IHOP 2002 High Resolution Doppler Lidar Data Readme

TITLE: Vertical velocity data, Horizontal velocity data and select water vapor flux data from the International H2O Project (IHOP)

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Local web address for instrument information: www.etl.noaa.gov/et2/instruments/hrdl/

DATA SET OVERVIEW: The NOAA High Resolution Doppler Lidar (HRDL) was deployed alongside the DLR Water Vapor Differential Absorption Lidar (DIAL) on the DRL Falcon F-20 Aircraft for IHOP. Measurement objectives for the combination of the two instruments aimed at observing horizontal and vertical transport of moisture in the region under the aircraft. These measurements directly addressed IHOP scientific objectives associated with the role of boundary layer heterogeneity in initiation of convective precipitation, and characterizing southerly low level jet transport of moisture into regions of convection.

HRDL uses coherent detection to measure the radial component of the wind velocity by detecting the Doppler shift of radiation backscattered toward the lidar from atmospheric aerosols. The instrument nominally transmits 2 mJ of eyesafe energy at a wavelength of 2.02 μm and a pulse rate of 200 shots per second. Each pulse has a duration of 200 ns, corresponding to a spatial resolution of about 30m. The backscattered energy is gathered by a 20 cm telescope and digitized for real-time and post processing.

HRDL was installed on the DLR Falcon in Munich prior to the IHOP experiment. Unfortunately, immediately after installation a key component (the local oscillator) failed and had to be sent back to the manufacturer. Eventually, a completely new local oscillator laser was procured and installed into the system. The laser failure delayed operation of HRDL until the first of June.

For IHOP HRDL was deployed in one of two configurations. To measure vertical profiles of vertical wind and estimate moisture flux profiles, the lidar pointed directly at the nadir to estimate vertical velocities from the surface through the boundary layer and into the free troposphere. The lidar returns were typically processed to yield a horizontal resolution of 1 s and a vertical resolution of 150 m. Boundary layer missions overflew surface flux stations and at least one overflight of the King Air, with its in situ turbulence flux package, was carried out.

For measuring horizontal transport, a refractive wedge was inserted above the aircraft optical window to deflect the beam 15 degrees off nadir. The beam was fixed perpendicular to the aircraft flight direction, providing a single component of the wind. In order to maximize the impact of the single component measurements, the Falcon typically flew box patterns with the sides aligned E-W and N-S. During E-W flights, for which the lidar was directed in a north-south direction, the primary component of the southerly low level jet was measured directly. Dropsonde comparisons were carried out during the June 9 flight, and showed good agreement between the component measured by the lidar and the radiosonde measurement.

TIME PERIOD: IHOP Dates: 31-MAY-02 Through 14-JUNE-02
Included HRDL Data Dates : 02-JUNE-02, 03-JUNE-02, 06-JUNE-02, 07-JUNE-02, 09-JUNE-02, 14-JUNE-02

PHYSICAL LOCATION: Aboard the DLR Falcon, flown over the states of Colorado, Kansas, Oklahoma and Texas

DATA SOURCE: NOAA/ETL High Resolution Doppler Lidar

WWW REFERENCE: www.atd.ucar.edu/dir_off/projects/2002/IHOP.html

INSTRUMENT DESCRIPTION: www.etl.noaa.gov/et2/instruments/hrdl

DATA FORMAT: The data is in the netCDF format. The file naming convention is as follows:
For the HRDL data only: hlasv_cwbsnr_yymmdd_hhmmtohhmm.nc
lasv represents the vertical lassen velocity data [m/s]
hlasv represents the horizontal lassen velocity data [m/s]
cwbsnr represents the position (lat/lon/altitude) modified wide band signal to noise ratio
y = year, d = day, m = month, h = hour, m = minute
For the combined HRDL and H2O vapor DIAL Flux measurements:
yymmdd_hlasv_flux_Leg#.nc
y = year, m = month, d = day
hlasv represents the horizontal lassen velocity data [m/s]
flux represent the combination of the H2O vapor DIAL and HRDL velocity measurements to obtain estimates of the water vapor flux [g m / kg s]
Leg# is the flight leg of the DLR Falcon represented

Parameters: Velocity data for LLJ days is 10 s resolution with the exception of 03:48 to 04:13 02-JUNE-02, and this data is 2 s time resolution.
For Vertical Flux days, the data is 1 s time resolution, and 150 m gates in the vertical.
Vertical resolution for LLJ day data is 140 m gates.
Range vector is the distance from plane altitude.
Version: 1 15-JAN-04
Bad Data Flag -999.0
Data has been interpolated for integration of HRDL and H2O DIAL data, as well as for missing velocity (HRDL) data.
Time is UTC

DATA REMARKS: Velocity sign convention:
For Vertical Flux days: Positive velocities are those moving toward the instrument, negative velocities are those moving away from the instrument. Thus, an updraft is represented with a positive value, and the down drafts are represented with a negative value.

For Horizontal Flux days: The data is representative of the magnitude of the wind speed in the direction of the dominating wind field.

For reference and quality of data, the image files show an inter-comparison of the lidar velocity measurements with dropsonde velocity measurements for the 06/09/02 case. The file naming convention is as follows: **yymmdd_hrdl_sonde_comp_leg.gif** where **yy**=year, **mm**=month, **dd**=day, **hrdl** is the name of the lidar, **sonde** represents dropsonde comparison and **leg** stands for E = East, W = West, N = North, S = South such that EW represents the leg in which the DLR Falcon traveled East to West etc.