PH-WUR AIRFRAME CHARACTERISTICS, INSTRUMENTATION AND POSSIBILITIES

Airframe:
SkyArrow 650 TCNS ERA, length 8.2m, wingspan 11.1m
range 3.5hrs, 330NM/600km; airspeed 40-105 kts, typical speed when measuring 60-70kts (30-35m/s); ceiling ~13500ft (4500m), max rate of climb 850fpm (4m/s)
Inertial GPS and accelerometers for high precision 3D position and motions

Scientific equipment:
Turbulence probe: 3D wind field
Thermocouple: fast response temperature
Infra red gas analyzer (LICOR 7500): fast response carbon dioxide and water vapor concentrations
PAR sensor: photosynthetically active radiation sensor
Net all-wave radiation sensor
Infra red thermometer: surface temperature
Laser altimeter: precise altitude (up to ~500 m agl)
Sampling frequency all sensors: up to 50Hz

Optional:
Other greenhouse gases
Cameras (visible, spectral)

Data formats:
Numerical (NETCDF, CSV), graphical, overlays on any map incl Google Earth©

PH-WUR AIRBORNE FACILITY FOR MONITORING GREENHOUSE GAS EMISSIONS

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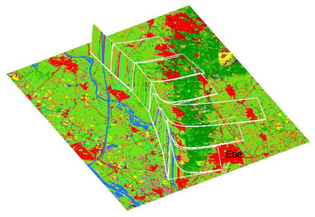
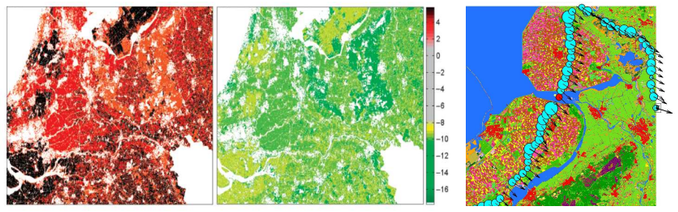
PH-WUR
AN AIRBORNE FACILITY FOR MONITORING GREENHOUSE GAS EMISSIONS





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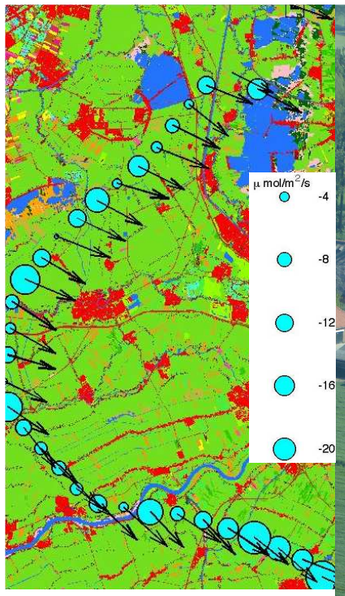
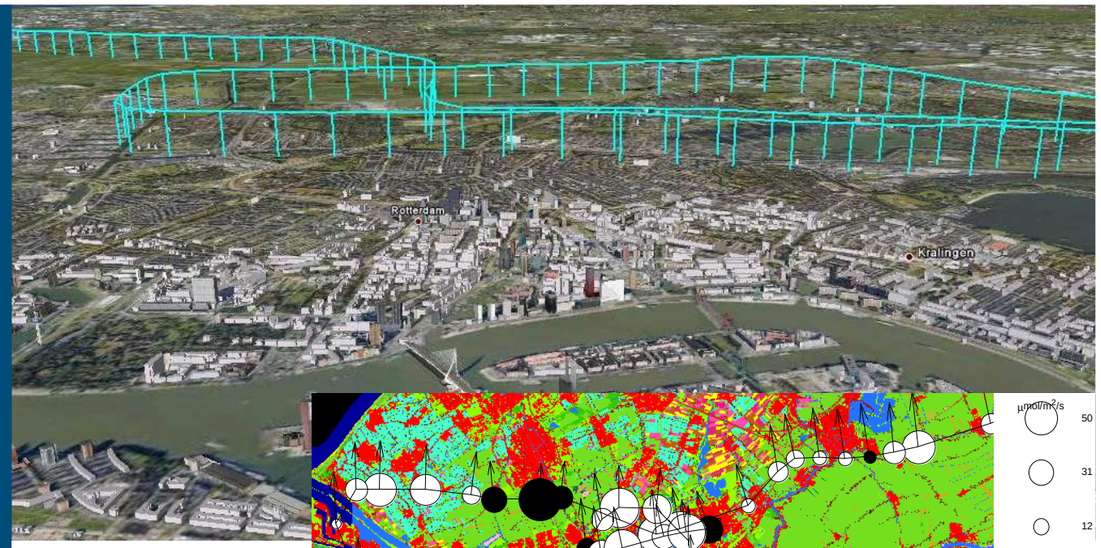
For quality of life

