The format of the Gill sonic anemometer (R3A) data measured at EGAT tower in February-March, 1999.

The raw data from R3A and a ventilated hygrothermometer were recorded during the radiosoundings in February-March, 1999. Each file represents the raw data streams for approximately 30 minutes and usually two consecutive data sets should cover the radiosonde launch time. In another words, when there was no radiosoundings, no sonic data were recorded, either. Below summarizes the details of the measurements. Also user's manual of R3A should be handy to understand the data structure and quality.

Gill Instruments Ltd. (1996): User Manual and Product Specification, Omnidirectional (R3) & Asymmetric (R3A) Research Ultrasonic Anemometer, Doc. No. 1210-PS-002-Iss 2, 1996/11/22.

File name Convention

Each file has the name with the following format: YMMDDmn Y represents the year, MM the month, DD the day, m the launch number of radiosonde of this day, and n the consecutive number of the Gill data associated to the radiosonde number m. For example, two files 90303A1 and 90303A2 represent two Gill raw data sets that correspond with the radiosonde flight number 90303A that took place on March 3 of 1999.

Sensors:

R3A sonic anemometer (3-d wind vectors, sonic temperature and clinometer outputs) and a ventilated hygrothermometer (NCAR in-house made) with a Vaisala 50Y temperature and humidity sensors, mounted at 60 m above the ground, on the tip of a 2-m long boom extended in the direction of 140 degrees from a 120- m tower. The three supporting spars of R3A are in the directions of 120, 180, and 240 degrees. The "N" identifier (see the manual figure) is in the direction of 0 degree. Thus, the data which were least affected by the tower structure and by the sonic array are those with wind coming from 0-120 degrees, and from 240-320 degrees.

Data Flow:

Digital data from R3A and analog outputs from 50Y were synchronized and combined together by a Gill Sensor Input Unit (SIU) into a RS422 signal. This serial signal was then captured and converted into a RS232c signal by a Gill Power and Communication Interface (PCI) connected to a PC running Gill's software 'RCOM'. This setting allowed recording of a continuous synchronized data flow from the sensors onto a PC.

Data Format:

The data consists of two parts, (i) data information header and (ii) actual data.

(1) The data information header looks like below and in the right column a brief explanation is added. For more details, see the Users manual.

Serial Number O000066

ABSTEMP ON K	:Absolute temp (K) reporting from the PRT sensors is ON (note however, there was no PRT sensor connected to the R3A during the measurements, and thus this field is always empty.)
AOPFSD 30	:Analog outputs full scale is set to 30. (analog outputs were not used during the measurements, and thus this setting does not mean anything.)
ASCTERM CRLF	:ASCII output string terminater was set to CR/LF
AVERAGE 10	:The number of samples used to produce one data point is set to 10. (Thus for example, one w data point represents the average

	of 10 raw w measurements sampled at 100Hz)
ECHO ON	:Character ehoing is on (this setting does not affect the data.)
SOSREP SONICTEMP C	:Speed of sound reporting is in the unit of sonic temperature in degC.
STRFMT BINARY	:The result message string is in binary mode.(this setting does not affect the data.)
WINDREP UVW CAL	:Wind vector data are reported in uvw format.
POLARWRAP 360	:The wrap angle of the analog output polar reporting is set to 360 deg.(analog outputs were not used during the measurements, and thus this setting does not mean anything.)
MSGMODE CONT	:The data are reported in continuous mode.
CTONE DISABLED	:The audible confidence tone was disabled.(this setting does not affect the data.)
ANAIP EEDDDD	:1st and 2nd channels of SIU are turns on.
Fri Feb 12 14:20:05 1999	:This time stamp indicates the starting time of the data recording.

(2) The actual data look like below. The data are recorded at 10Hz rate.

Sa Sb U' V' W' ST(C) AT(K) Ip1 Ip2
04,20,+06.16,+02.25,-01.78,+025.82,------,+0.6756,+0.4614

05,00,+06.19,+02.03,-01.86,+025.79,------,+0.6750,+0.4608

06,01,+06.17,+01.79,-01.88,+025.82,------,+0.6762,+0.4608

07,00,+06.23,+01.52,-01.78,+025.85,------,+0.6762,+0.4614

Each column represents the following information:.

Sa: Status Address in the range of 00-10. 07: inclinometer x axis MSB, 08: inclinometer x axis LSB, 09: inclinometer y axis MSB, 10: inclinometer y axis LSB. For other address numbers: see the Users Manual.

Sb: Status Data, when Sa=08-10, Sb gives inclinometer data as 16 bit twos' complement numbers expressed with two hex characters. All these hex values should first be translated into decimal values. Then they can be converted into a physical unit of degrees by multiplying 0.01. Positive x values are the tilt angle of R3A measured clockwise around the 90-to-270 degrees line. Similarly, the positive y values are the tilt angle measured clockwise around the 0-to180 degrees line. The level has the range is -30 to 30 degrees.

U': U axis velocity in 0.01 m/s unit. Positive U values are wind blowing from 150 degrees.

V': V axis velocity in 0.01 m/s unit Positive V values are wind blowing from 60 degrees.

W': W axis velocity in 0.01 m/s unit. Positive W values are wind blowing upward.

ST(C): Sonic temperature in 0.01 degC unit

AT(K): Absolute temperature (not available for this data set)

Ip1: Temperature data from 50Y sensor of the hygrothermometer in volt. The voltage output of 50Y in the range of 0-1V corresponds with -40 to 60 deg C. Thus Ta=100*Ip1-40 would produce the temperature value in degC. However, for the particular 50Y used in this measurements, the NCAR's in-house calibration procedure produced the following polynomial fit:

Ta=-40.46834+101.23375*Ip1-0.644574*Ip1^2

Ip2: Relative humidity data from 50Y sensor of the hygrothermometer in V. The voltage output of 50Y in the range of 0-1 V corresponds with 0-100% of relative humidity. Thus RH=Ip2*100 would yield RH value in %. However, for the particular 50Y used in this measurements, the NCAR's in-house calibration procedure produced the following polynomial fit:

RH(%)=0.149819+98.4557*Ip2-1.356555*Ip2^2+0.2071125*Ip1*Ip2