDDA)

**Assimilation Window:** 00z to 04z

**Flight height:** up to 1200m

**Number of assimilated values:** ca. 20’000 (Temperature, dew point, wind speed / direction, pressure)

**Meteodrone Sites:**
Altenrhein, Amlikon, Schänis
Relative Humidity, ML=5 (ca. 377m AGL)

Init time: 2015-07-13 00z

RH(WRF_DA) – RH(WRF_noDA) [%]
Resolving Local Wind Phenomena

Observing effects from Alpine pumping:
Liftoff in Altenrhein Airport
Icing

- Data collection in Climate-Wind-Tunnel of Rail Tec Arsenal in Vienna to identify potentially dangerous atmospheric conditions
Thank you very much!

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