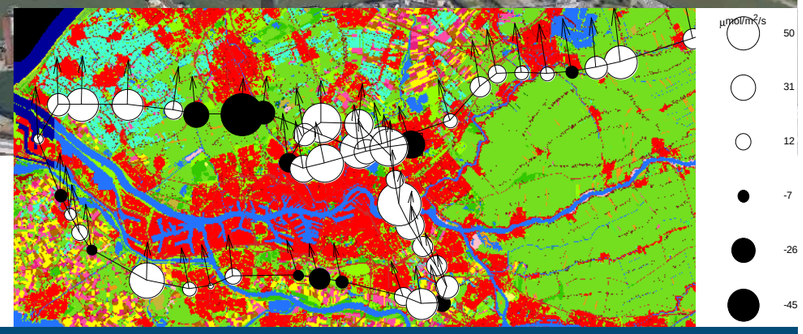


Above: Carbon dioxide flux over the fen meadow area in the west of the Netherlands (7 April 2008): size of bubble relative to flux magnitude; blue uptake; arrows wind direction

PH-WUR MONITORS RURAL CARBON DIOXIDE SINKS AND SOURCES

Rural areas play a significant role in the greenhouse gas budget. Forest and grasslands take up carbon dioxide, croplands and drained peat lands emit carbon dioxide. Fertilized cropland and grassland emit other greenhouse gases, mostly nitrous oxide. The PHWUR can monitor these at the regional scale and provide snapshot estimates of these fluxes or -by repeated flights- integrated fluxes over longer time periods (seasonal, annual). Through footprint modeling (see front page picture) regional totals can be attributed to the various land use types found in the landscape.





Top: Birds eye view of the flight over Rotterdam depicted at right

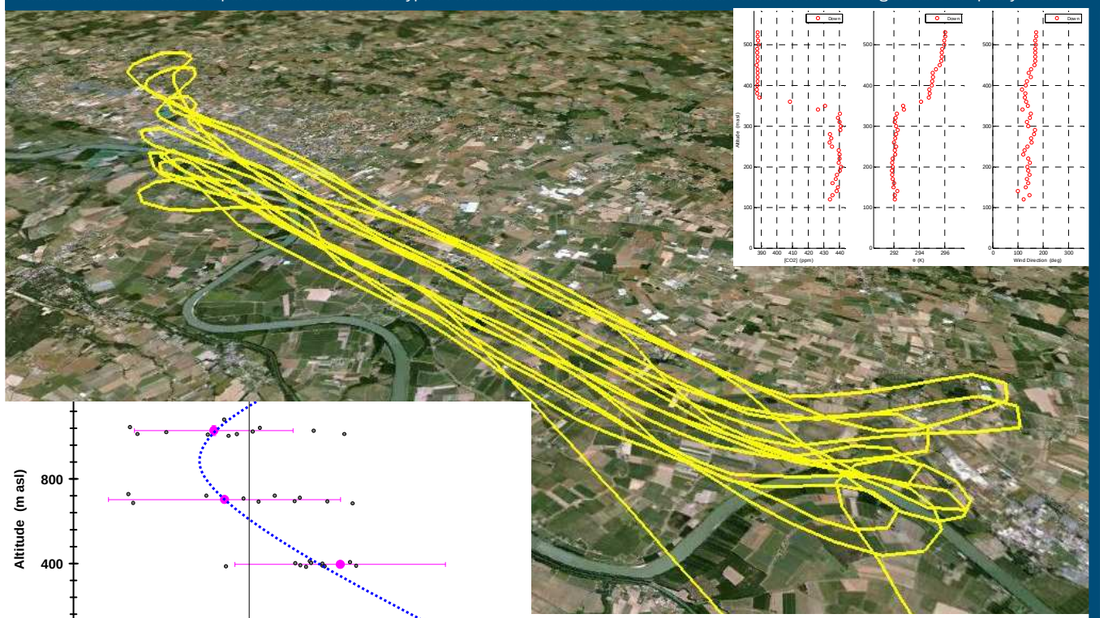
Right: Carbon dioxide flux (17 June 2009): size of bubble relative to flux magnitude; black uptake, white emission

PH-WUR MONITORING THE URBAN METABOLISM

Cities have a specific climate of their own. The 'urban heat island' is characterized relatively warm conditions and a high pollutant load. The PHWUR can be used to monitor the urban metabolism: thermal properties of the city, heat and vapor exchange, greenhouse gas emissions (but note that safety regulations may prevent low-level flight over build-up areas).

OBSERVING BOUNDARY LAYER DYNAMICS WITH THE **PH-WUR**

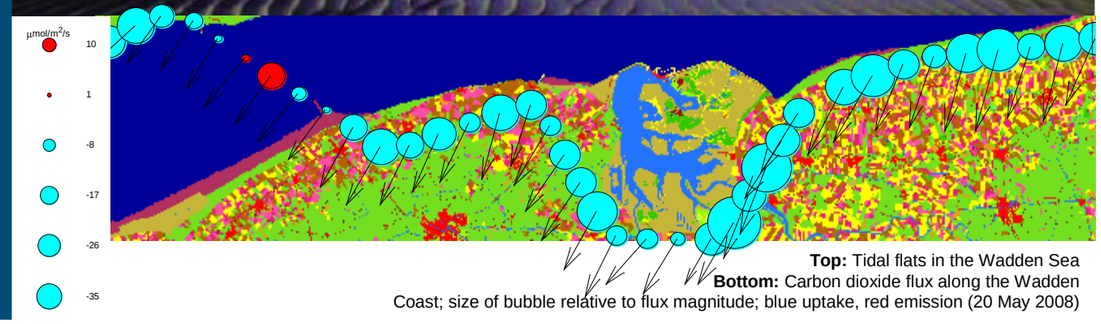
The PHWUR can be used to study the dynamics of the boundary layer by repeated profile flights. Also it can be used to study the divergence of fluxes in the boundary layer or entrainment near the boundary layer top by performing a number of stacked flights. The measurement of turbulent fluxes of heat and water vapor are beneficial to this type of research. Such in-situ observations are ideal for meteorological and air quality studies.



Background: Stacked flights near Marmande (SW France, 23 April 2007)
Bottom: Sensible heat flux divergence (afternoon) from same flights
Top: Profiles of temperature, humidity and CO_2 concentration (morning)

MONITORING COASTAL METEROLOGY WITH THE **PH-WUR**

The PHWUR can be used to monitor aspects of coastal meteorology like sea breeze developments and associated land-sea thermal contrasts and resulting boundary layer dynamics. Also the important emissions of greenhouse gas exchanges from nutrient rich estuaries and tidal flats can be followed (note that safety regulations may prevent flights too far off the coast).



Top: Tidal flats in the Wadden Sea
Bottom: Carbon dioxide flux along the Wadden Coast; size of bubble relative to flux magnitude; blue uptake, red emission (20 May 2008)